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FCC RADIO TEST REPORT

Applicant's company	**RELIGHT TECHNOLOGY CORPORATION**
Applicant Address	5F.,No.253,Dong Sec.1, Guangming 6th Rd.,Zhubei City, Hsinchu County 302,Taiwan ,R.O.C.
FCC ID	**S39RL11101**
Manufacturer's company	**RELIGHT TECHNOLOGY CORPORATION**
Manufacturer Address	5F.,No.253,Dong Sec.1, Guangming 6th Rd.,Zhubei City, Hsinchu County 302,Taiwan ,R.O.C.

Product Name	TX-30 2.4GHz FHSS 3CH Radio control system
Brand Name	RELight
Model Name	RL-11101
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2407 ~ 2465 MHz
Received Date	Feb. 23, 2012
Final Test Date	May 07, 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.

Testing Laboratory
1190

ILAC MRA

Table of Contents

1. CERTIFICATE OF COMPLIANCE 1
2. SUMMARY OF THE TEST RESULT 2
3. GENERAL INFORMATION 3
3.1. Product Details 3
3.2. Accessories 3
3.3. Table for Filed Antenna 3
3.4. Table for Carrier Frequencies 4
3.5. Table for Test Modes 4
3.6. Table for Testing Locations 5
3.7. Table for Supporting Units 5
3.8. Table for Parameters of Test Software Setting 5
3.9. Test Configurations 6
3.10. Maximum Peak Output Power Measurement 8
3.11. Hopping Channel Separation Measurement 10
3.12. Number of Hopping Frequency Measurement 15
3.13. Dwell Time Measurement 17
3.14. Radiated Emissions Measurement 22
3.15. Band Edge Emissions Measurement 31
3.16. Antenna Requirements 34
4. LIST OF MEASURING EQUIPMENTS 35
5. TEST LOCATION 37
6. TAF CERTIFICATE OF ACCREDITATION 38
APPENDIX A. TEST PHOTOS ..... A1 ~ A4
APPENDIX B. RF EXPOSURE REPORT ..... B1 ~ B2

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR222336	Rev. 01	Initial issue of report	May 11, 2012

Certificate No.: CB10103078

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**TX-30 2.4GHz FHSS 3CH Radio control system**
Brand Name	:	**RELight**
Model Name	:	**RL-11101**
Applicant	:	**RELIGHT TECHNOLOGY CORPORATION**
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 Feb. 23, 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
3.10	15.247(b)(1)	Maximum Peak Conducted Output Power	Complies	10.02 dB
3.11	15.247(a)(1)	Hopping Channel Separation	Complies	-
3.12	15.247(b)(1)	Number of Hopping Frequency	Complies	-
3.13	15.247(a)(1)	Dwell Time	Complies	-
3.14	15.247(d)	Radiated Emissions	Complies	13.00 dB
3.15	15.247(d)	Band Edge Emissions	Complies	0.35 dB
3.16	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	$\pm 8.5\times 10^{-8}$	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

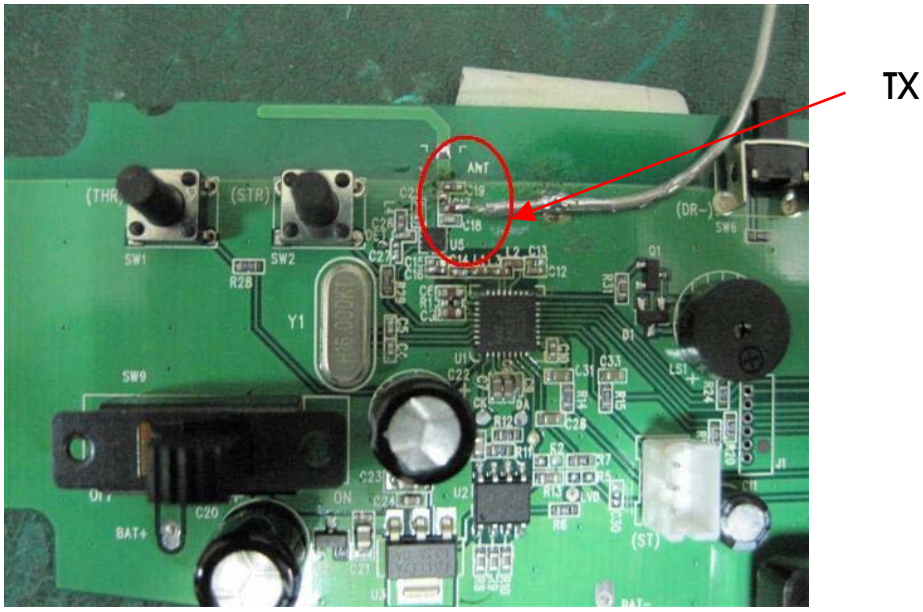
Items	Description
Power Type	From AA Battery
Modulation	GFSK
Frequency Range	2407 ~ 2465 MHz
Channel Number	59 (Min. Hopping channel requirement: 15)
Channel Band Width (99%)	890.00 kHz
Peak Conducted Output Power	10.98dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	RELight	-	Printed	-	2.9



3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2407～2477MHz	1	2407 MHz
	2	2408 MHz
	:	:
	35	2441 MHz
	36	2442 MHz
	40	2446 MHz
	:	:
	58	2464 MHz
	59	2465 MHz

3.5. Table for Test Modes

The following table is a list of the test modes shown in this test report.

Test Items	Mode	Channel	Antenna
Max. Peak Conducted Output Power	CTX	1/36/59	NA
Average Output Power	CTX	1/36/59	NA
Hopping Channel Separation	Hopping Mode	1～36～59	NA
Number of Hopping Frequency	Hopping Mode	1～59	NA
Dwell Time	Hopping Mode	1～59	NA
Radiated Emissions Below 1GHz	Normal Link	-	-
Radiated Emissions Above 1GHz	CTX	1/36/59	1
Band Edge Emissions	CTX	1/59	1

The following test modes were performed for the test:

Mode 1: Place EUT in X axis

Mode 2: Place EUT in Y axis

Mode 3: Place EUT in Z axis

<for TX Spurious Emissions Below 1GHz >

Mode 3 generated the worst case, so it was selected to perform test and its test result was written in the report.

<For TX Spurious Emissions Above 1GHz >

Mode 3 generated the worst case, so it was selected to perform test and its test result was written in the 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	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	262045	IC 4086D	-

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
Receiver	RELight	-	-

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.

