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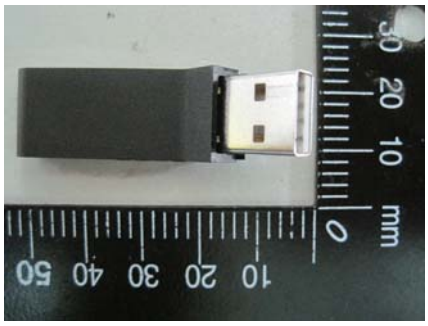
FCC RADIO TEST REPORT

Applicant's company	**Eleven Engineering Inc.**
Applicant Address	10150-100 Street, Suite 900, Edmonton, Alberta, Canada T5J OP6
FCC ID	**OP5PL5561**
Manufacturer's company	**Eleven Engineering Inc.**
Manufacturer Address	10150-100 Street, Suite 900, Edmonton, Alberta, Canada T5J OP6

Product Name	SKAA USB TX
Brand Name	SKAA
Model Name	PL5561
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Mar. 01, 2012
Final Test Date	Apr. 20, 2012
Submission Type	Original Equipment



Statement

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 C and FCC Public Notice DA00705**.
The test equipment used to perform the test is calibrated and traceable to NML/ROC.

TAF
Testing Laboratory
1190

ILAC MRA

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR0D2902-01	Rev. 01	Initial issue of report	Apr. 20, 2012

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**SKAA USB TX**
Brand Name	:	**SKAA**
Model Name	:	**PL5561**
Applicant	:	**Eleven Engineering 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 Mar. 01, 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.

Jordan Hsiao

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	17.55 dB
4.2	15.247(b)(1)	Peak Output Power	Complies	6.83 dB
4.3	15.247(a)(1)	Hopping Channel Separation	Complies	-
4.4	15.247(b)(1)	Number of Hopping Frequency	Complies	-
4.5	15.247(a)(1)	Dwell Time	Complies	-
4.6	15.247(d)	Radiated Emissions	Complies	6.74 dB
4.7	15.247(d)	Band Edge Emissions	Complies	15.04 dB
4.8	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Peak Output Power	±0.8dB	Confidence levels of 95%
Hopping Channel Separation	$\pm 8.5\times10^{-8}$	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

Items	Description
Power Type	From Host System
Modulation	FHSS (FSK)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	49
Channel Spacing	1.536 MHz
Channel Band Width (99%)	2228.65 kHz
Output Power	14.17 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3
Remark: A channel palette of 49 channels, which are spaced by 1.536 MHz starting at 2403.585 MHz. From this palette, 20 channels are used by the system at any given moment. Upon startup the system beings to hop on 20 random channels. The hopping sequence is a pseudo random ordered list of the 20 channels, and is 20 elements long. 20 hopping channels are always used at any given point in time. The system has a regular hopping rate of ranging from 100 hops per second to 1000 hops per second, and has a dwell time ranging between 1 ms to 10 ms. During normal operation all channels are used equally and transmissions never span more than 1 hop time. Every hop cycle contains a single transmission from the transmitter and receiver and no channels in the current list of 20 are skipped. This guarantees that all 20 channels are used equally on average, and that the total dwell time on any channel within the hop set is less than 0.4 s in any 8 s period.	

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	PCB Antenna	NA	2.01

3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2400～2483.5MHz	1	2403.585 MHz
	2	2405.121 MHz
	3	2406.657 MHz
	:	:
	23	2483.913 MHz
	24	2440.449 MHz
	25	2441.985 MHz
	:	:
	47	2474.241 MHz
	48	2475.777 MHz
	49	2477.313 MHz

3.5. Table for Test Modes

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	Channel	Antenna
AC Power Conducted Emissions	Normal Link	-	1
PEAK Output Power	CTX	1/24/49	NA
Hopping Channel Separation	Hopping Mode	48～49	NA
Number of Hopping Frequency	Hopping Mode	Hopping 1～49	NA
Dwell Time	Hopping Mode	Hopping 1～49	NA
Radiated Emissions Below 1GHz	Normal Link	-	1
Radiated Emissions Above 1GHz	CTX	1/24/49	1
Band Edge Emissions	CTX	1/24/49	1

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	-
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.

3.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	D400	QDS-BRCM1005-D
Mouse	First Price	FP-M02	DoC
Ear phone	SHYARO CHI	MIC-04	N/A
Speaker	-	-	N/A
Speaker fixture	-	-	N/A
Speaker fixture power	-	-	N/A

3.8. 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

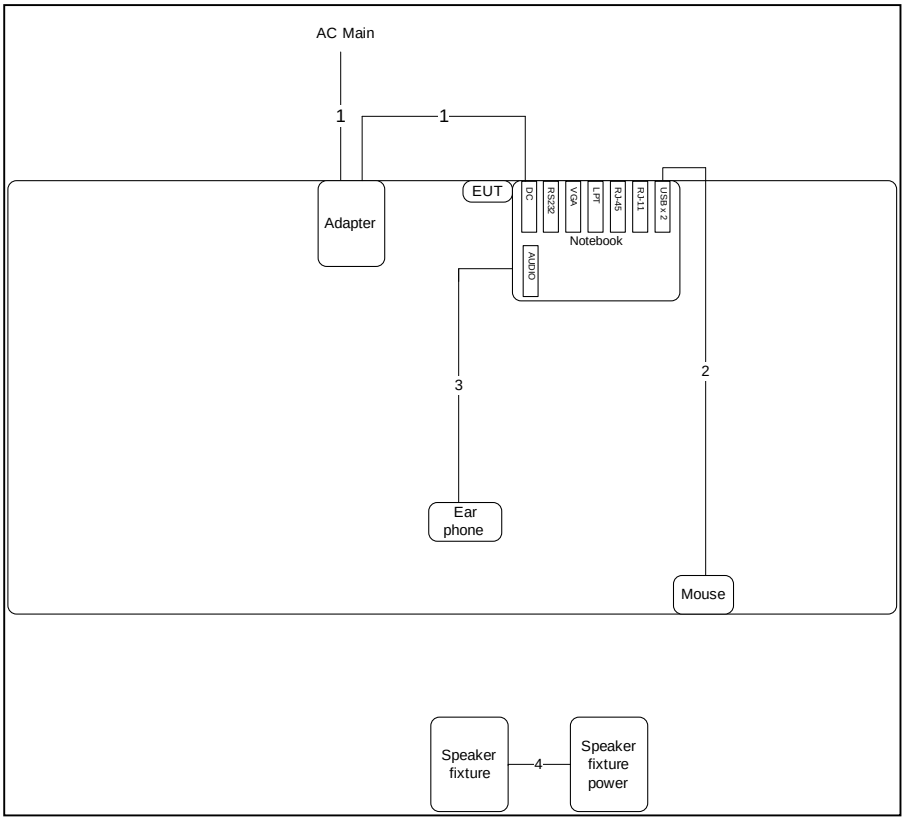
Test Software Version	DOS		
Frequency	2403.585 MHz	2440.449 MHz	2477.313 MHz
Power Parameters	High Power	High Power	High Power

Executed "DOS" was executed the test program to control the EUT continuously transmit RF signal.

3.9. Test Configurations

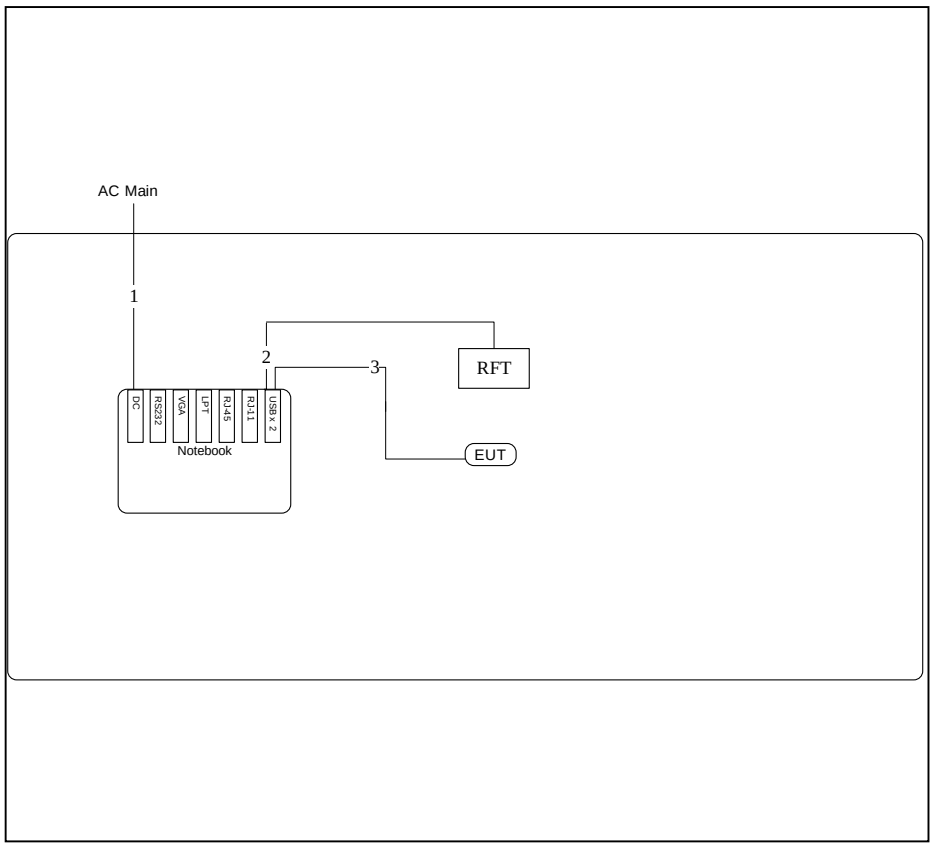
3.9.1. Radiation Emissions Test Configuration

