SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan 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	**Eleven Engineering Inc.**
Applicant Address	10150-100 Street, Suite 900, Edmonton, Alberta, Canada T5J OP6
FCC ID	**OP5PL5557**
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	PL5557
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	May 03, 2012
Final Test Date	May 29, 2012

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.

Testing Laboratory
1190

ILAC MRA

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR0N2542-01	Rev. 01	Initial issue of report	Jun. 25, 2012

Certificate No.: CB10106100

1. CERTIFICATE OF COMPLIANCE

Product Name	:	SKAA USB TX
Brand Name	:	SKAA
Model Name	:	PL5557
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 May 03, 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	6.74 dB
4.2	15.247(b)(1)	Maximum Peak Conducted Output Power	Complies	9.14 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	4.57 dB
4.7	15.247(d)	Band Edge Emissions	Complies	18.24 dB
4.8	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak Conducted 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%)	2240.00 kHz
Conducted Output Power	11.86 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. 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

Others
USB Cable, 0.90m, Non-Shielded

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	Printed Antenna	NA	4.55

3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
	2	2403.585 MHz
	3	2405.121 MHz
	:	:
	24	2437.377 MHz
	25	2438.913 MHz
	26	2440.449 MHz
	:	:
	48	2474.241 MHz
	49	2475.777 MHz
	50	2477.313 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	Channel	Antenna
AC Power Conducted Emissions	Normal Link	-	1
Max. Conducted Output Power	CTX	2/26/50	1
Hopping Channel Separation	Hopping Mode	2~50	NA
Number of Hopping Frequency	Hopping Mode	Hopping 2~50	NA
Dwell Time	Hopping Mode	Hopping 2~50	NA
Radiated Emissions Below 1GHz	CTX	-	1
Radiated Emissions Above 1GHz	CTX	2/26/50	1
Band Edge Emissions	CTX	2/26/50	1

Note:

All the test modes were listed as below.

<For Conducted Emissions Test>:

Test Mode 1: Ipod sync with iTunes and EUT put horizontally on the table

<Radiated Emissions Test Below 1GHz>:

Test Mode 1: EUT put horizontally on the table

<For Radiated Emissions Test Above 1GHz>:

Test Mode 1: EUT put horizontally on the table

Test Mode 2: EUT put vertically on the table

Due to Mode 2 generated the worst test result, so it was recorded in this report.

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	187376	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	187376	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	E6220	PPD-AR5BXB63
Mouse	iCooky	AMS0706W	DoC
iPod	Apple	A1136	DoC
EARPHONES	E-books	E-EPC040	N/A
i-touch	Apple	A1288	BCGA1288

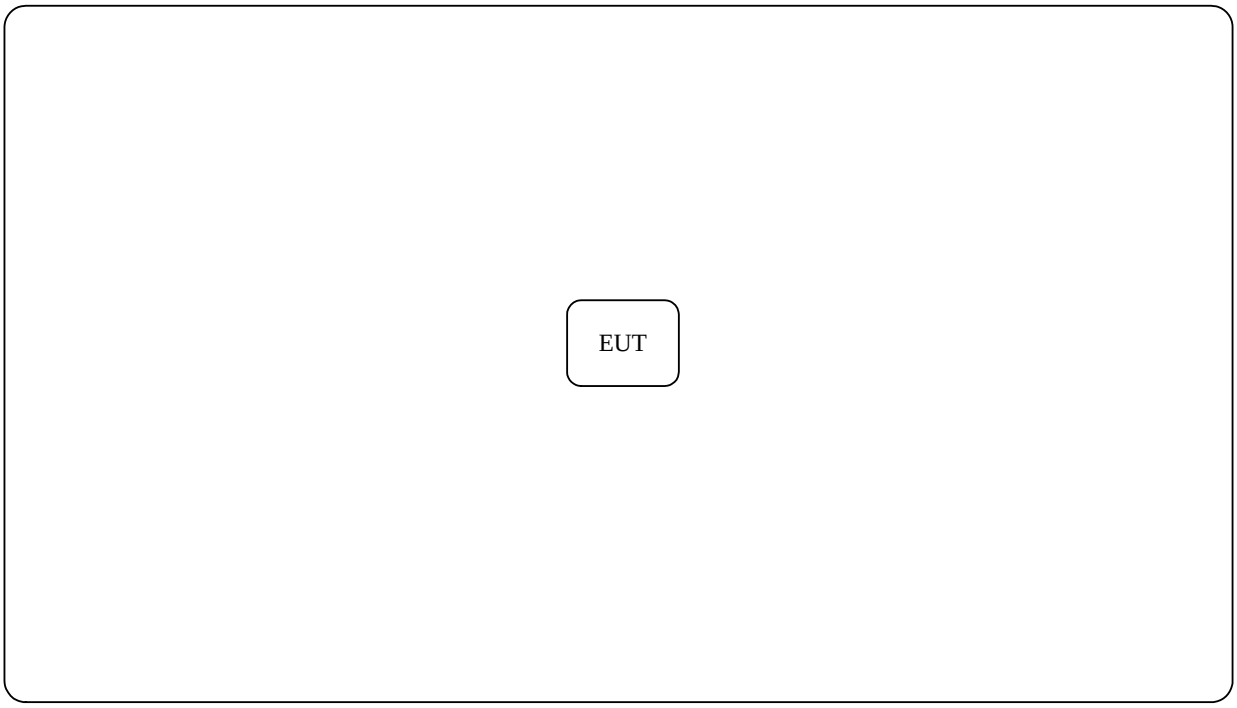
3.8. Table for Parameters of Test Software Setting

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.

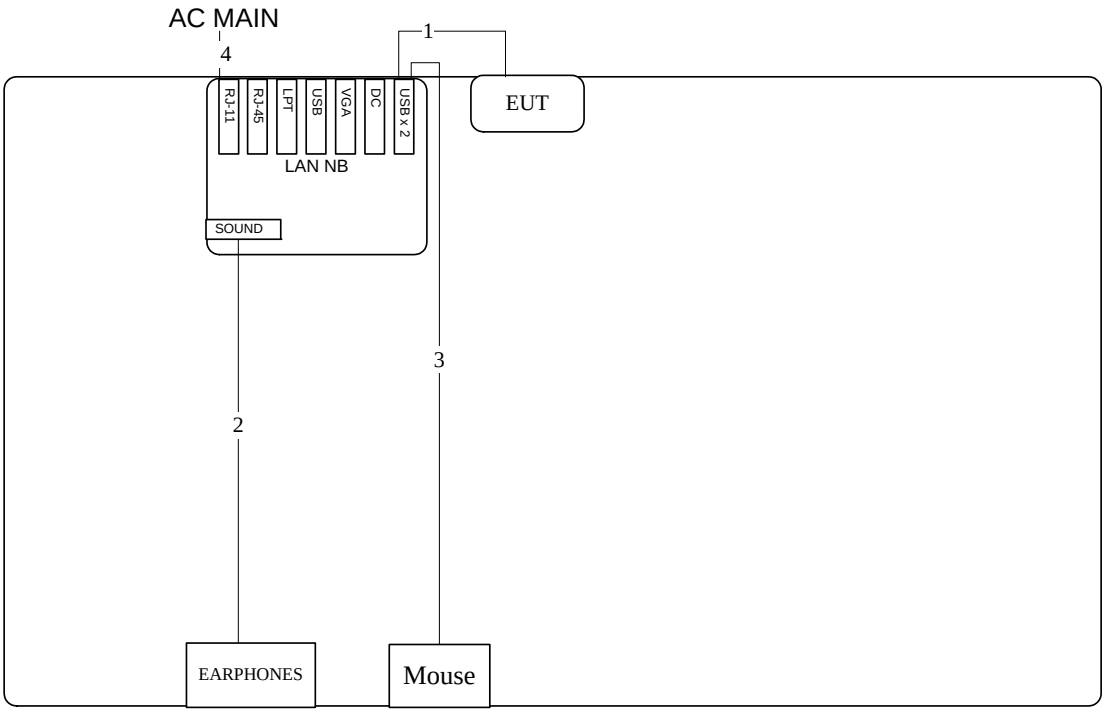
Test Software Version	N/A		
Frequency	2403.585 MHz	2440.449 MHz	2477.313 MHz
Power Parameters	0	0	0