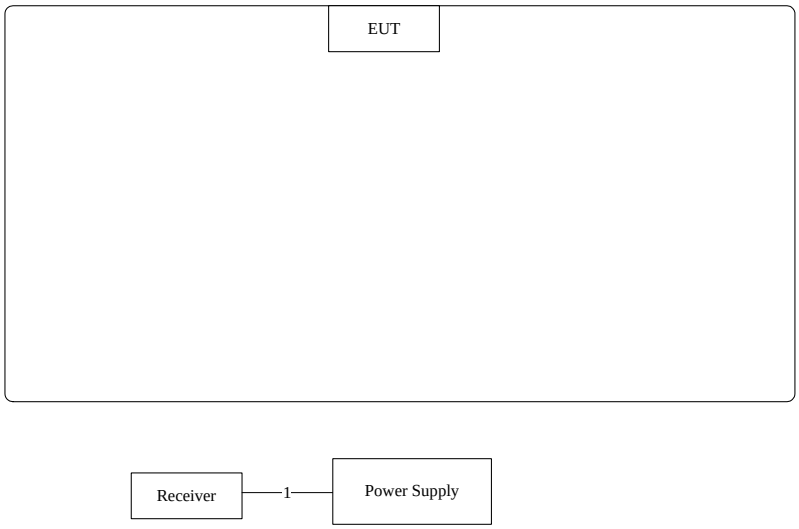
Power Parameters

Test Software Version	N/A		
Frequency	2407 MHz	2442 MHz	2465 MHz
Power Parameters	Default	Default	Default

3.9. Test Configurations

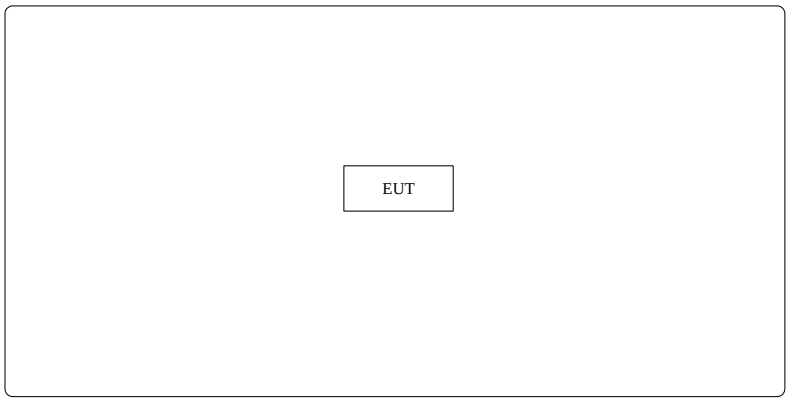
3.9.1. Radiation Emissions Test Configuration

< 30MHz ~1GHz >



Item	Cable	Shield	Length
1	Power Cable	No	0.45M

<Above 1GHz >



3.10. Maximum Peak Output Power Measurement

3.10.1. 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.

3.10.2. Measuring Instruments and Setting

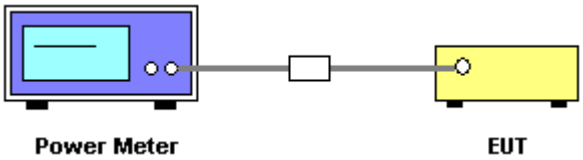
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

3.10.3. 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.

3.10.4. Test Setup Layout



3.10.5. Test Deviation

There is no deviation with the original standard.

3.10.6. EUT Operation during Test

The EUT was programmed to be in hopping mode.

3.10.7. Test Result of Maximum Peak Output Power

Temperature	23°C	Humidity	63%
Test Engineer	Allen Liu	Configurations	CTX

Channel	Frequency	Conducted Power (dBm)	Conducted Power (W)	Max. Limit(dBm)	Max. Limit(W)	Result
1	2407 MHz	10.96	0.0125	21.00	0.1259	Complies
36	2442 MHz	10.98	0.0125	21.00	0.1259	Complies
59	2465 MHz	10.61	0.0115	21.00	0.1259	Complies

3.11. Hopping Channel Separation Measurement

3.11.1. 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 2400~2483.5MHz 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.

3.11.2. Measuring Instruments and Setting

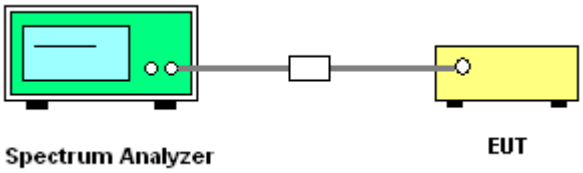
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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

3.11.3. 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 utilised for 20 dB bandwidth measurement.
3. The resolution bandwidth of 100 kHz and the video bandwidth of 100 KHz were utilised for channel separation measurement.
4. Test was performed in accordance with Measurement under FCC Public Notic DA00-705.

3.11.4. Test Setup Layout



3.11.5. Test Deviation

There is no deviation with the original standard.

3.11.6. EUT Operation during Test

The EUT was programmed to be in hopping mode.

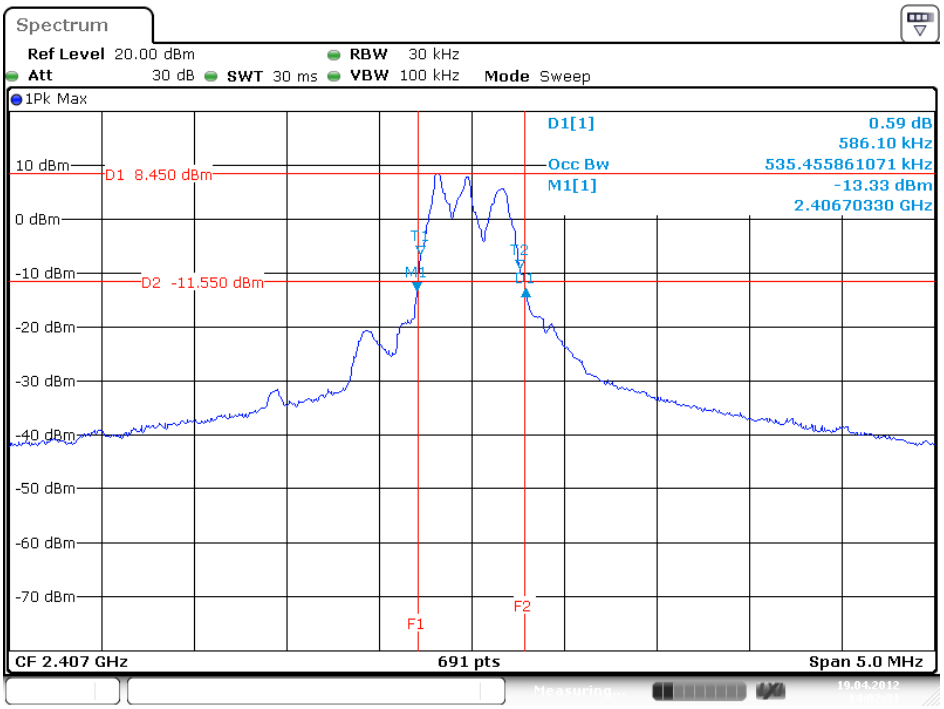
3.11.7. Test Result of Hopping Channel Separation

Temperature	23°C	Humidity	63%
Test Engineer	Allen Liu	Configurations	Hopping mode

Frequency	20dB Bandwidth (kHz)	99% Occupied BW (kHz)	Channel Specing (kHz)	Channel Specing Min. Limits (kHz)	Result
2407 MHz	586.10	535.45	1000.00	390.73	Complies
2442 MHz	687.40	672.93	1000.00	458.27	Complies
2465 MHz	690.00	890.00	1000.00	460.00	Complies