Test Configuration: 9kHz~1GHz



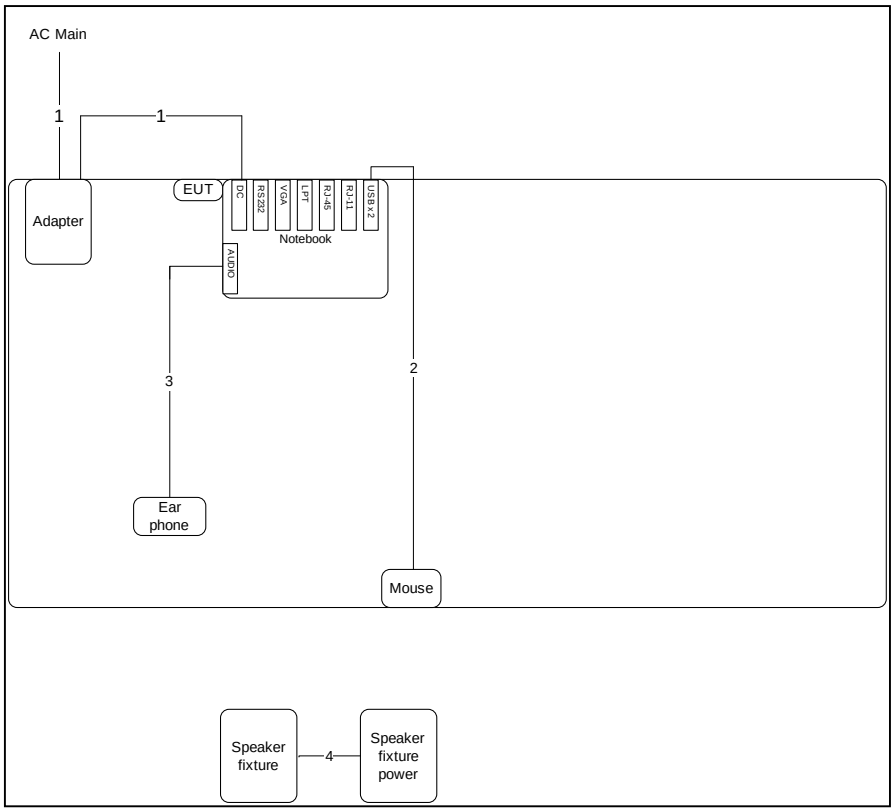
Item	Connection	Shield	Length
1	Power cable	No	2.6M
2	USB cable	Yes	1.8M
3	Ear phone cable	No	0.72 M
4	Speaker fixture power cable	No	0.11 M

Test Configuration: Above 1GHz



Item	Connection	Shield	Length
1	Power cable	No	2.6M
2	USB cable	No	0.85M
3	USB cable	No	1.5M

3.9.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	2.6M
2	USB cable	Yes	1.8M
3	Ear phone cable	No	0.72 M
4	Speaker fixture power cable	No	0.11 M

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For a Low-power Radio-frequency Device 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

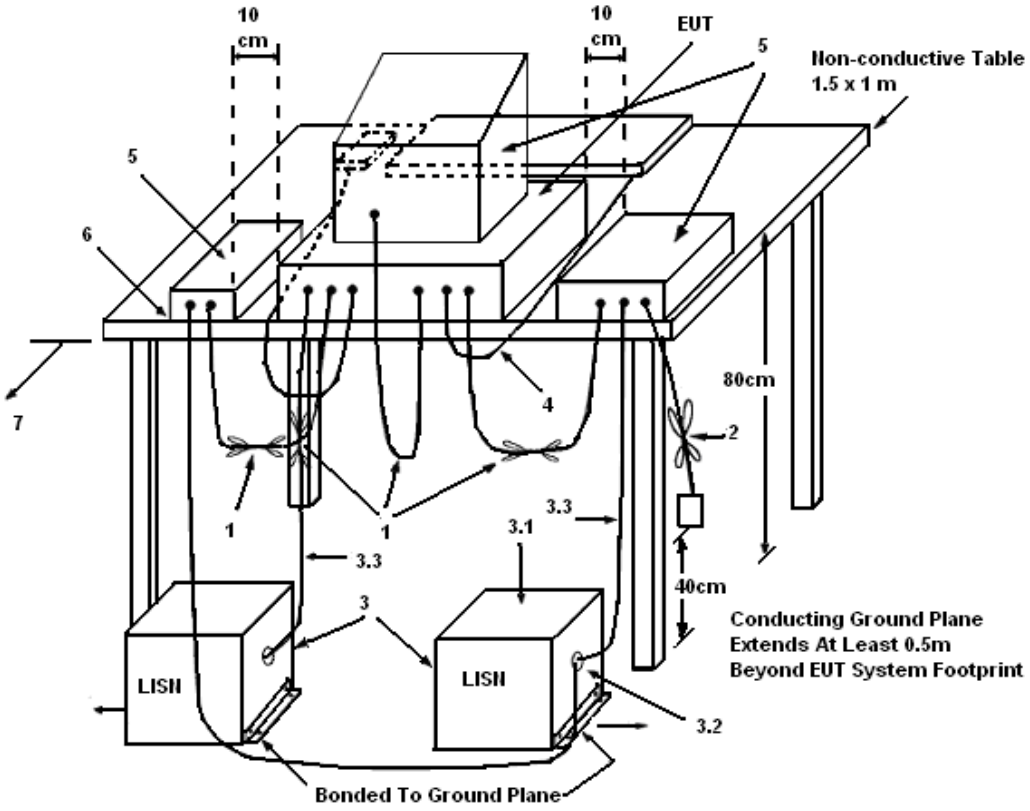
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.4. 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.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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 Ω. 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

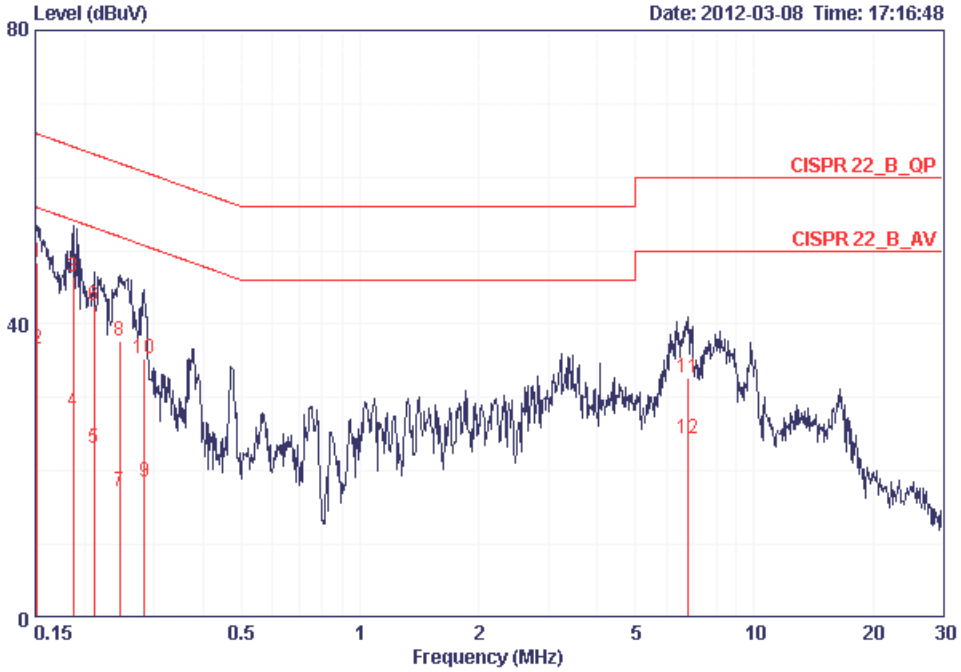
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