3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration



3.9.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Usb cable	No	0.9M
2	Earphones cable	No	1.1M
3	Usb cable	No	1.8M
4	Power Cable	No	2.6M

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

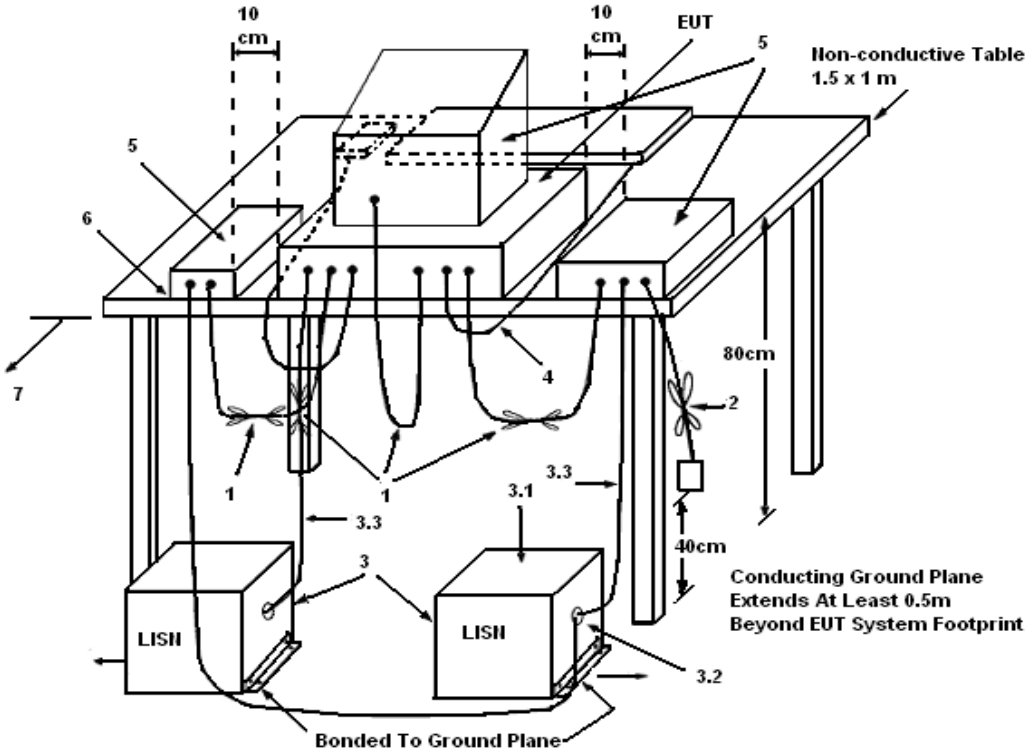
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

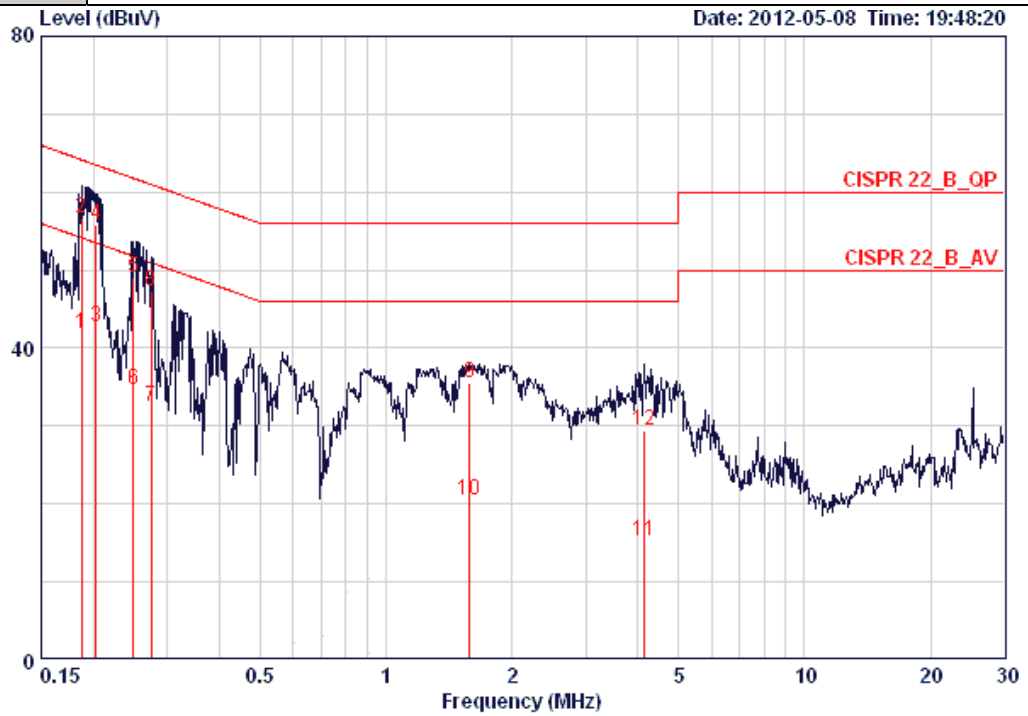
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