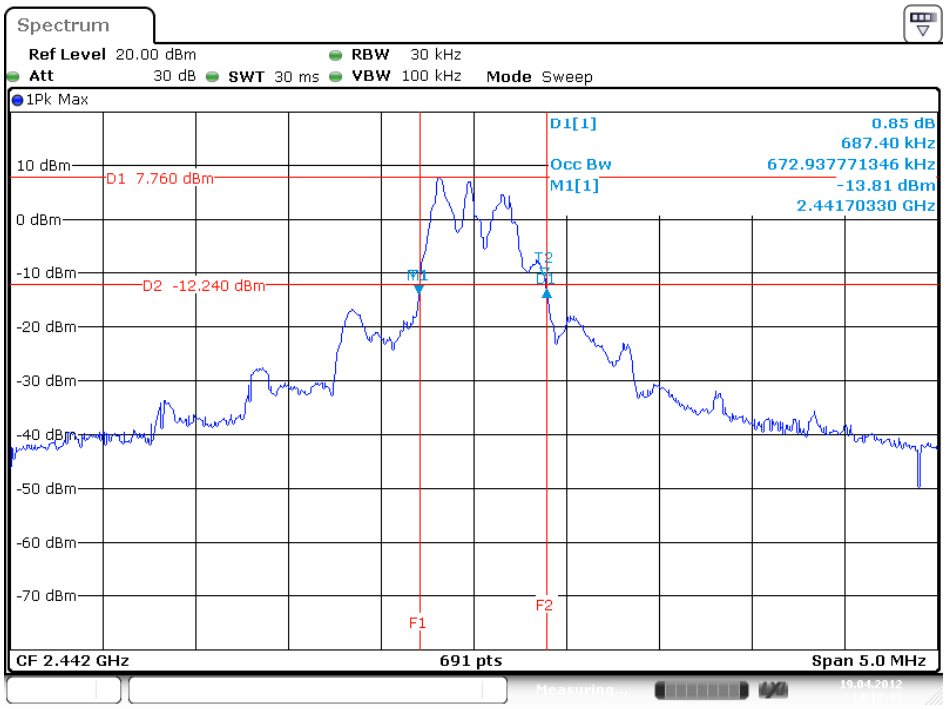
Note: The limit should be the greater of 25 kHz or 2/3 of 20 dB bandwidth for device operates with an output power not greater than 125 mW.