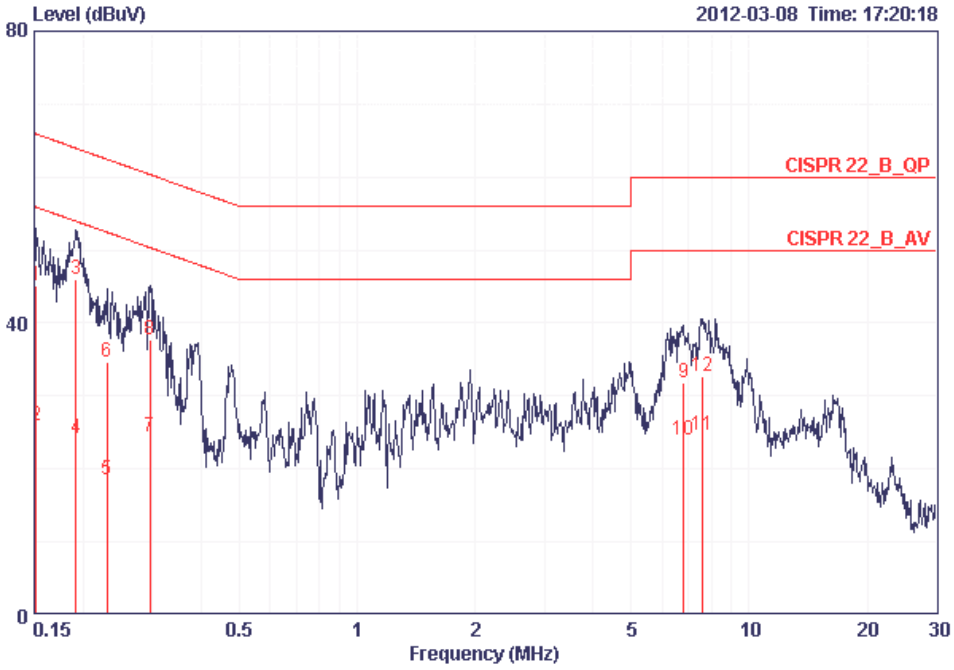
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	50%
Test Engineer	Sin Chang	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.15160	48.36	-17.55	65.91	48.09	0.07	0.20	QP
2	0.15160	36.64	-19.27	55.91	36.37	0.07	0.20	AVERAGE
3 @	0.18739	46.38	-17.78	64.15	46.12	0.06	0.20	QP
4	0.18739	28.07	-26.09	54.15	27.81	0.06	0.20	AVERAGE
5	0.21167	23.04	-30.10	53.14	22.79	0.05	0.20	AVERAGE
6	0.21167	42.55	-20.59	63.14	42.30	0.05	0.20	QP
7	0.24552	17.20	-34.70	51.91	16.96	0.04	0.20	AVERAGE
8	0.24552	37.78	-24.12	61.91	37.54	0.04	0.20	QP
9	0.28328	18.53	-32.19	50.72	18.29	0.04	0.20	AVERAGE
10	0.28328	35.36	-25.36	60.72	35.12	0.04	0.20	QP
11	6.805	32.65	-27.35	60.00	32.07	0.25	0.34	QP
12	6.805	24.49	-25.51	50.00	23.91	0.25	0.34	AVERAGE

Temperature	20°C	Humidity	50%
Test Engineer	Sin Chang	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15160	45.20	-20.71	65.91	44.90	0.10	0.20	QP
2	0.15160	25.88	-30.03	55.91	25.58	0.10	0.20	AVERAGE
3 @	0.19140	45.96	-18.01	63.98	45.68	0.08	0.20	QP
4	0.19140	24.14	-29.83	53.98	23.86	0.08	0.20	AVERAGE
5	0.23040	18.44	-34.00	52.44	18.16	0.08	0.20	AVERAGE
6	0.23040	34.61	-27.83	62.44	34.33	0.08	0.20	QP
7	0.29555	24.33	-26.03	50.37	24.06	0.07	0.20	AVERAGE
8	0.29555	37.68	-22.68	60.37	37.41	0.07	0.20	QP
9	6.805	31.83	-28.17	60.00	31.21	0.29	0.34	QP
10	6.805	24.02	-25.98	50.00	23.40	0.29	0.34	AVERAGE
11	7.606	24.72	-25.28	50.00	24.01	0.32	0.40	AVERAGE
12	7.606	32.80	-27.20	60.00	32.09	0.32	0.40	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Peak Output Power Measurement

4.2.1. Limit

For frequency hopping systems operating in the 2400 ~ 2483.5MHz band employing at least 15 non-overlapping hopping channels, the limit for peak output power is 1Watt (30dBm). For all other frequency hopping systems in the 2400 ~ 2483.5MHz band: 0.125 watts (21dBm). 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

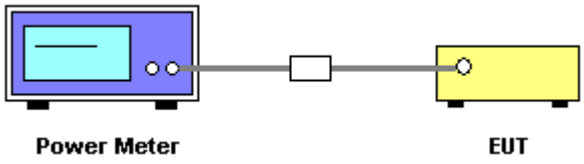
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	MA2411B

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.

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 hopping mode.

4.2.7. Test Result of Peak Output Power

Temperature	22°C	Humidity	65%
Test Engineer	Sam Chen	Configurations	CTX

Channel	Frequency	Peak Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit(W)	Result
1	2403.585 MHz	13.66	0.0232	21.00	0.1259	Complies
24	2440.449 MHz	14.15	0.0260	21.00	0.1259	Complies
49	2477.313 MHz	14.17	0.0261	21.00	0.1259	Complies

4.3. Hopping Channel Separation Measurement

4.3.1. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

4.3.2. Measuring Instruments and Setting

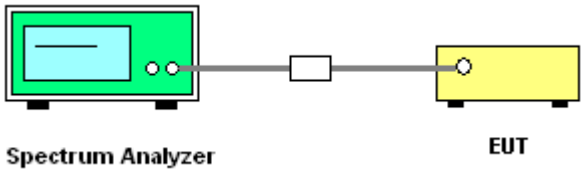
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 1MHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 1KHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilized for 20 dB bandwidth measurement.
3. The resolution bandwidth of 1MHz and the video bandwidth of 1KHz were utilized for channel separation measurement.
4. Test was performed in accordance with Measurement under FCC Public Notice DA00-705.

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 hopping mode.

4.3.7. Test Result of Hopping Channel Separation

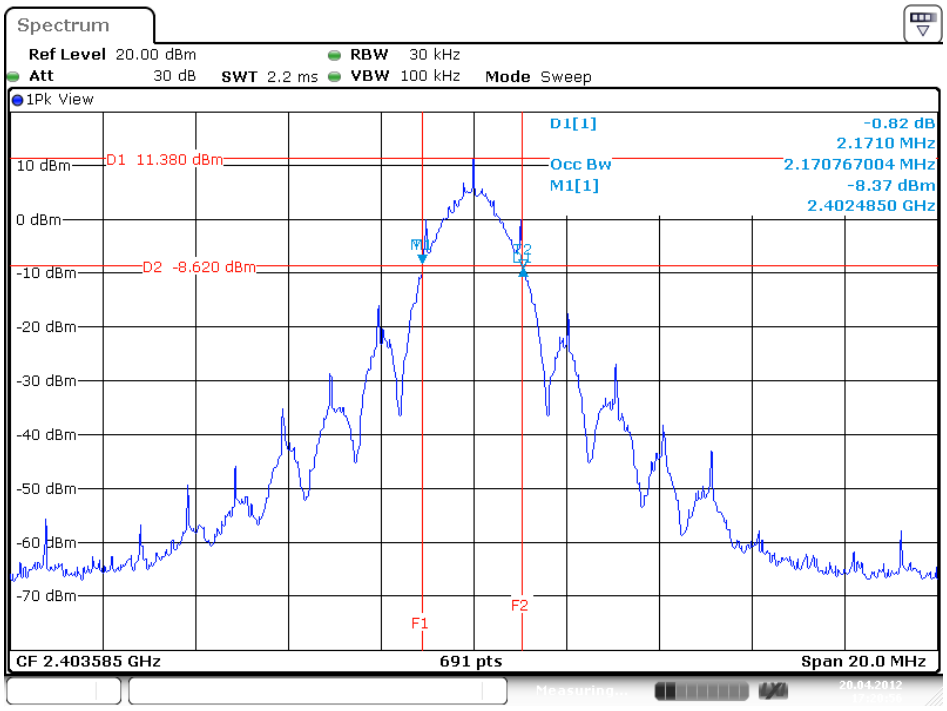
Temperature	22°C	Humidity	65%
Test Engineer	Sam Chen	Configurations	Hopping mode

Frequency	Channel Specing (kHz)	20dB Bandwidth (kHz)	99% Occupied BW (kHz)	2/3 of 20dB Bandwidth Limits (kHz)	Result
2403.585 MHz	1536.00	2171.00	2170.76	1447.33	Complies
2440.449 MHz	1536.00	2229.00	2228.65	1486.00	Complies
2477.313 MHz	1536.00	2229.00	2199.71	1486.00	Complies

Ch. Separation Limits: >20dB bandwidth or >2/3 of 20dB bandwidth.