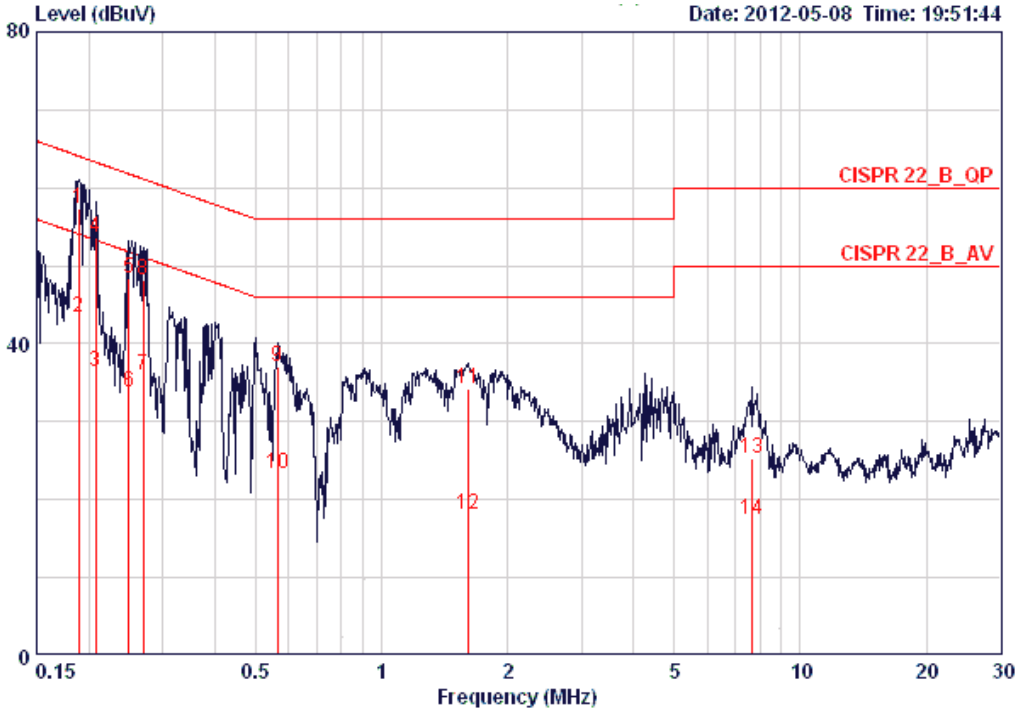
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23℃	Humidity	63%
Test Engineer	Ryo Fan	Phase	Line
Configuration	Normal Link / Mode 1		



	Freq	Level	Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18739	41.81	-12.35	54.15	41.75	0.06	0.00	AVERAGE
2	0.18739	56.78	-7.38	64.15	56.72	0.06	0.00	QP
3	0.20289	42.64	-10.85	53.49	42.59	0.05	0.00	AVERAGE
4	0.20289	55.81	-7.68	63.49	55.76	0.05	0.00	QP
5	0.24945	49.14	-12.63	61.78	49.10	0.04	0.00	QP
6	0.24945	34.57	-17.20	51.78	34.53	0.04	0.00	AVERAGE
7	0.27442	32.42	-18.56	50.98	32.38	0.04	0.00	AVERAGE
8	0.27442	47.31	-13.67	60.98	47.27	0.04	0.00	QP
9	1.585	35.59	-20.41	56.00	35.55	0.04	0.00	QP
10	1.585	20.51	-25.49	46.00	20.47	0.04	0.00	AVERAGE
11	4.136	15.26	-30.74	46.00	15.15	0.11	0.00	AVERAGE
12	4.136	29.41	-26.59	56.00	29.30	0.11	0.00	QP

Temperature	23℃	Humidity	63%
Test Engineer	Ryo Fan	Phase	Neutral
Configuration	Normal Link / Mode 1		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.18938	57.32	-6.74	64.06	57.24	0.08	0.00	QP
2	0.18938	43.32	-10.74	54.06	43.24	0.08	0.00	AVERAGE
3	0.20723	36.47	-16.85	53.32	36.39	0.08	0.00	AVERAGE
4	0.20723	53.73	-9.59	63.32	53.65	0.08	0.00	QP
5	0.24945	48.44	-13.34	61.78	48.36	0.08	0.00	QP
6	0.24945	33.86	-17.92	51.78	33.78	0.08	0.00	AVERAGE
7	0.27009	36.00	-15.12	51.12	35.92	0.08	0.00	AVERAGE
8	0.27009	48.25	-12.87	61.12	48.17	0.08	0.00	QP
9	0.56409	37.12	-18.88	56.00	37.05	0.07	0.00	QP
10	0.56409	23.30	-22.70	46.00	23.23	0.07	0.00	AVERAGE
11	1.610	34.27	-21.73	56.00	34.19	0.08	0.00	QP
12	1.610	18.11	-27.89	46.00	18.03	0.08	0.00	AVERAGE
13	7.646	25.34	-34.66	60.00	25.02	0.32	0.00	QP
14	7.646	17.47	-32.53	50.00	17.15	0.32	0.00	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum 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

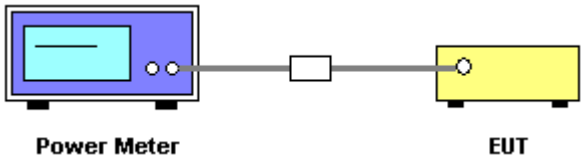
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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 Maximum Peak Output Power

Temperature	25℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	Hopping mode
Test Date	May 29, 2012		

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
2	2403.585 MHz	11.86	21.00	**Complies**
26	2440.449 MHz	11.77	21.00	**Complies**
50	2477.313 MHz	11.45	21.00	**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

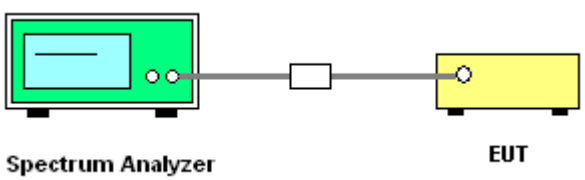
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (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 100 kHz and the video bandwidth of 100 kHz 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

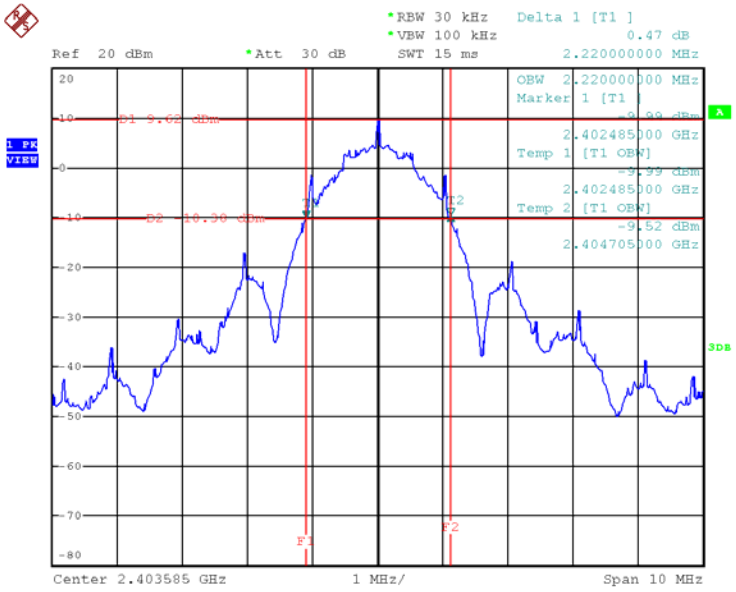
Temperature	25℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	Hopping mode

Frequency	20dB Bandwidth (kHz)	99% Occupied BW (kHz)	Channel Specing (kHz)	2/3 of 20dB Bandwidth Min. Limits (kHz)	Result
2403.585 MHz	2220.00	2220.00	1536.00	1480.00	Complies
2440.449 MHz	2180.00	2220.00	1536.00	1453.33	Complies
2477.313 MHz	2220.00	2240.00	1536.00	1480.00	Complies