20 dB Bandwidth Plot on Channel 1 / 2407 MHz



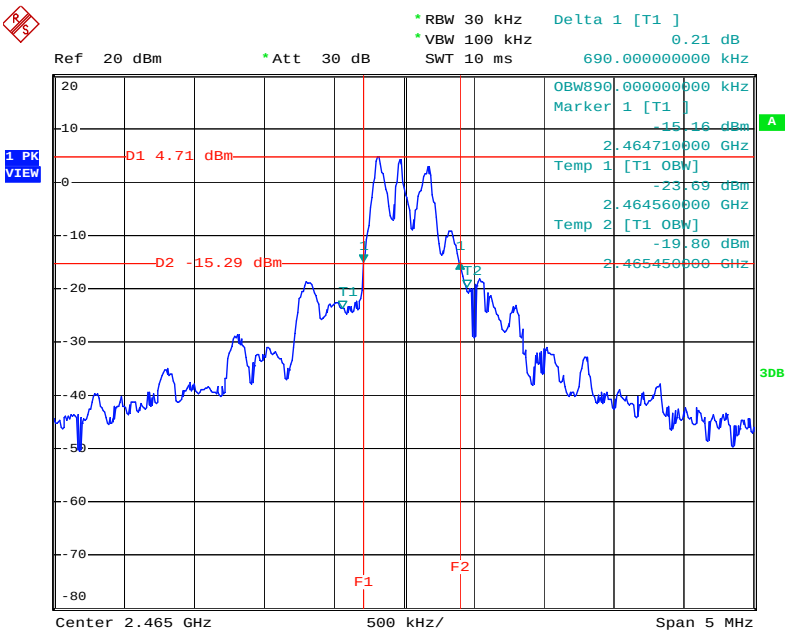
Date: 19.APR.2012 14:02:31

20 dB Bandwidth Plot on Channel 36 / 2442 MHz



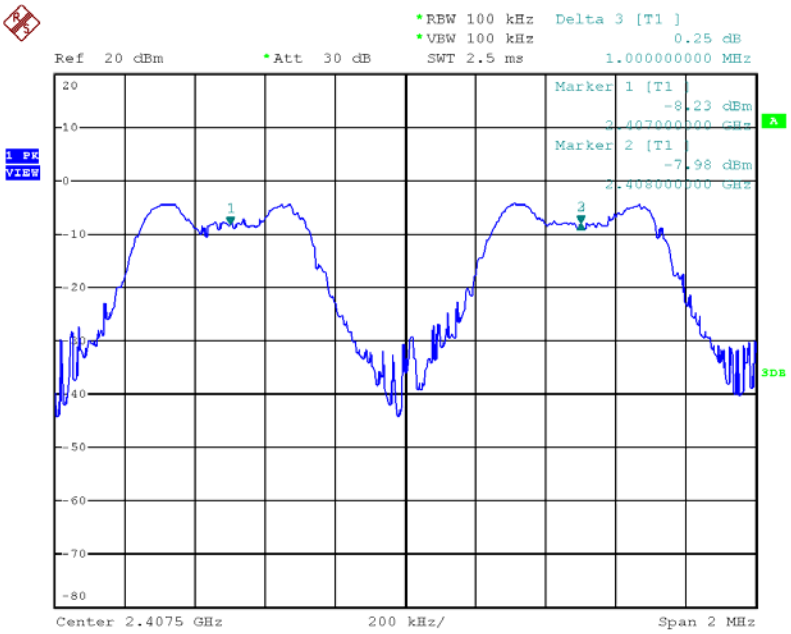
Date: 19.APR.2012 14:12:31

20 dB Bandwidth Plot on Channel 59 / 2465 MHz



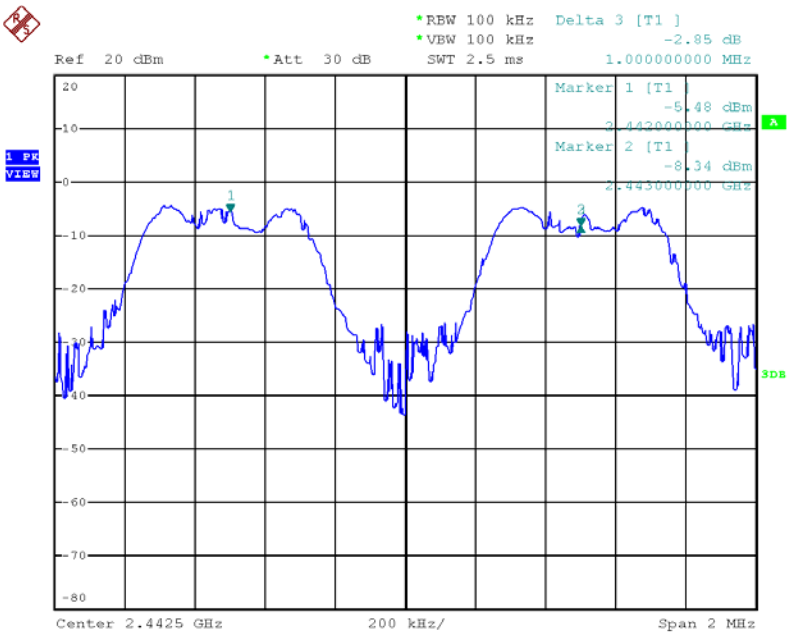
Date: 7.MAY.2012 21:27:47

Channel Separation Plot on Channel 1 / 2407 MHz



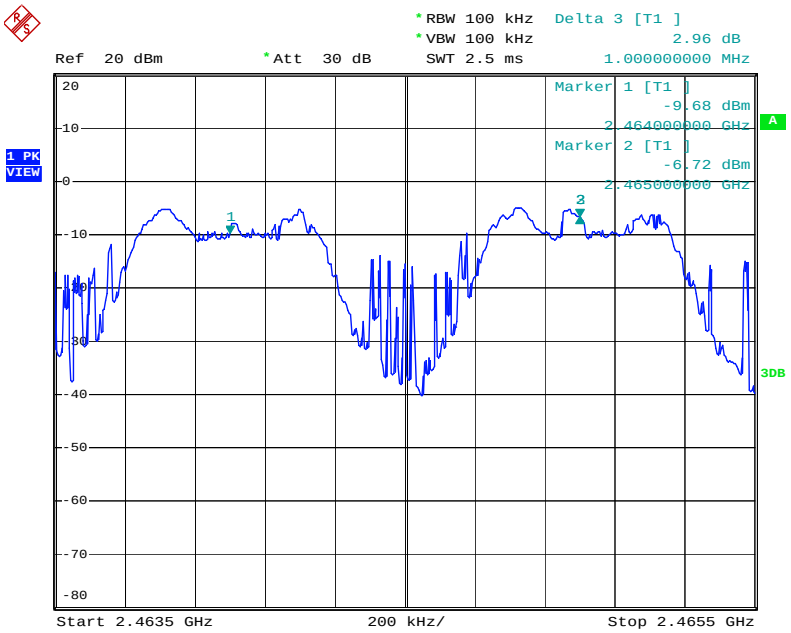
Date: 2.MAR.2012 15:50:12

Channel Separation Plot on Channel 36 / 2442 MHz



Date: 2.MAR.2012 16:03:22

Channel Separation Plot on Channel 59 / 2465 MHz



Date: 7.MAY.2012 21:52:35

3.12. Number of Hopping Frequency Measurement

3.12.1. Limit

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

3.12.2. Measuring Instruments and Setting

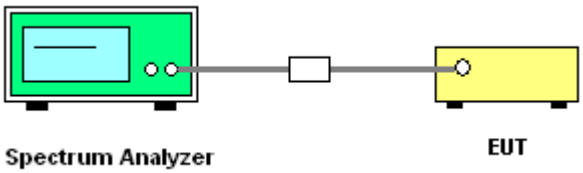
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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

3.12.3. Test Procedures

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

3.12.4. Test Setup Layout



3.12.5. Test Deviation

There is no deviation with the original standard.

3.12.6. EUT Operation during Test

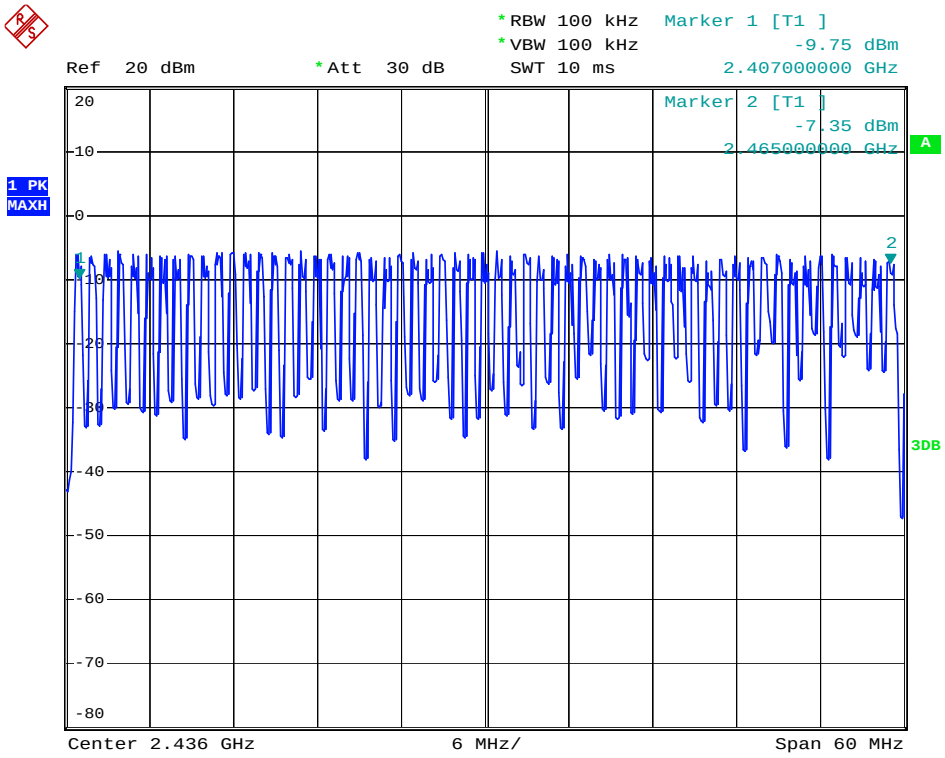
The EUT was programmed to be in hopping mode.

3.12.7. Test Result of Number of Hopping Frequency

Temperature	23℃	Humidity	63%
Test Engineer	Allen Liu	Configurations	Hopping mode

Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
1~59	2407 MHz ~ 2465 MHz	59	15	Complies

Number of Hopping Channel Plot on Channel 1~59 / 2407 MHz ~ 2465 MHz



Date: 7.MAY.2012 22:01:00

3.13. Dwell Time Measurement

3.13.1. 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.

3.13.2. Measuring Instruments and Setting

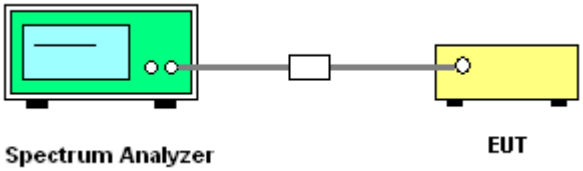
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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

3.13.3. 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.

3.13.4. Test Setup Layout



3.13.5. Test Deviation

There is no deviation with the original standard.

3.13.6. EUT Operation during Test

The EUT was programmed to be in hopping Mode.