Note: The limit should be the greater of 25 kHz or 2/3 of 20 dB bandwidth for device operates with an output power not greater than 125 mW.

20 dB Bandwidth Plot on Channel 1 / 2403.585 MHz



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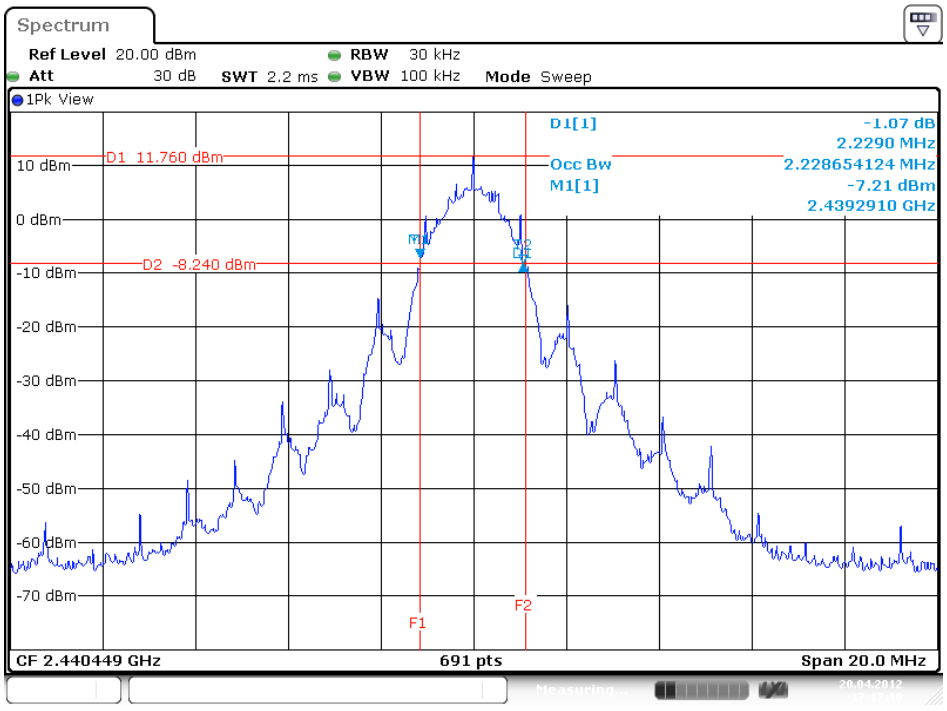
20 dB Bandwidth Plot on Channel 24 / 2440.449 MHz



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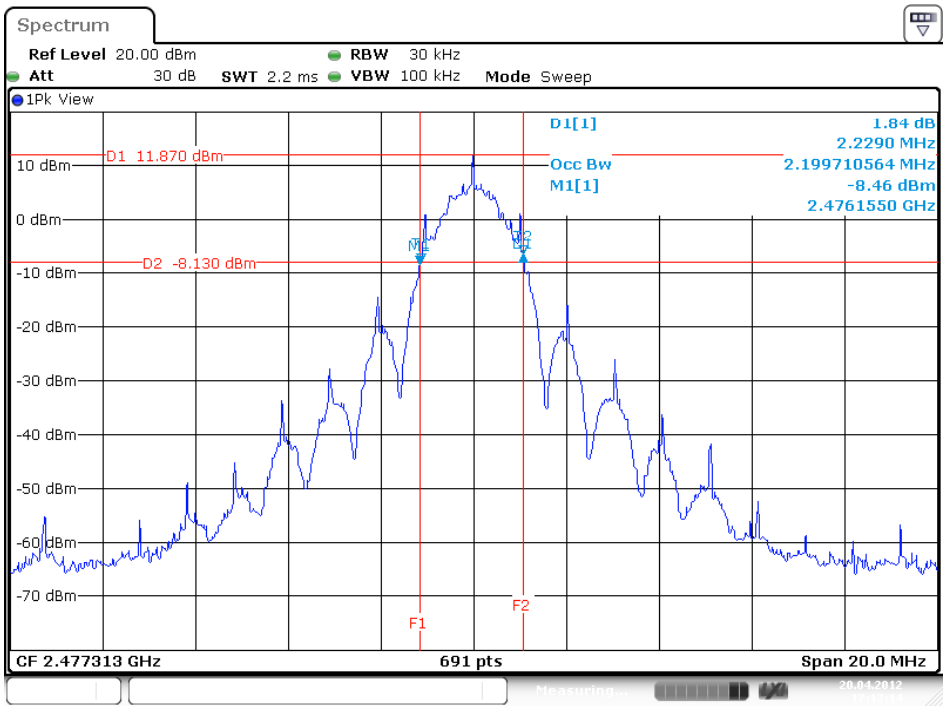
20 dB Bandwidth Plot on Channel 49 / 2477.313 MHz



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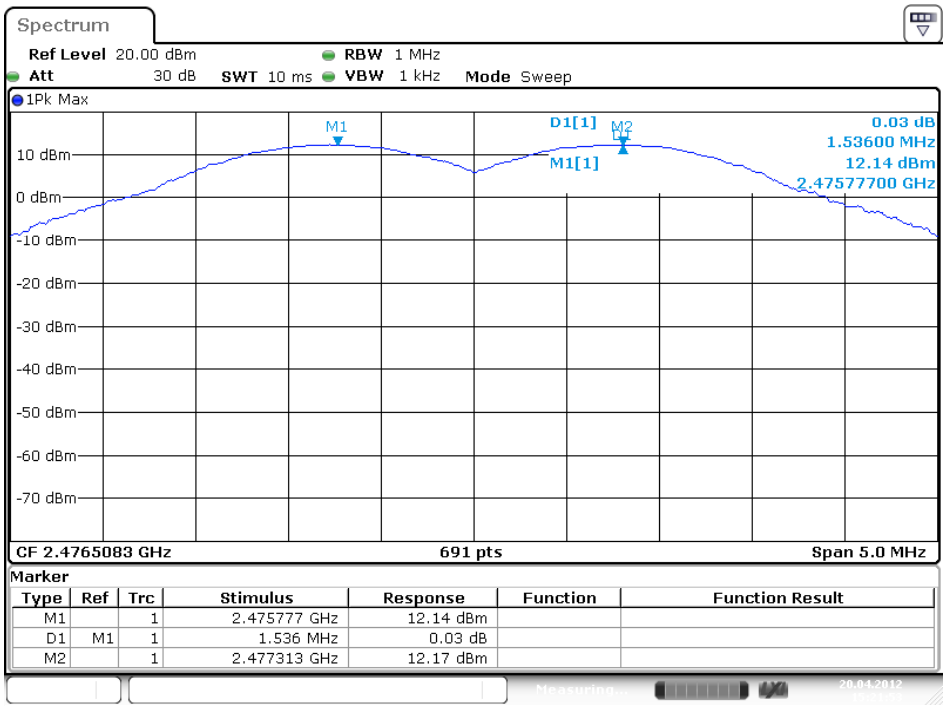
Channel Separation Plot on Channel 49 / 2477.313 MHz



Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	2.475777 GHz	12.14 dBm		
D1	M1	1	1.536 MHz	0.03 dB		
M2		1	2.477313 GHz	12.17 dBm		

Date: 20.APR.2012 15:21:54

4.4. Number of Hopping Frequency Measurement

4.4.1. Limit

For frequency hopping systems operating in the 2400 ~ 2483.5MHz band employing at least 15 non-overlapping hopping channels.

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.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	1MHz
VB	1KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 1MHz and the video bandwidth of 1KHz were utilized.
3. Observe frequency hopping in 2400 ~ 2483.5MHz, there are at least 15 non-overlapping channels.