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

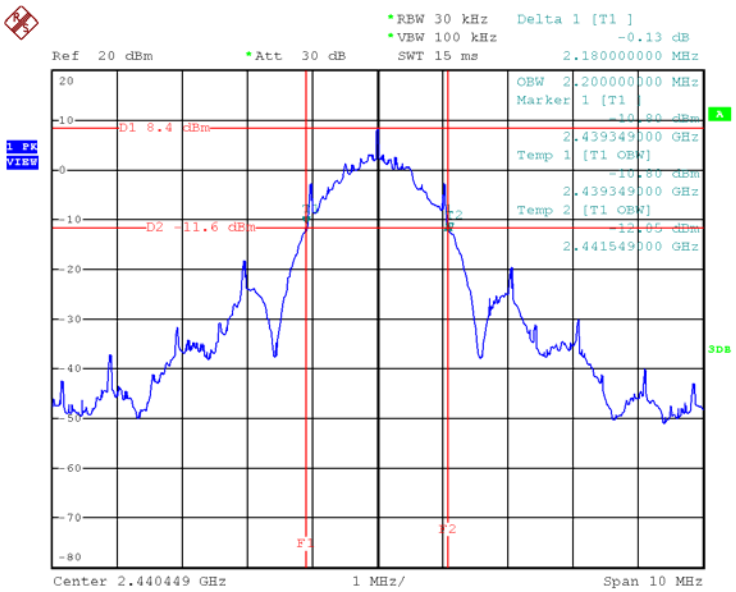
Note: The limit should be the greater of 25 kHz or 2/3 of 20 dB bandwidth for device operates with an output power not greater than 125 mW.

20 dB Bandwidth Plot on Channel 2 / 2403.585 MHz



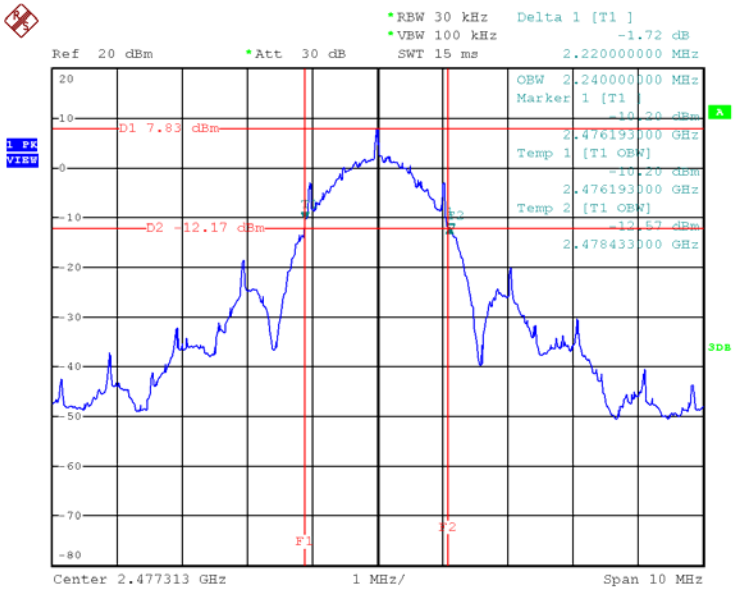
Date: 21.MAY.2012 21:52:37

20 dB Bandwidth Plot on Channel 26 / 2440.449 MHz

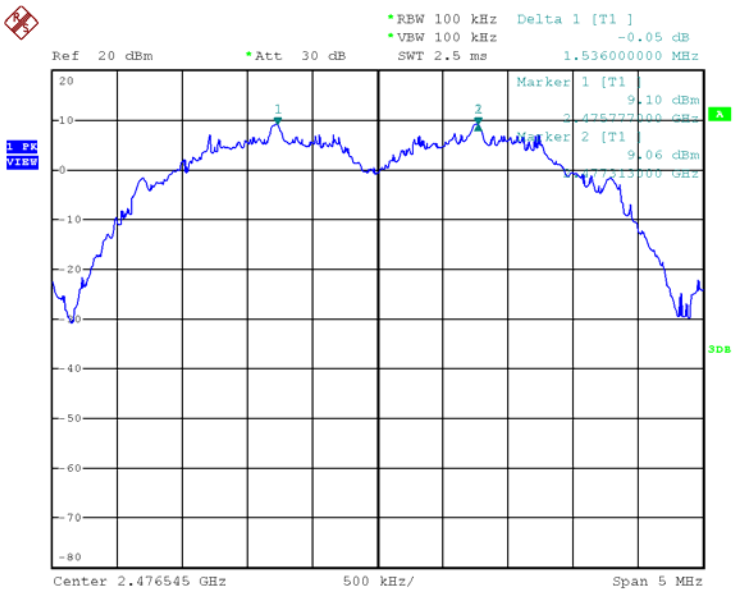


Date: 21.MAY.2012 21:56:08

20 dB Bandwidth Plot on Channel 50 / 2477.313 MHz



Channel Separation Plot on Channel 49~50 / 2475.777 MHz ~ 2477.313 MHz



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

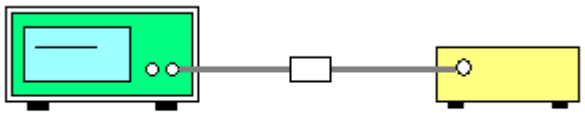
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
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 100 kHz and the video bandwidth of 100 kHz were utilised.
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

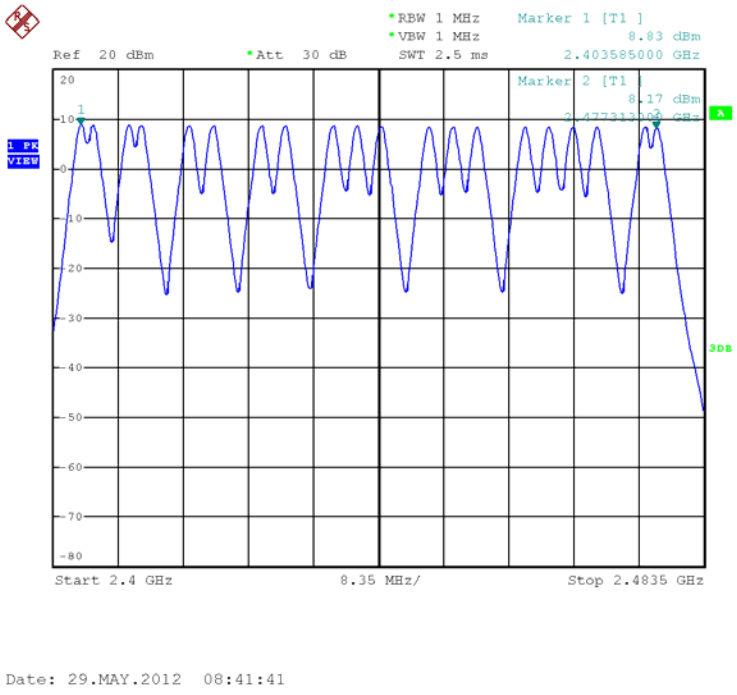
The EUT was programmed to be in hopping mode.