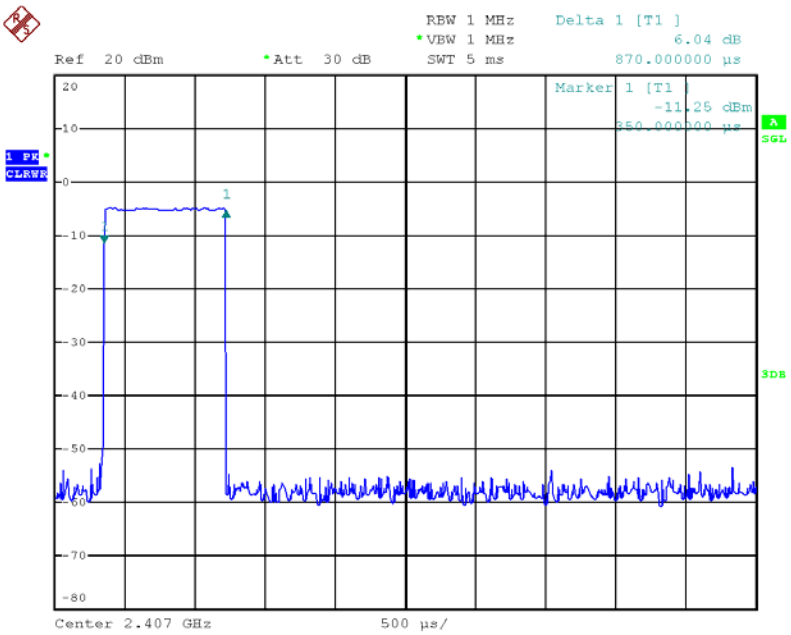
3.13.7. Test Result of Dwell Time

Temperature	23°C	Humidity	63%
Test Engineer	Allen Liu	Configurations	Hopping Mode

Frequency	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell time duration (s)	Dwell Time (s)	Limits (s)	Test\ Result
2407 MHz	0.8700	9	10	23.6	0.0185	0.4000	Complies
2442 MHz	0.8700	14	10	23.6	0.0287	0.4000	Complies
2465 MHz	0.8600	10	10	23.6	0.0203	0.4000	Complies

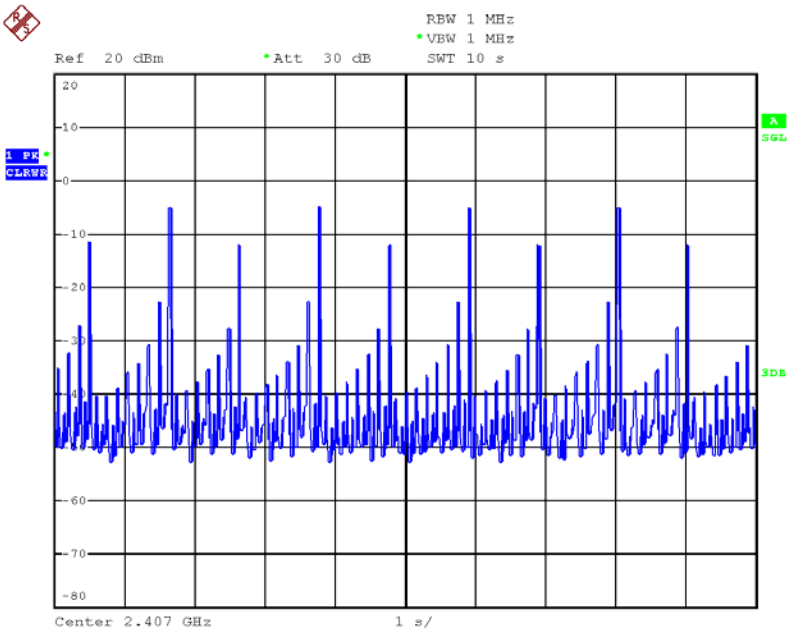
Note: Dwell time=pulse duration x number of pulses / measure time x dwell time duration