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

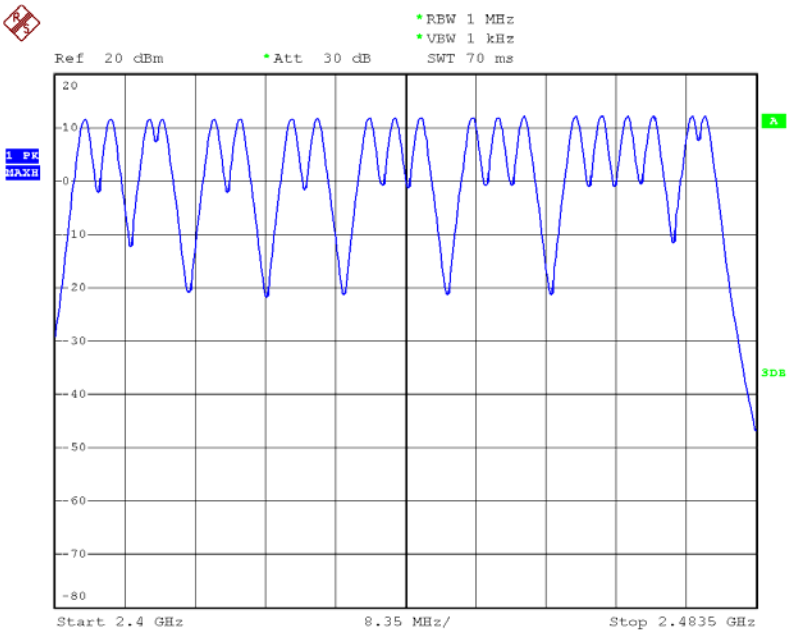
The EUT was programmed to be in hopping mode.

4.4.7. Test Result of Number of Hopping Frequency

Temperature	22℃	Humidity	65%
Test Engineer	Sam Chen	Configurations	Hopping mode

ModulationType	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
FSK	2403.585 MHz ~ 2477.313 MHz	20	15	Complies

Number of Hopping Channel Plot on Channel 1~49 / 2403.585 MHz ~ 2477.313 MHz



4.5. Dwell Time Measurement

4.5.1. Limit

Frequency hopping systems in the 2400 ~ 2483.5MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.5.2. Measuring Instruments and Setting

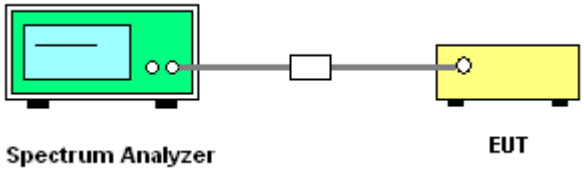
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 MHz
RB	1 MHz
VB	1 MHz
Detector	Peak
Trace	Single Trigger

4.5.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer
2. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
4. Sweep Time is more than once pulse time.
5. Set the center frequency on any frequency would be measure and span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Count the number of pulses in the dwell time duration (0.4 seconds multiplied by the number of hopping channels).
8. Dwell time=pulse duration x number of pulses / measure time x dwell time duration.

4.5.4. Test Setup Layout



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 hopping Mode.

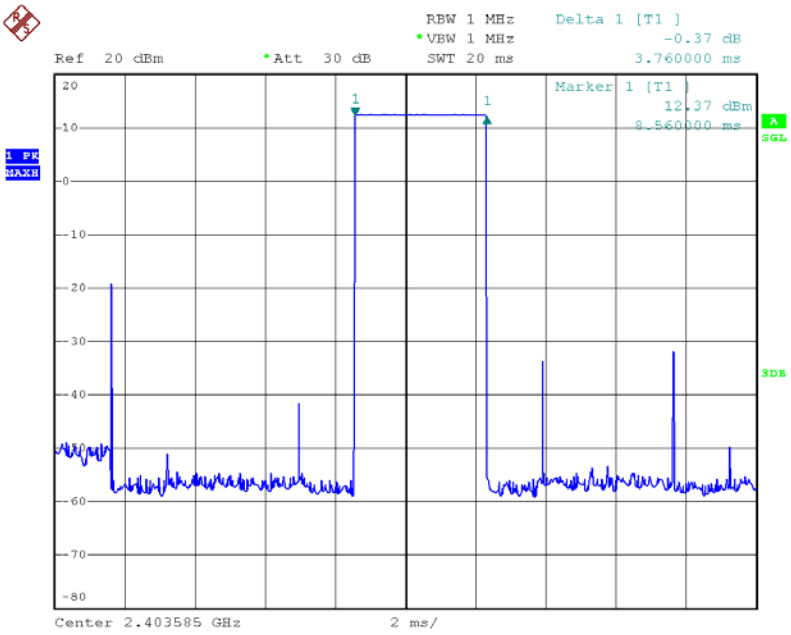
4.5.7. Test Result of Dwell Time

Temperature	22°C	Humidity	65%
Test Engineer	Sam Chen	Configurations	Hopping Mode

Frequency	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell time duration (s)	Dwell Time (s)	Limits (s)	Test\ Result
2403.585 MHz	0.0037600	82	8.00	8.0	0.3083	0.4000	Complies
2440.449 MHz	0.0037600	81	8.00	8.0	0.3046	0.4000	Complies
2477.313 MHz	0.0037200	82	8.00	8.0	0.3050	0.4000	Complies

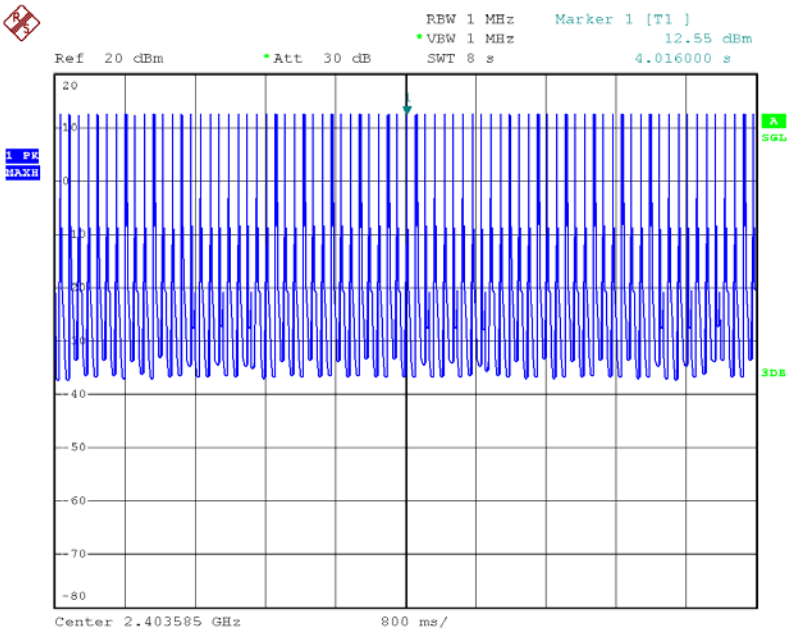
Note: Dwell time=pulse duration x number of pulses / measure time x dwell time duration