4.4.7. Test Result of Number of Hopping Frequency

Temperature	25℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	Hopping mode

Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
2~50	2402 MHz~2432 MHz	20	15	**Complies**

Number of Hopping Channel Plot on Channel 2~50 / 2402 MHz ~ 2432 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

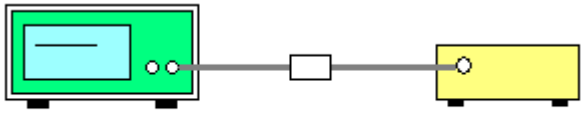
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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.

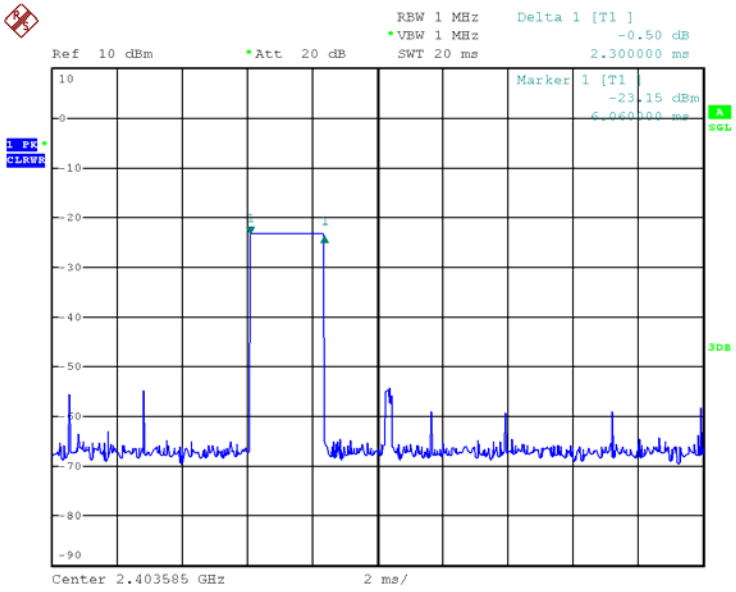
4.5.7. Test Result of Dwell Time

Temperature	25℃	Humidity	63%
Test Engineer	Satoshi Yang	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	2.3000	18	1.00	8.0	0.3312	0.4000	Complies
2440.449 MHZ	2.5200	18	1.00	8.0	0.3629	0.4000	Complies
2477.313 MHz	2.7200	18	1.00	8.0	0.3917	0.4000	Complies

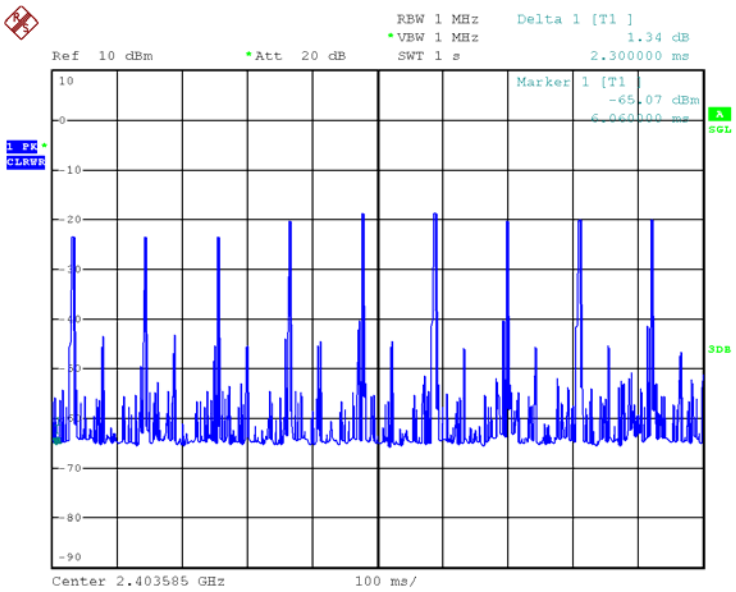
Note: Dwell time=pulse duration x number of pulses / measure time x dwell time duration