Single Pulse Plot on Channel 1 / 2407 MHz



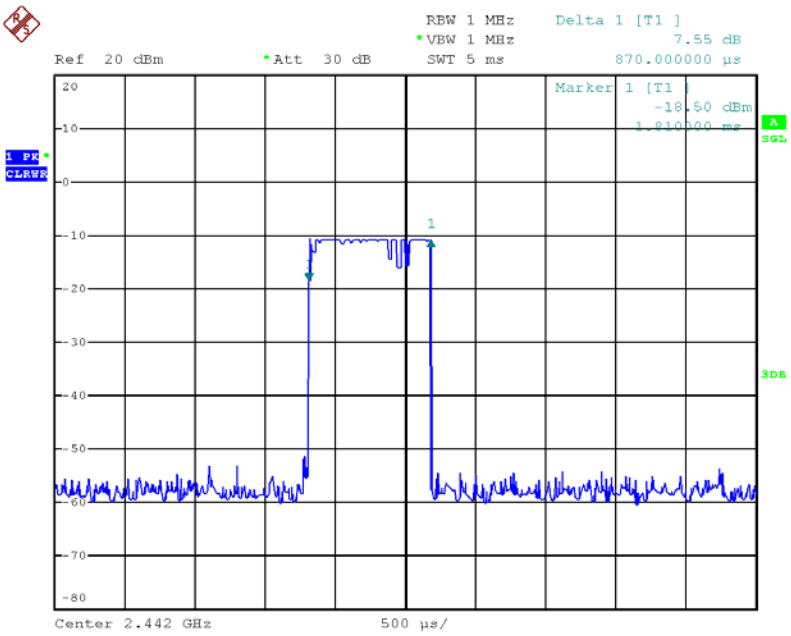
Date: 2.MAR.2012 16:08:23

Number of Pulses Plot on Channel 1 / 2407 MHz



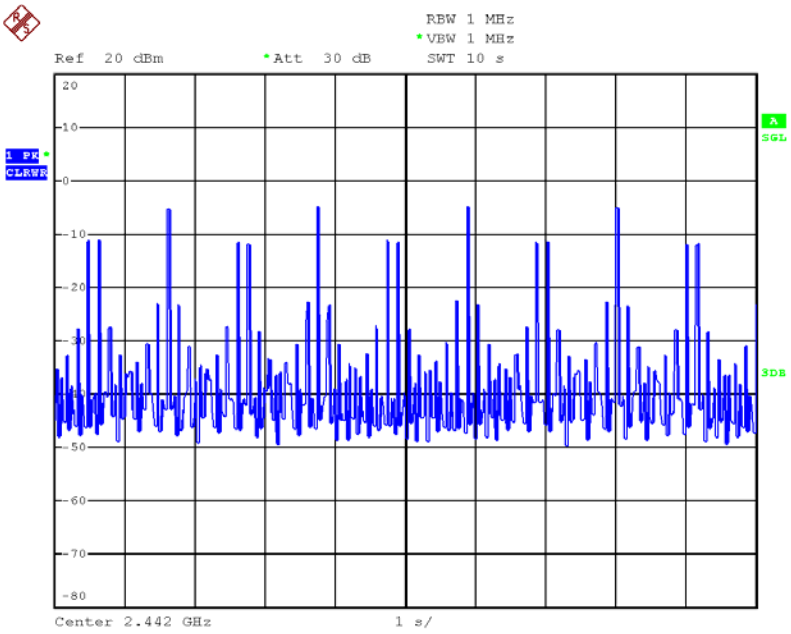
Date: 2.MAR.2012 16:16:20

Single Pulse Plot on Channel 36 / 2442 MHz



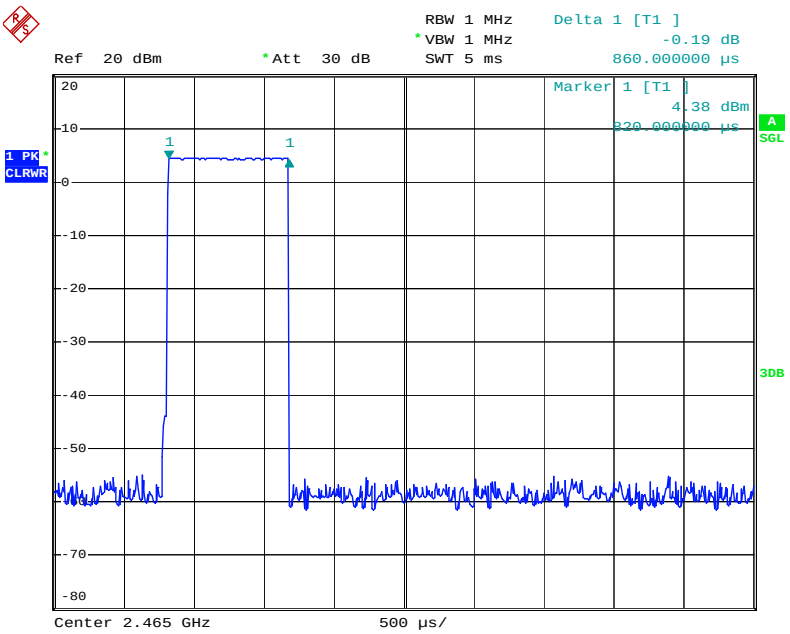
Date: 2.MAR.2012 16:09:29

Number of Pulses Plot on Channel 36 / 2442 MHz



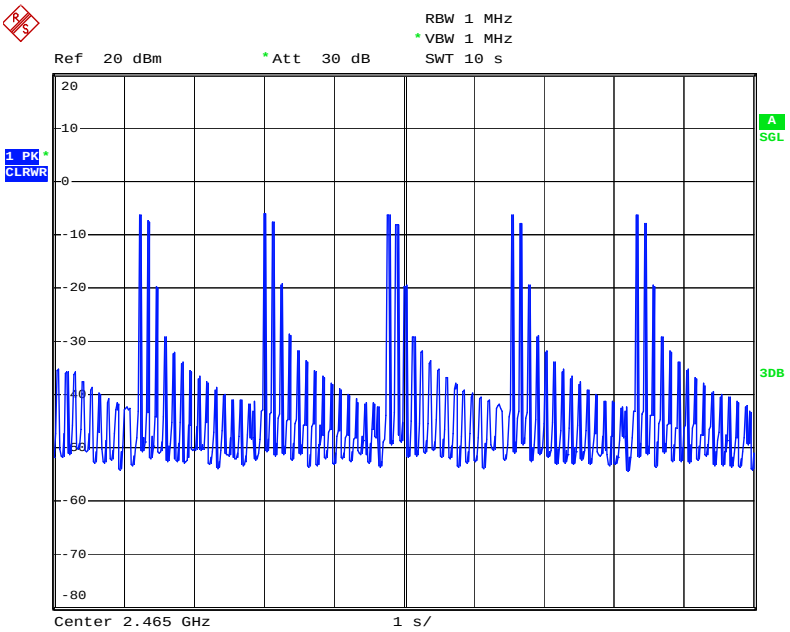
Date: 2.MAR.2012 16:14:03

Single Pulse Plot on Channel 59 / 2465 MHz



Date: 7.MAY.2012 21:32:10

Number of Pulses Plot on Channel 59 / 2465 MHz



Date: 7.MAY.2012 21:45:06

3.14. Radiated Emissions Measurement

3.14.1. 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

3.14.2. 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)	1MHz / 3MHz for peak

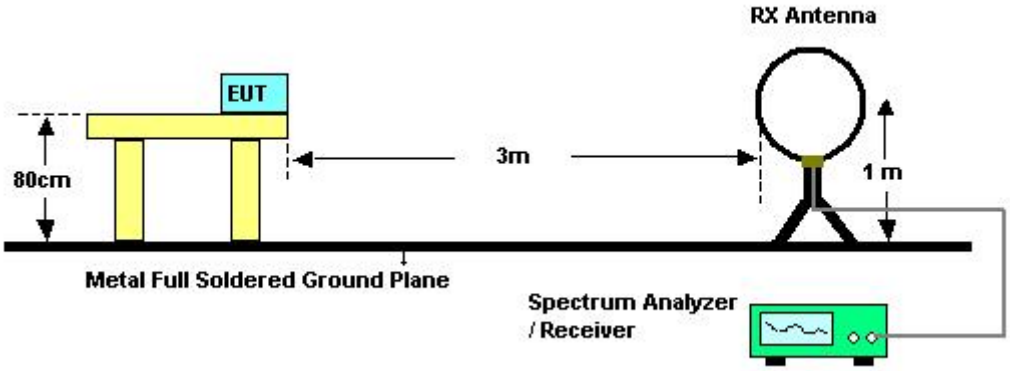
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.14.3. Test Procedures

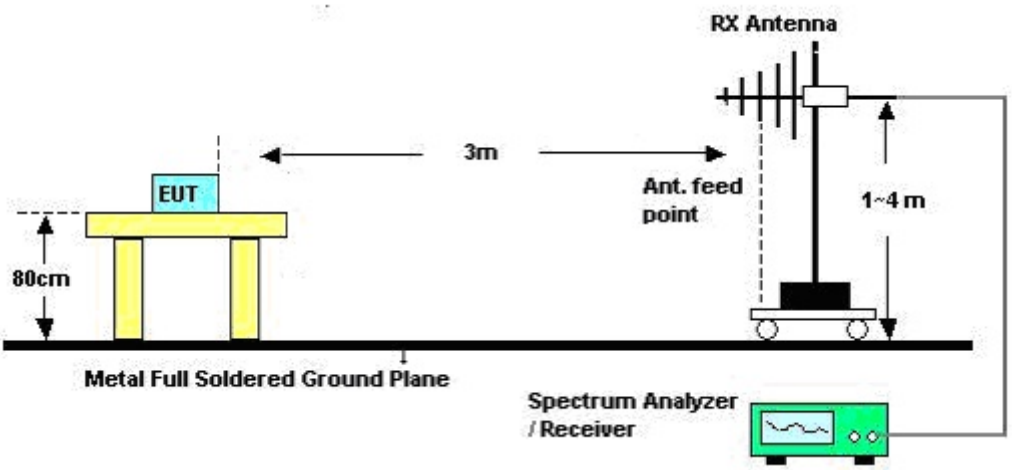
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

3.14.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



3.14.5. Test Deviation

There is no deviation with the original standard.

3.14.6. EUT Operation during Test

The EUT was programmed to be in CTX mode.

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

Temperature	25.6°C	Humidity	56%
Test Engineer	Serway Li	Test Date	Mar. 21, 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.