Single Pulse Plot on Channel 1 / 2403.585 MHz



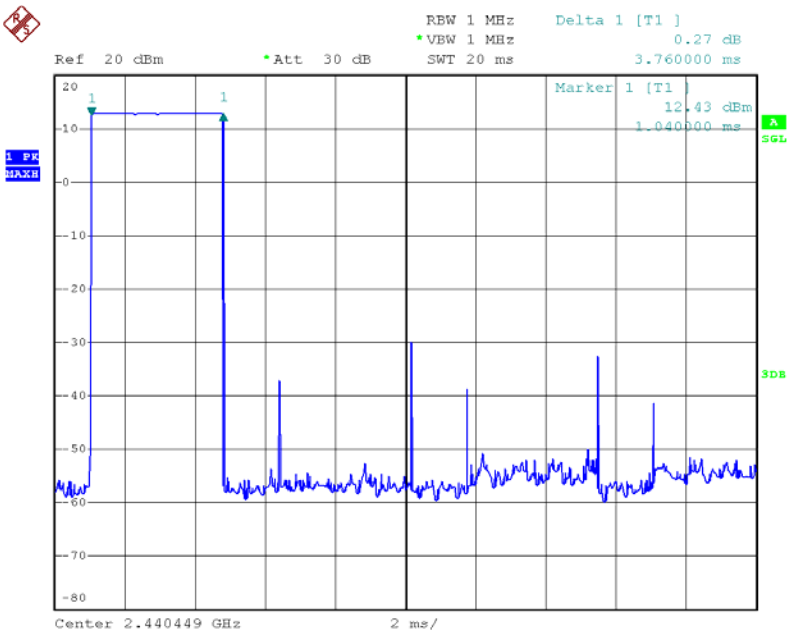
Date: 11.APR.2012 18:47:29

Number of Pulses Plot on Channel 1 / 2403.585 MHz



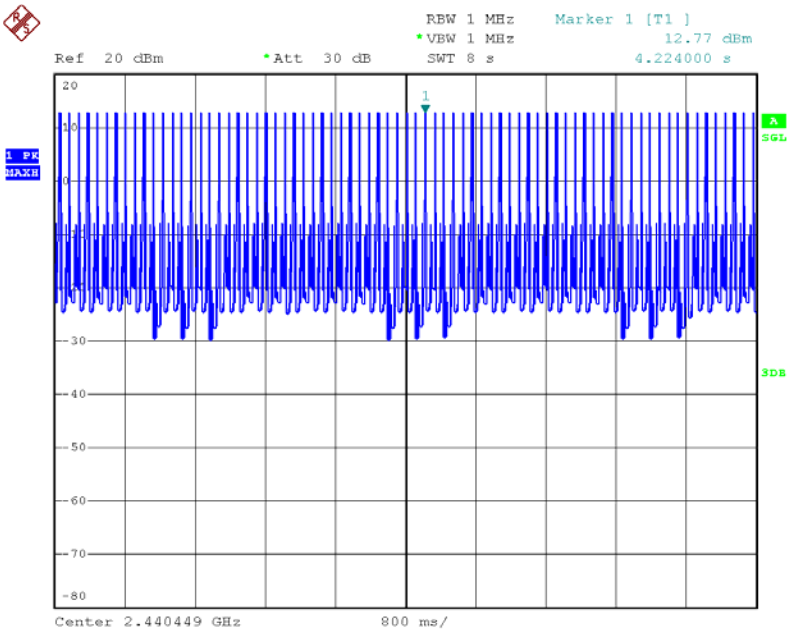
Date: 11.APR.2012 18:50:38

Single Pulse Plot on Channel 24 / 2440.499 MHz



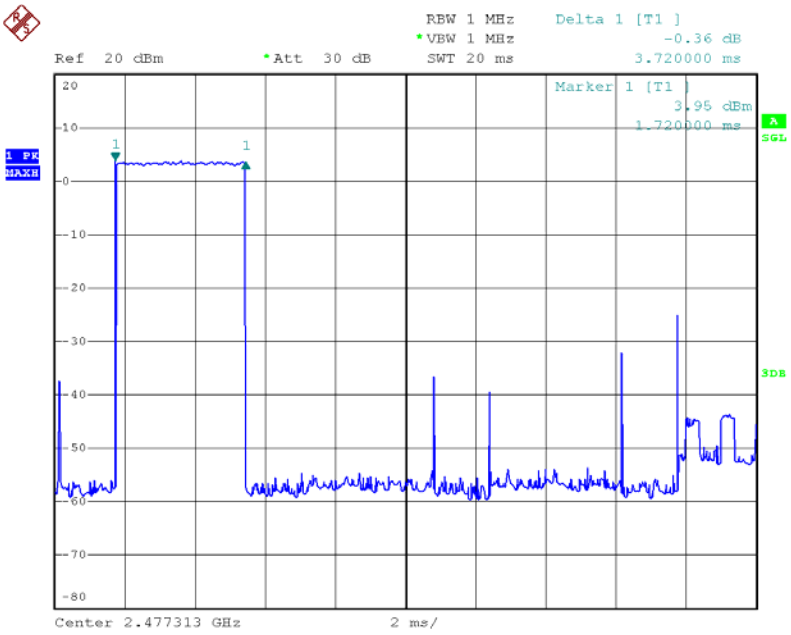
Date: 11.APR.2012 18:48:30

Number of Pulses Plot on Channel 24 / 2440.499 MHz



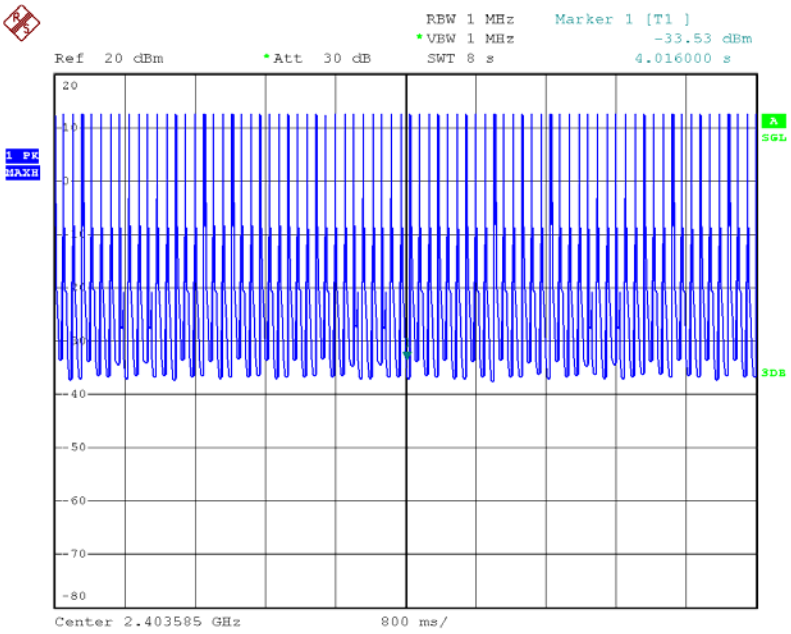
Date: 11.APR.2012 18:50:16

Single Pulse Plot on Channel 49 / 2477.313 MHz



Date: 11.APR.2012 18:47:58

Number of Pulses Plot on Channel 49 / 2477.313 MHz



Date: 11.APR.2012 18:51:00

4.6. Radiated 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 spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1000KHz / 1000KHz for peak

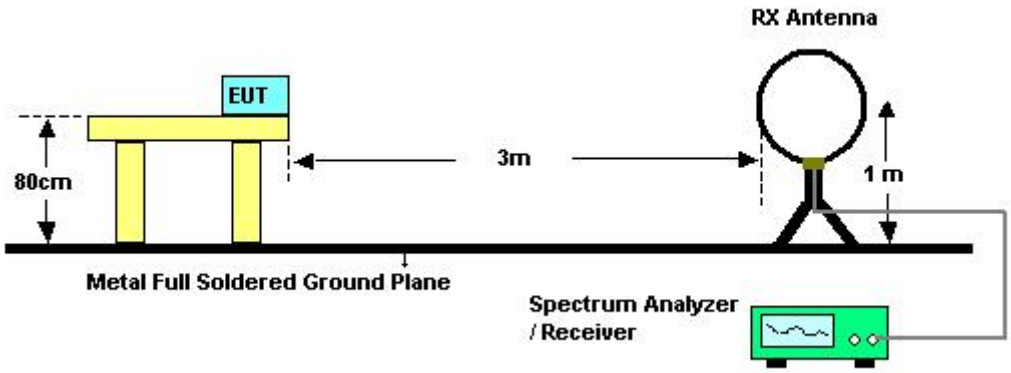
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.6.3. Test Procedures

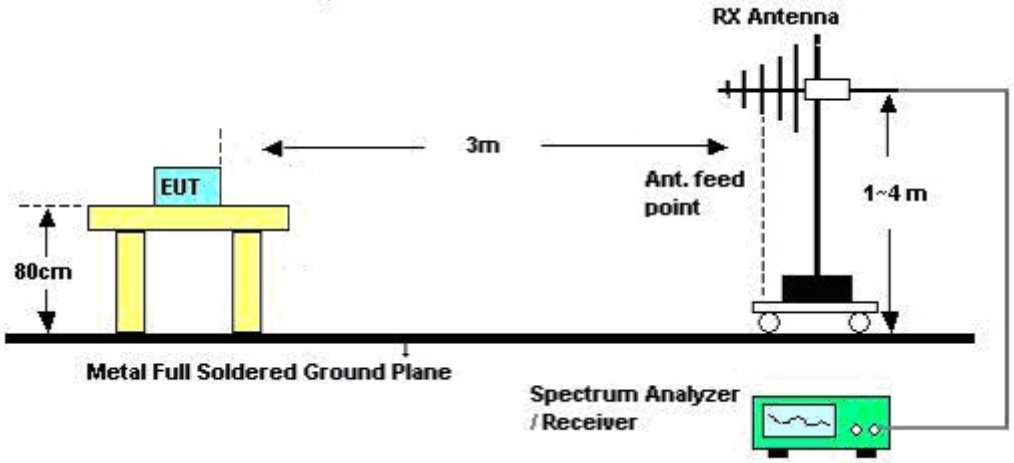
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.6.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



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 hopping mode.