Single Pulse Plot on Channel 2 / 2403.585 MHz



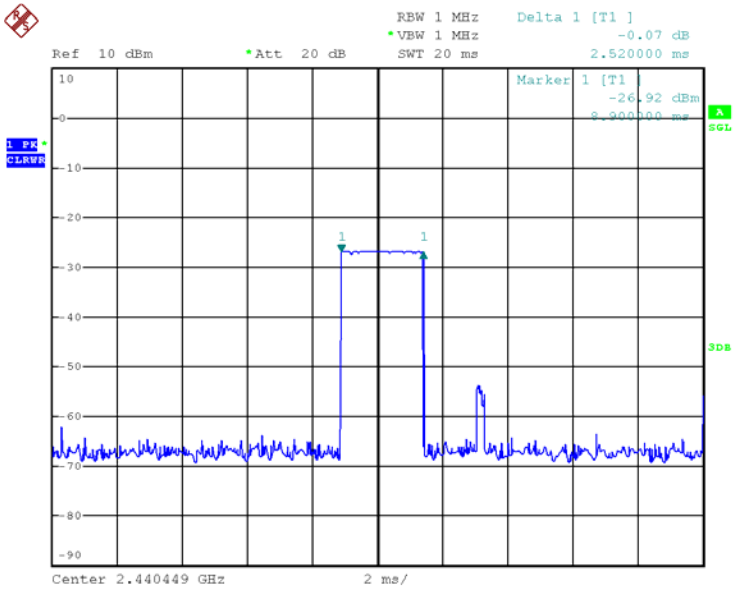
Date: 21.MAY.2012 23:22:04

Number of Pulses Plot on Channel 2 / 2403.585 MHz



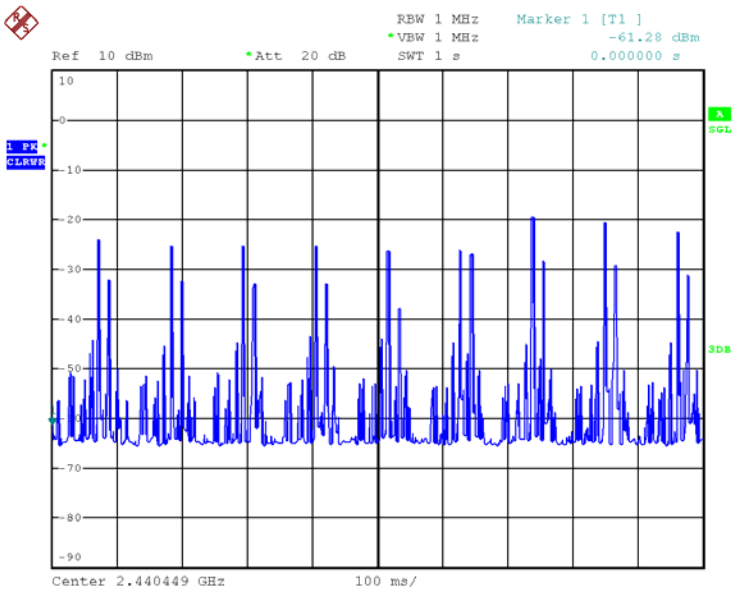
Date: 21.MAY.2012 23:23:23

Single Pulse Plot on Channel 26 / 2440.449MHz



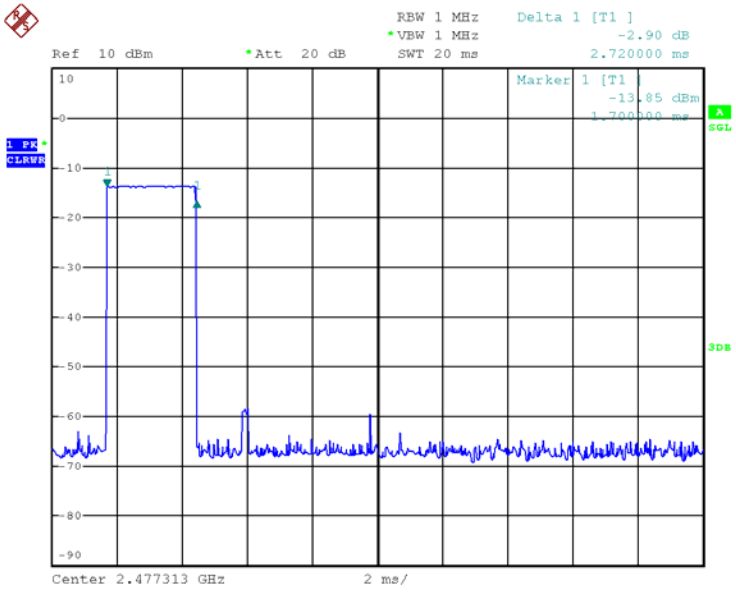
Date: 21.MAY.2012 23:12:34

Number of Pulses Plot on Channel 26 / 2440.449MHz



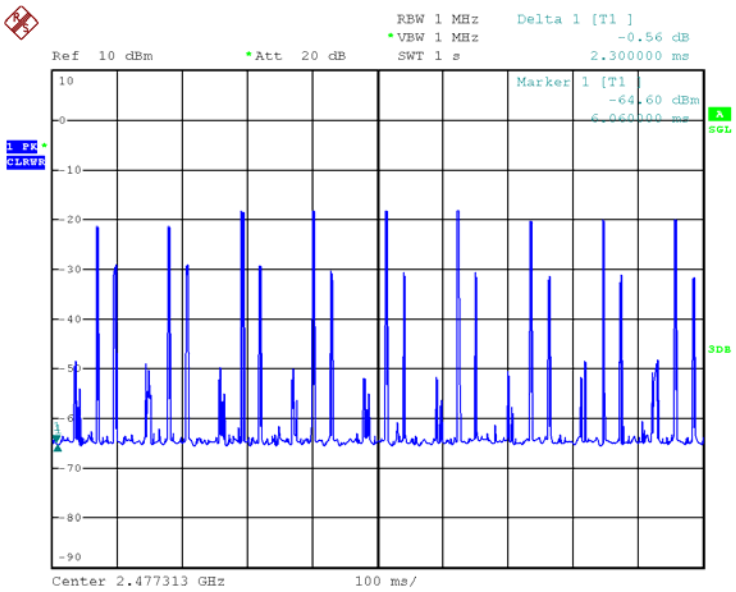
Date: 21.MAY.2012 23:15:16

Single Pulse Plot on Channel 50 / 2477.313 MHz



Date: 21.MAY.2012 23:29:46

Number of Pulses Plot on Channel 50 / 2477.313 MHz



Date: 21.MAY.2012 23:26:32

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 / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1000KHz / 1000KHz for peak

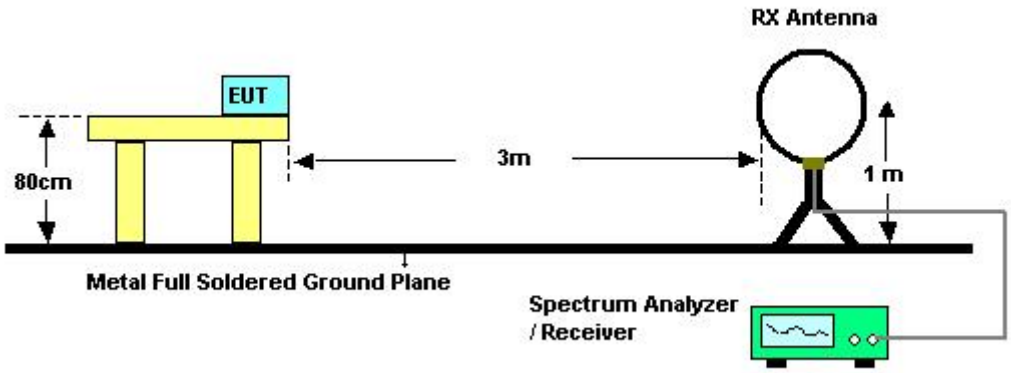
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.6.3. Test Procedures

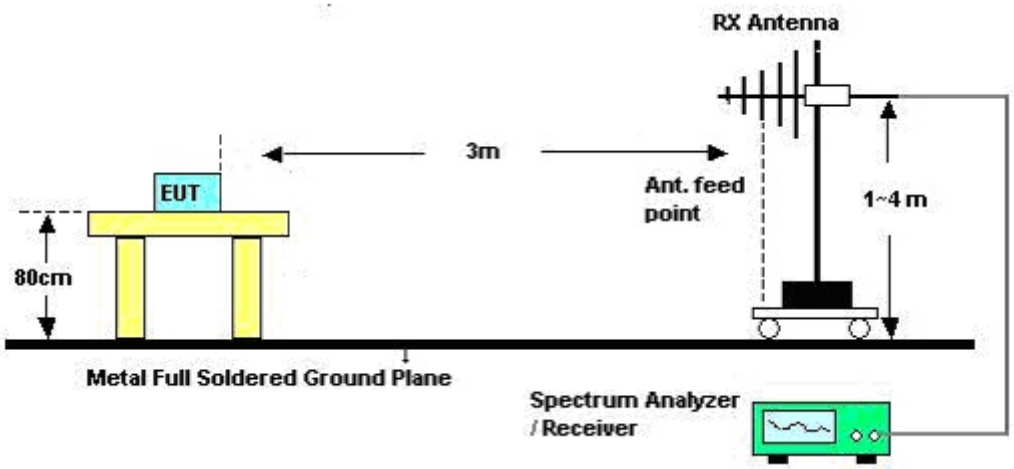
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 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 30MHz



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	21℃	Humidity	56%
Test Engineer	Magic Lai	Evaluating Date	May 29, 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.