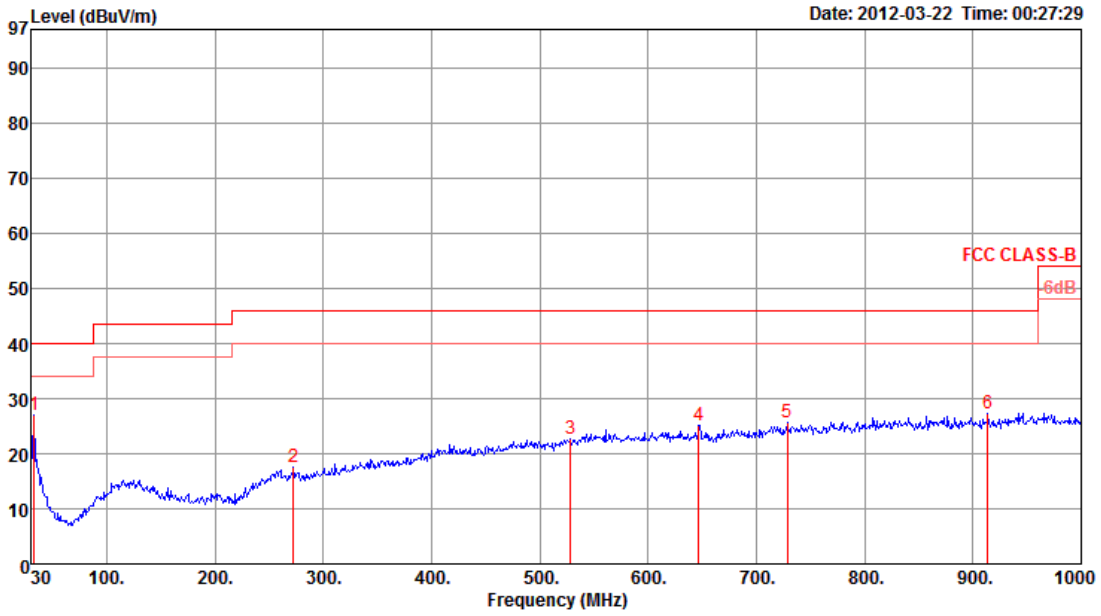
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

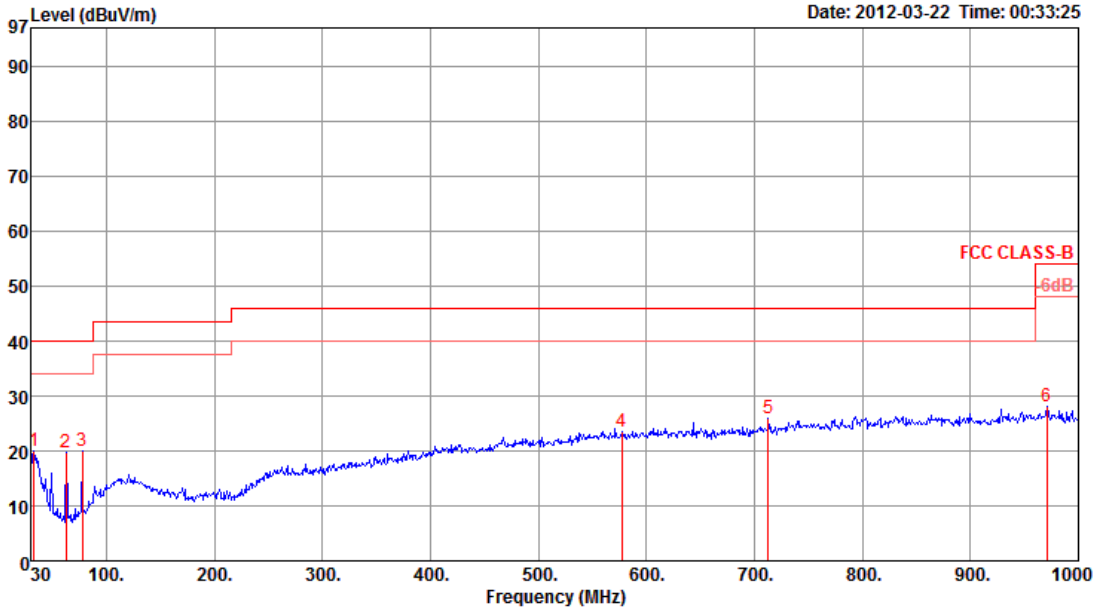
Temperature	20°C	Humidity	70%
Test Engineer	Serway Li	Configurations	Normal Link

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	32.91	27.00	40.00	-13.00	36.67	0.88	27.80	17.25	0	400	Peak	HORIZONTAL
2	272.50	17.47	46.00	-28.53	28.82	2.50	26.96	13.11	0	400	Peak	HORIZONTAL
3	528.58	22.64	46.00	-23.36	28.78	3.47	28.10	18.49	0	400	Peak	HORIZONTAL
4	646.92	25.12	46.00	-20.88	29.62	3.89	28.05	19.66	0	400	Peak	HORIZONTAL
5	728.40	25.79	46.00	-20.21	28.80	4.19	27.88	20.68	0	400	Peak	HORIZONTAL
6	913.67	27.23	46.00	-18.77	29.14	4.66	27.34	20.77	0	400	Peak	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	32.91	19.90	40.00	-20.10	29.57	0.88	27.80	17.25	0	100	Peak	VERTICAL
2		62.98	19.65	40.00	-20.35	39.93	1.19	27.75	6.28	0	100	Peak	VERTICAL
3		77.53	19.87	40.00	-20.13	39.26	1.32	27.69	6.98	0	100	Peak	VERTICAL
4		577.08	23.40	46.00	-22.60	28.60	3.64	28.10	19.26	0	100	Peak	VERTICAL
5		712.88	25.83	46.00	-20.17	29.51	4.17	27.94	20.09	0	100	Peak	VERTICAL
6		970.90	28.18	54.00	-25.82	28.99	4.85	27.12	21.46	0	100	Peak	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.

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

Temperature	25.6°C	Humidity	56%
Test Engineer	Serway Li	Configurations	Channel 1
Test Date	Apr. 19, 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	4813.53	26.97	54.00	-27.03	25.68	3.31	33.02	35.04	Average	100	250	HORIZONTAL
2	4813.53	47.23	74.00	-26.77	45.94	3.31	33.02	35.04	Peak	100	250	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	4813.59	28.34	54.00	-25.66	27.05	3.31	33.02	35.04	Average	103	76	VERTICAL
2	4813.59	48.60	74.00	-25.40	47.31	3.31	33.02	35.04	Peak	103	76	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Serway Li	Configurations	Channel 36
Test Date	Apr. 19, 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	4884.13	30.54	54.00	-23.46	29.08	3.33	33.16	35.03	Average	100	249	HORIZONTAL
2	4884.13	50.80	74.00	-23.20	49.34	3.33	33.16	35.03	Peak	100	249	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	4883.64	28.84	54.00	-25.16	27.38	3.33	33.16	35.03	Average	100	94	VERTICAL
2	4883.64	49.10	74.00	-24.90	47.64	3.33	33.16	35.03	Peak	100	94	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Serway Li	Configurations	Channel 59
Test Date	Apr. 19, 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	4929.70	47.68	74.00	-26.32	45.92	4.13	35.03	32.66	254	104	Peak	HORIZONTAL
2	a	4929.70	27.42	54.00	-26.58	25.66	4.13	35.03	32.66	254	104	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	4929.66	47.41	74.00	-26.59	45.65	4.13	35.03	32.66	91	108	Peak	VERTICAL
2	a	4929.66	27.15	54.00	-26.85	25.39	4.13	35.03	32.66	91	108	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.