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

Temperature	20°C	Humidity	59%
Test Engineer	Wen Chao	Test Date	Mar. 08, 2012

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

Note:

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

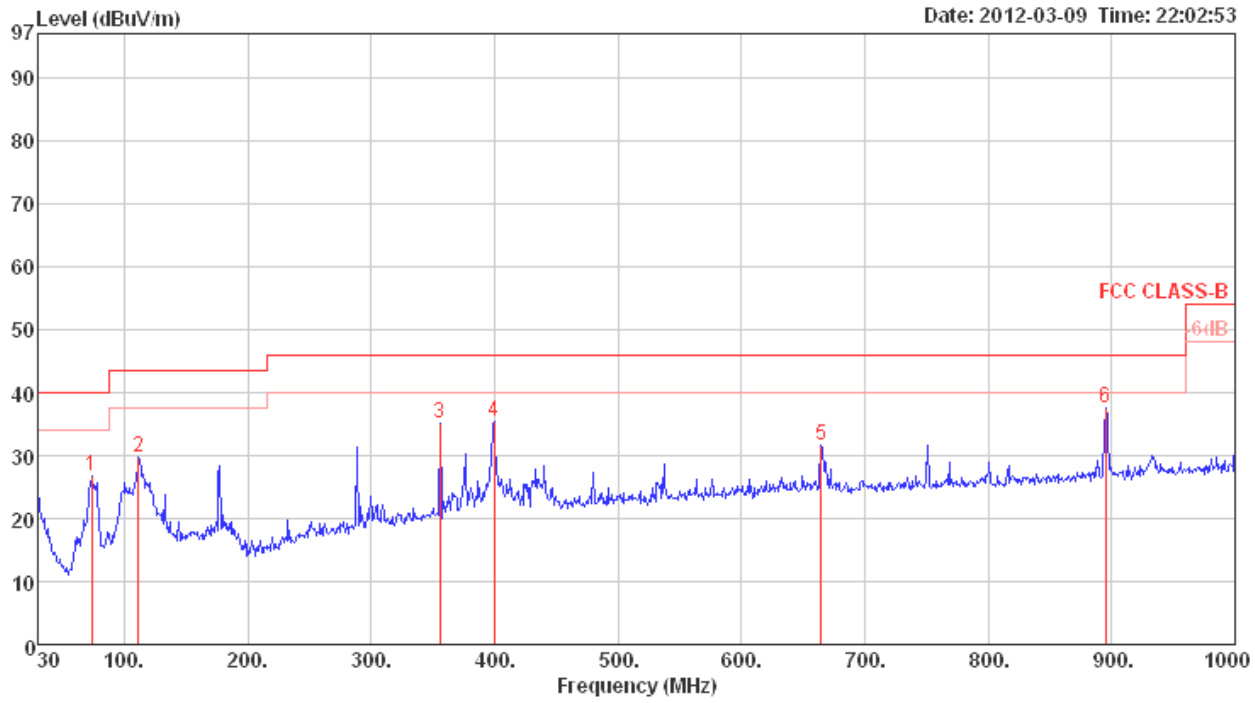
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

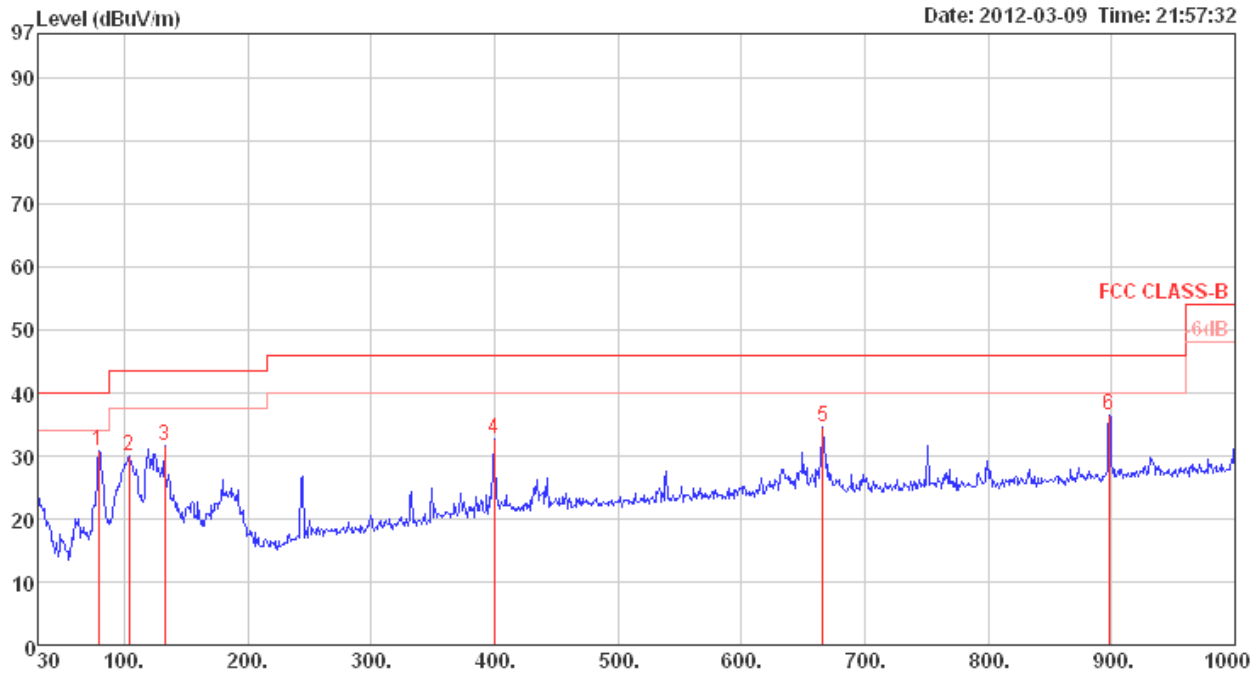
Temperature	20°C	Humidity	59%
Test Engineer	Wen Chao	Configurations	Normal Link

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	73.65	26.80	40.00	-13.20	46.80	0.88	6.83	27.71	Peak	100	0	HORIZONTAL
2	111.48	29.60	43.50	-13.90	44.07	1.20	11.87	27.54	Peak	100	0	HORIZONTAL
3	355.92	35.07	46.00	-10.93	45.27	2.21	14.88	27.29	Peak	100	0	HORIZONTAL
4	399.57	35.30	46.00	-10.70	44.54	2.30	16.06	27.60	Peak	100	0	HORIZONTAL
5	664.38	31.71	46.00	-14.29	37.33	3.44	18.98	28.04	Peak	100	0	HORIZONTAL
6	895.24	37.62	46.00	-8.38	40.96	3.58	20.49	27.41	Peak	100	0	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	79.47	30.68	40.00	-9.32	50.17	1.07	7.12	27.68	Peak	400	0	VERTICAL
2	103.72	30.02	43.50	-13.48	45.12	1.20	11.28	27.58	Peak	400	0	VERTICAL
3	132.82	31.65	43.50	-11.85	45.47	1.33	12.28	27.43	Peak	400	0	VERTICAL
4	399.57	32.71	46.00	-13.29	41.95	2.30	16.06	27.60	Peak	400	0	VERTICAL
5	666.32	34.49	46.00	-11.51	40.11	3.43	18.98	28.03	Peak	400	0	VERTICAL
6	898.15	36.38	46.00	-9.62	39.67	3.59	20.52	27.40	Peak	400	0	VERTICAL

Note:

The amplitude of spurious emissions which 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.