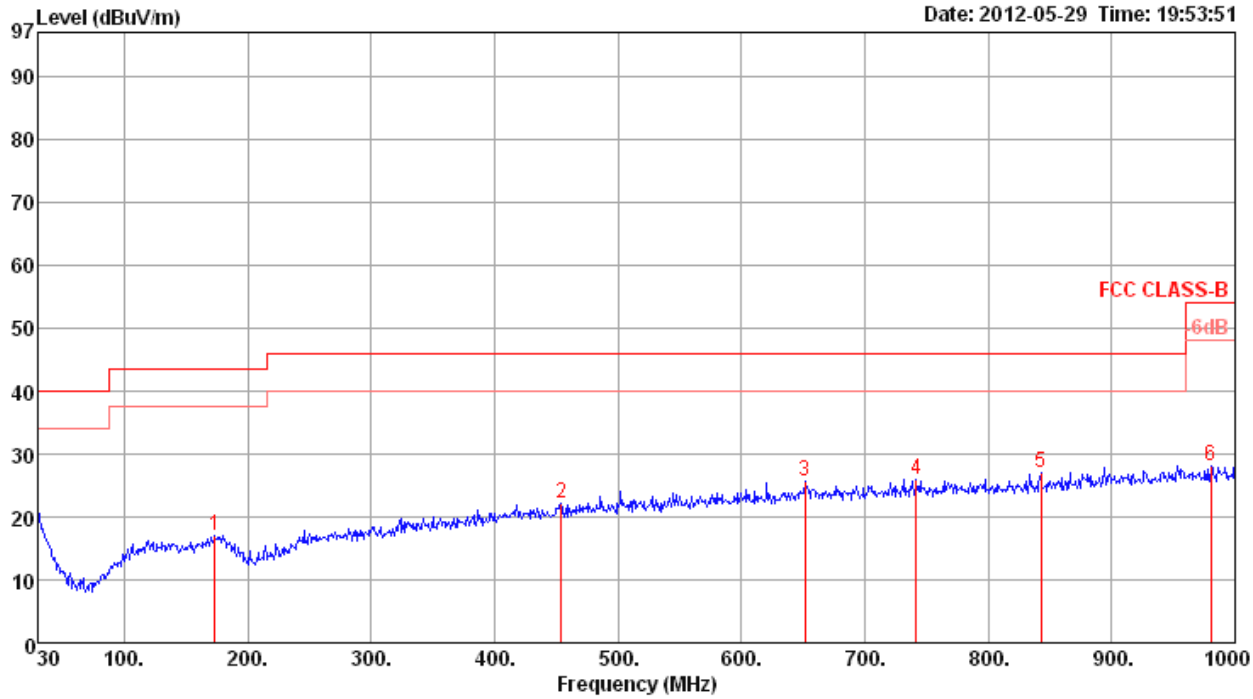
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

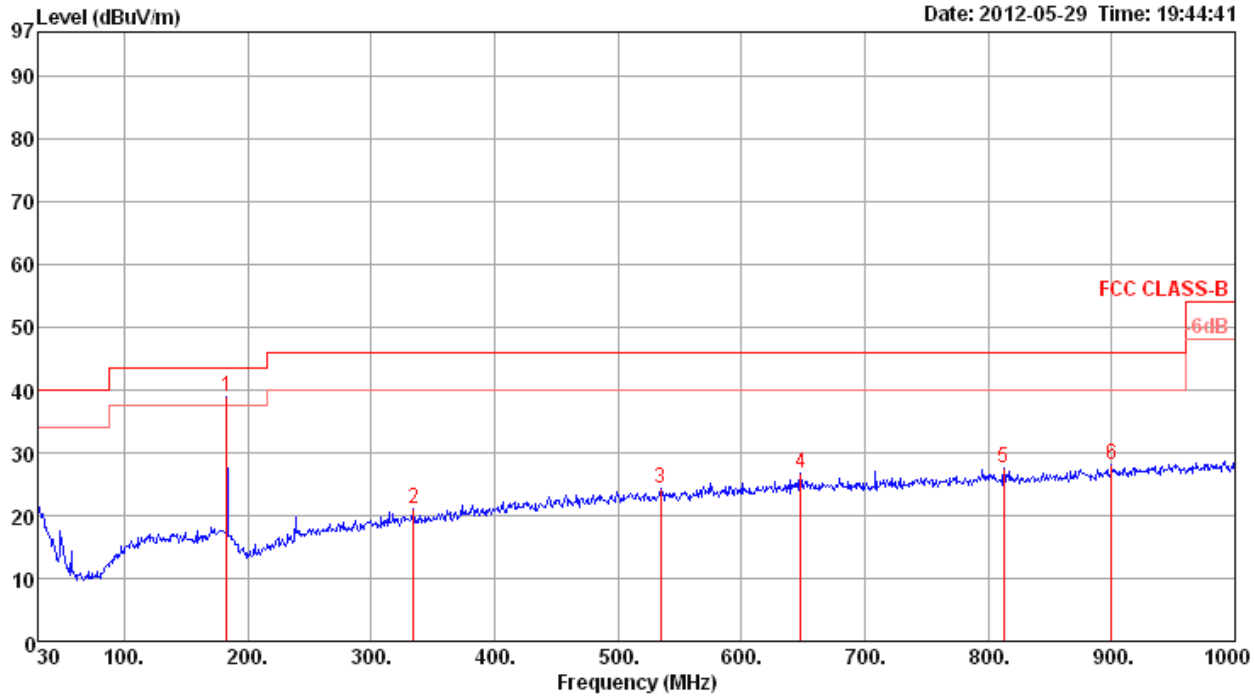
Temperature	21℃	Humidity	56%
Test Engineer	Magic Lai	Configurations	Mode 1

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	173.56	16.91	43.50	-26.59	29.52	1.57	13.05	27.23	Peak	400	0	HORIZONTAL
2	453.89	22.27	46.00	-23.73	30.62	2.61	16.91	27.87	Peak	400	0	HORIZONTAL
3	651.77	25.73	46.00	-20.27	31.36	3.49	18.93	28.05	Peak	400	0	HORIZONTAL
4	741.98	26.04	46.00	-19.96	31.03	3.47	19.37	27.83	Peak	400	0	HORIZONTAL
5	842.86	27.14	46.00	-18.86	31.18	3.39	20.09	27.52	Peak	400	0	HORIZONTAL
6	980.60	28.09	54.00	-25.91	30.37	3.66	21.14	27.08	Peak	400	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	183.26	38.93	43.50	-4.57	51.96	1.62	12.53	27.18	Peak	400	0	VERTICAL
2	334.58	21.03	46.00	-24.97	31.70	2.17	14.30	27.14	Peak	400	0	VERTICAL
3	534.40	24.21	46.00	-21.79	31.52	2.77	18.02	28.10	Peak	400	0	VERTICAL
4	647.89	26.76	46.00	-19.24	32.70	3.19	18.92	28.05	Peak	400	0	VERTICAL
5	812.79	27.50	46.00	-18.50	31.87	3.33	19.87	27.57	Peak	400	0	VERTICAL
6	900.09	27.98	46.00	-18.02	31.25	3.60	20.53	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	21℃	Humidity	56%
Test Engineer	Magic Lai	Configurations	Channel 2
Test Date	May 23, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4806.29	22.61	54.00	-31.39	21.34	3.29	33.02	35.04	Average	107	310	HORIZONTAL
2	4806.29	55.01	74.00	-18.99	53.74	3.29	33.02	35.04	Peak	107	310	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	4806.29	23.49	54.00	-30.51	22.22	3.29	33.02	35.04	Average	100	130	VERTICAL
2	4806.29	55.89	74.00	-18.11	54.62	3.29	33.02	35.04	Peak	100	130	VERTICAL