3.15. Band Edge Emissions Measurement

3.15.1. 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

3.15.2. 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 / 3 MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz /100 KHz for Peak

3.15.3. 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.

3.15.4. Test Setup Layout

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

3.15.5. Test Deviation

There is no deviation with the original standard.

3.15.6. EUT Operation during Test

The EUT was programmed to be in hopping mode.

3.15.7. Test Result of Band Edge and Fundamental Emissions

Temperature	25.6°C	Humidity	56%
Test Engineer	Serway Li	Configurations	Channel 1, 36, 59
Test Date	May. 03, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.68	46.77	54.00	-7.23	16.39	2.21	28.17	0.00	Average	140	49	HORIZONTAL
2	2389.68	67.03	74.00	-6.97	36.65	2.21	28.17	0.00	Peak	140	49	HORIZONTAL
3	2406.84	86.38	54.00			2.22	28.21	0.00	Average	140	49	HORIZONTAL
4	2406.84	106.64	74.00			2.22	28.21	0.00	Peak	140	49	HORIZONTAL

Item 1, 2 are Band Edge.

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	2389.36	39.45	54.00	-14.55	9.07	2.21	28.17	0.00	Average	136	41	HORIZONTAL
2	2389.36	59.71	74.00	-14.29	29.33	2.21	28.17	0.00	Peak	136	41	HORIZONTAL
3	2442.00	87.98	54.00			2.24	28.29	0.00	Average	136	41	HORIZONTAL
4	2442.00	108.24	74.00			2.24	28.29	0.00	Peak	136	41	HORIZONTAL
5	2483.50	43.03	54.00	-10.97	12.39	2.26	28.38	0.00	Average	136	41	HORIZONTAL
6	2483.50	63.29	74.00	-10.71	32.65	2.26	28.38	0.00	Peak	136	41	HORIZONTAL

Item 3, 4 are Band Edge.

Channel 59

	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	2476.80	85.84	54.00			2.26	28.38	0.00	Average	141	36	HORIZONTAL
2	2476.80	106.43	74.00			2.26	28.38	0.00	Peak	141	36	HORIZONTAL
3	2483.50	53.06	54.00	-0.94	22.42	2.26	28.38	0.00	Average	141	36	HORIZONTAL
4	2483.50	73.65	74.00	-0.35	43.01	2.26	28.38	0.00	Peak	141	36	HORIZONTAL

Item 3, 4 are Band Edge.

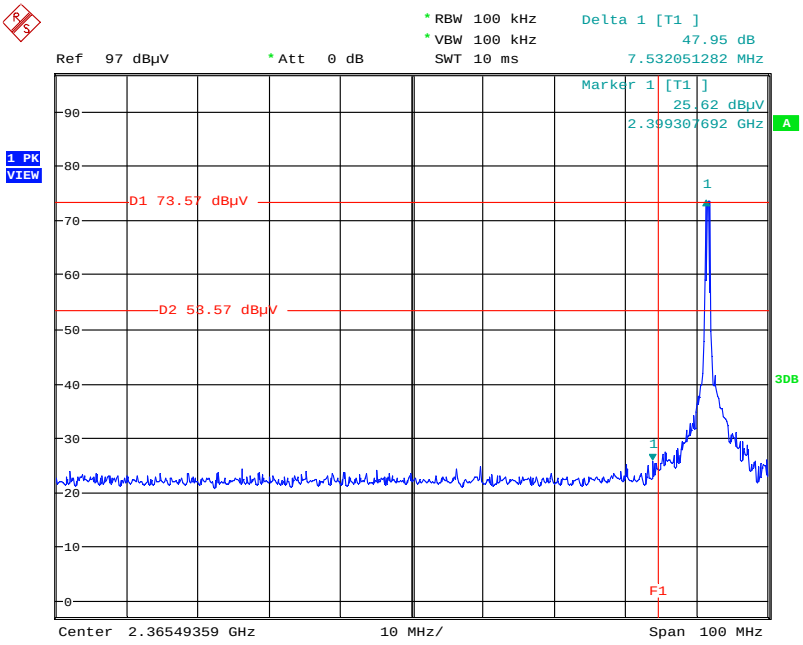
Note:

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 1 / 2407 MHz



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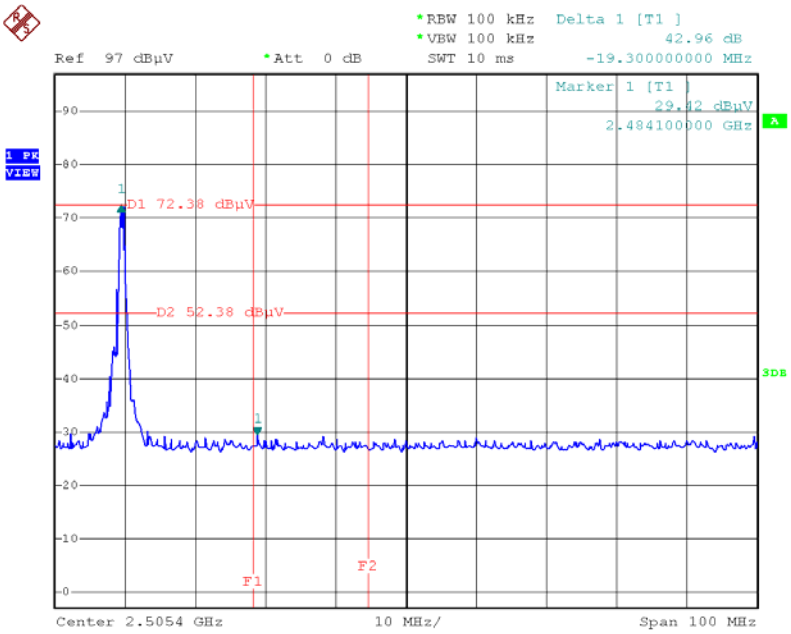
Plot on Channel 59 / 2465 MHz



Date: 3.MAY.2012 16:34:12

3.16. Antenna Requirements

3.16.1. 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.

3.16.2. Antenna Connector Construction

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

4. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Jan. 11, 2012	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 25, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 29, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 03, 2011	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Jan. 22, 2012	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2010*	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9KHz~40GHz	Sep. 26, 2011	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2011	Conducted (TH01-CB)
RF Power Divider	HP	11636A	00306	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	44100	1839	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	42100	17930	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)

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

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

5. 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

6. TAF CERTIFICATE OF ACCREDITATION

TAF

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