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

Temperature	20°C	Humidity	59%
Test Engineer	Wen Chao	Configurations	Channel 1
Test Date	Apr. 11, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	4806.16	56.36	74.00	-17.64	55.18	4.08	35.32	32.42	78	143	Peak	HORIZONTAL
2 a	4806.16	26.98	54.00	-27.02	25.80	4.08	35.32	32.42	78	143	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	4808.03	59.13	74.00	-14.87	57.95	4.08	35.32	32.42	345	149	Peak	VERTICAL
2 a	4808.03	29.75	54.00	-24.25	28.57	4.08	35.32	32.42	345	149	Average	VERTICAL

Temperature	20℃	Humidity	59%
Test Engineer	Wen Chao	Configurations	Channel 24
Test Date	Apr. 11, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	4879.98	51.84	74.00	-22.16	50.32	4.11	35.15	32.56	77	138	Peak	HORIZONTAL
2	4879.98	22.46	54.00	-31.54	20.94	4.11	35.15	32.56	77	138	Average	HORIZONTAL
3 p	7322.56	64.61	74.00	-9.39	57.54	5.31	34.93	36.69	90	128	Peak	HORIZONTAL
4 a	7322.56	35.23	54.00	-18.77	28.16	5.31	34.93	36.69	90	128	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	4879.97	55.48	74.00	-18.52	53.96	4.11	35.15	32.56	339	131	Peak	VERTICAL
2	4879.97	26.10	54.00	-27.90	24.58	4.11	35.15	32.56	339	131	Average	VERTICAL
3 p	7319.82	64.15	74.00	-9.85	57.08	5.31	34.93	36.69	15	111	Peak	VERTICAL
4 a	7319.82	34.77	54.00	-19.23	27.70	5.31	34.93	36.69	15	111	Average	VERTICAL

Temperature	20℃	Humidity	59%
Test Engineer	Wen Chao	Configurations	Channel 49
Test Date	Apr. 11, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	4955.48	53.85	74.00	-20.15	51.95	4.14	34.97	32.73	287	153	Peak	HORIZONTAL
2	4955.48	24.47	54.00	-29.53	22.57	4.14	34.97	32.73	287	153	Average	HORIZONTAL
3 p	7433.16	63.43	74.00	-10.57	56.11	5.38	34.88	36.82	42	100	Peak	HORIZONTAL
4 a	7433.16	34.05	54.00	-19.95	26.73	5.38	34.88	36.82	42	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	4955.44	58.19	74.00	-15.81	56.29	4.14	34.97	32.73	0	117	Peak	VERTICAL
2	4955.44	28.81	54.00	-25.19	26.91	4.14	34.97	32.73	0	117	Average	VERTICAL
3 p	7433.17	67.26	74.00	-6.74	59.94	5.38	34.88	36.82	360	101	Peak	VERTICAL
4 a	7433.17	37.88	54.00	-16.12	30.56	5.38	34.88	36.82	360	101	Average	VERTICAL

Note:

The amplitude of spurious emissions which 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.

4.7. Band Edge Emissions Measurement

4.7.1. 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

4.7.2. 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 /100 KHz for Peak

4.7.3. 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.

4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

The EUT was programmed to be in hopping mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	20°C	Humidity	59%
Test Engineer	Wen Chao	Configurations	Channel 1, 24, 49
Test Date	Apr. 11, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	2390.00	56.31	74.00	-17.69	25.60	2.84	0.00	27.87	77	100	Peak	VERTICAL
2	2390.00	26.93	54.00	-27.07	-3.78	2.84	0.00	27.87	77	100	Average	VERTICAL
3 p	2403.99	113.06				2.85	0.00	27.84	77	100	Peak	VERTICAL
4 a	2403.99	83.68				2.85	0.00	27.84	77	100	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 2403.585 MHz.

Channel 24

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	2379.60	55.89	74.00	-18.11	25.17	2.83	0.00	27.89	154	106	Peak	VERTICAL
2	2379.60	26.51	54.00	-27.49	-4.21	2.83	0.00	27.89	154	106	Average	VERTICAL
3 p	2441.00	114.22	74.00				0.00	27.78	154	106	Peak	VERTICAL
4 a	2441.00	84.84	54.00				0.00	27.78	154	106	Average	VERTICAL
5	2488.70	55.29	74.00	-18.71	24.68	2.91	0.00	27.70	154	106	Peak	VERTICAL
6	2488.70	25.91	54.00	-28.09	-4.70	2.91	0.00	27.70	154	106	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 2440.449 MHz.

Channel 49

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	2477.80	113.64				2.90	0.00	27.73	148	104	Peak	VERTICAL
2 a	2477.80	84.26				2.90	0.00	27.73	148	104	Average	VERTICAL
3	2483.66	58.96	74.00	-15.04	28.33	2.90	0.00	27.73	148	104	Peak	VERTICAL
4	2483.66	29.58	54.00	-24.42	-1.05	2.90	0.00	27.73	148	104	Average	VERTICAL

Item 1, 2 are the fundamental frequency at 2477.313 MHz.

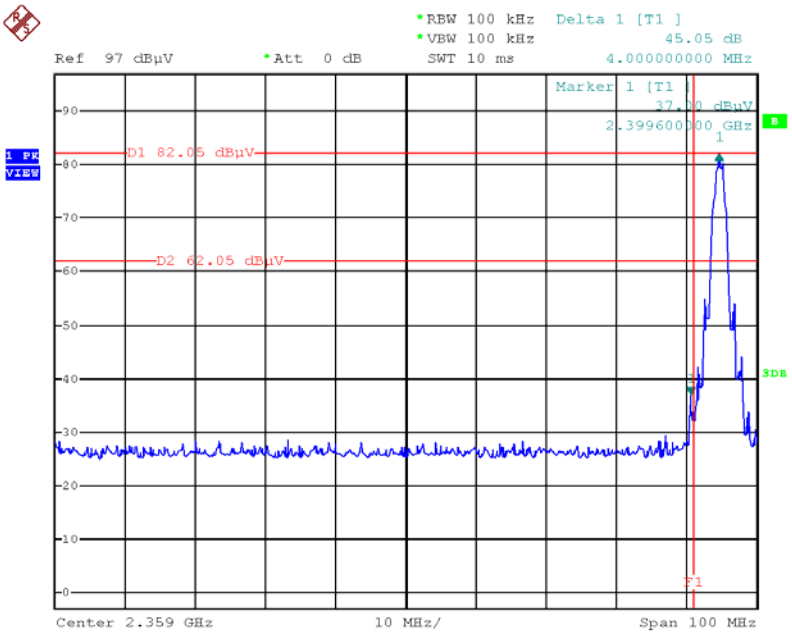
Note:

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

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

For Emission not in Restricted Band

Low Band Edge Plot on Channel 1 / 2403.585 MHz



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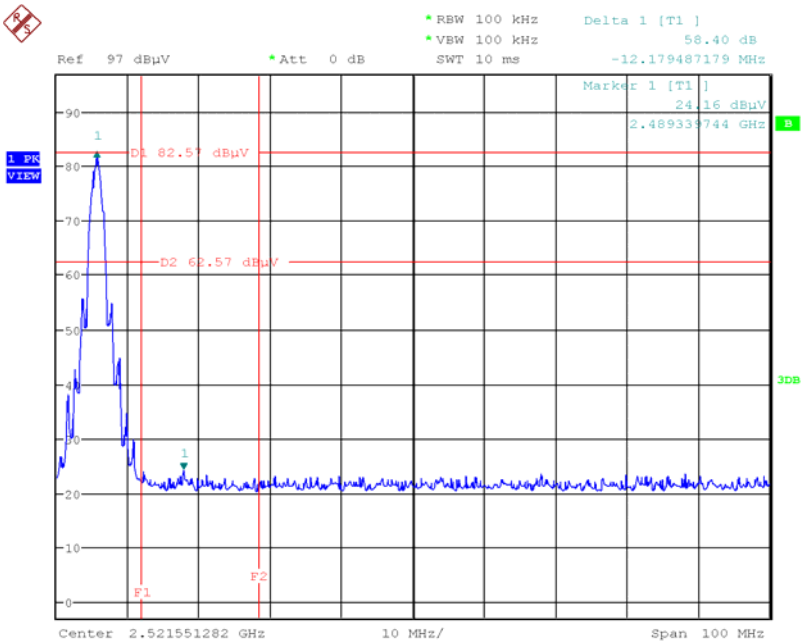
High Band Edge Plot on Channel 48 / 2477.313 MHz



Date: 10.APR.2012 16:36:58

4.8. Antenna Requirements

4.8.1. 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.

4.8.2. 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. 01, 2011	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Oct. 28, 2011	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Nov. 16, 2011	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K~30MHz	Jan. 04, 2012	Conduction (CO01-CB)
COND Cable	-	Cable	-	0.15MHz~30MHz	Dec. 04, 2011	Conduction (CO01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Oct. 08, 2011	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-2	-	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (05CH01-CB)
RF Cable-high	Woken	High Cable-5	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (05CH01-CB)
RF Cable-high	Woken	High Cable-6	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (05CH01-CB)
RF Cable-high	Woken	High Cable-3	-	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	-	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 17, 2011	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 22, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Oct. 08, 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. 23, 2011	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP	100304	9kHz ~ 40GHz	Nov. 22, 2011	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 06, 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)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
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)

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

Note: *Calibration Interval of instruments listed above is two year.

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.：L1190-091230

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 Rd., 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：December 30, 2009

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