Temperature	21℃	Humidity	56%
Test Engineer	Magic Lai	Configurations	Channel 26
Test Date	May 23, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	7319.91	26.95	54.00	-27.05	22.33	4.06	35.96	35.40	Average	100	26	HORIZONTAL
2	7319.91	59.35	74.00	-14.65	54.73	4.06	35.96	35.40	Peak	100	26	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	7319.87	33.09	54.00	-20.91	28.47	4.06	35.96	35.40	Average	100	200	VERTICAL
2	7319.87	65.49	74.00	-8.51	60.87	4.06	35.96	35.40	Peak	100	200	VERTICAL

Temperature	21℃	Humidity	56%
Test Engineer	Magic Lai	Configurations	Channel 50
Test Date	May 23, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	7433.26	27.38	54.00	-26.62	22.51	4.07	36.20	35.40	Average	100	145	HORIZONTAL
2	7433.26	59.78	74.00	-14.22	54.91	4.07	36.20	35.40	Peak	100	145	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	7433.38	33.20	54.00	-20.80	28.33	4.07	36.20	35.40	Average	100	183	VERTICAL
2	7433.38	65.60	74.00	-8.40	60.73	4.07	36.20	35.40	Peak	100	183	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 / 1MHz 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	21℃	Humidity	56%
Test Engineer	Magic Lai	Configurations	Channel 2, 26, 50
Test Date	May 23, 2012		

Channel 2

	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	2378.80	23.26	54.00	-30.74	-7.08	2.21	28.13	0.00	Average	106	104	VERTICAL
2	2378.80	55.66	74.00	-18.34	25.32	2.21	28.13	0.00	Peak	106	104	VERTICAL
3	2403.19	74.71				2.22	28.21	0.00	Average	106	104	VERTICAL
4	2403.19	107.11				2.22	28.21	0.00	Peak	106	104	VERTICAL

Item 3, 4 are the fundamental frequency at 2402.049 MHz.

Channel 26

	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	2390.00	22.77	54.00	-31.23	-7.62	2.22	28.17	0.00	Average	104	59	VERTICAL
2	2390.00	55.17	74.00	-18.83	24.78	2.22	28.17	0.00	Peak	104	59	VERTICAL
3	2440.05	74.61				2.23	28.29	0.00	Average	104	59	VERTICAL
4	2440.05	107.01				2.23	28.29	0.00	Peak	104	59	VERTICAL
5	2483.50	22.84	54.00	-31.16	-7.79	2.26	28.37	0.00	Average	104	59	VERTICAL
6	2483.50	55.24	74.00	-18.76	24.61	2.26	28.37	0.00	Peak	104	59	VERTICAL

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

Channel 50

	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	2477.71	74.82				2.26	28.37	0.00	Average	123	79	VERTICAL
2	2477.71	107.22				2.26	28.37	0.00	Peak	123	79	VERTICAL
3	2485.10	23.36	54.00	-30.64	-7.31	2.26	28.41	0.00	Average	123	79	VERTICAL
4	2485.10	55.76	74.00	-18.24	25.09	2.26	28.41	0.00	Peak	123	79	VERTICAL

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

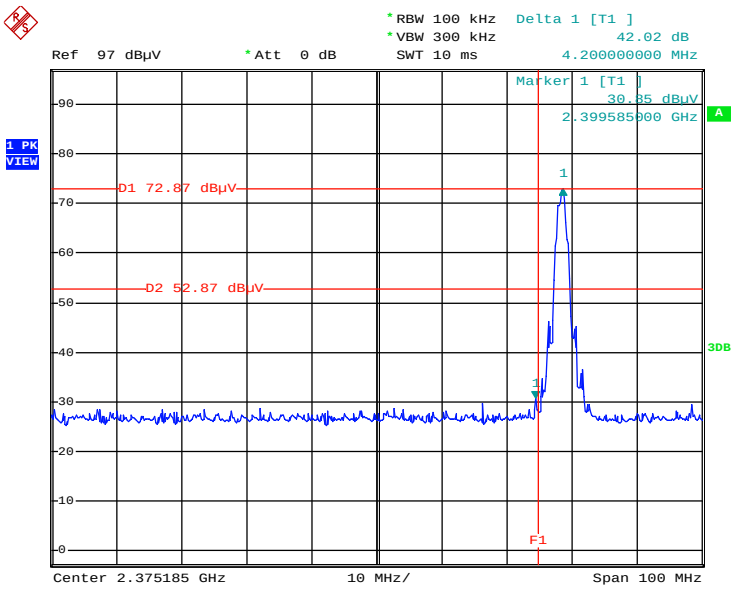
Note:

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

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

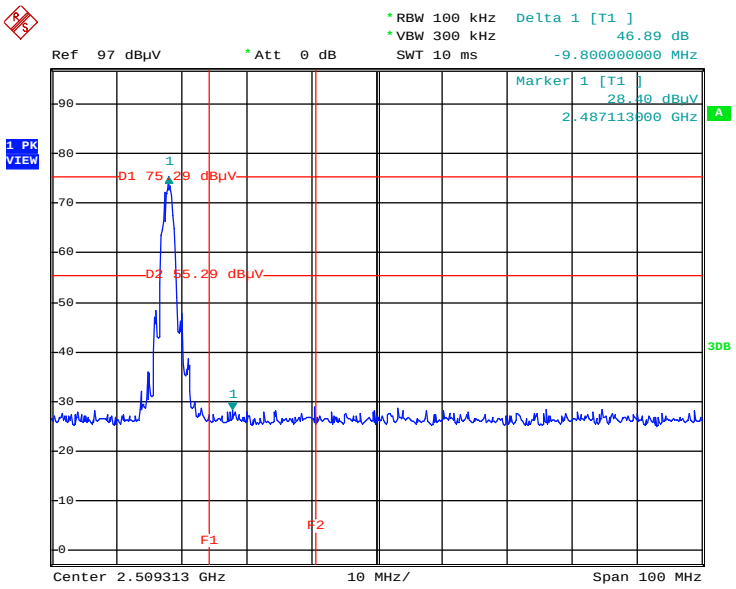
For Emission not in Restricted Band

Plot on Channel 2 / 2403.585 MHz



Date: 23.MAY.2012 06:49:36

Plot on Channel 50 / 2477.313 MHz



Date: 23.MAY.2012 06:45:49

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	Apr. 24, 2011	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Oct. 30, 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. 01, 2011	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 17, 2011	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 13, 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. 06, 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. 06, 2011	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 06, 2012	Radiation (03CH01-CB)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	Sep. 09, 2011	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	-	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-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)
Spectrum analyzer	R&S	FSP30	100023	9KHz~30GHz	Mar. 05, 2012	Conducted (TH01-CB)
Temp. and Humidity Chamber	TEN BILLION	TTH-D3SP	TBN-931011	-30~100℃	May 21, 2011	Conducted (TH01-CB)
Temp. and Humidity Chamber	TEN BILLION	TTH-D3SP	TBN-931011	-30~100℃	May 21, 2012	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Power Divider	HP	11636A	00306	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
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)
Signal generator	R&S	SMU200A	102782	10MHz-40GHz	Mar. 09, 2012	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	Apr. 16, 2012	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071042	1GHz – 18GHz	Oct. 14, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 13, 2011	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 08, 2011	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one 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.：L1190-110702

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

P1, total 22 pages

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