SPORTON International Inc.
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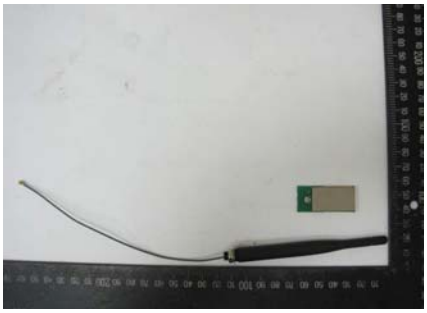
FCC RADIO TEST REPORT

Applicant's company	**Joymax Electronics Co., Ltd.**
Applicant Address	No. 5 Dong Yuan Rd. 2, Jhongli Industrial Park, Jhongli City, Tao Yuan 32063 Taiwan, R.O.C.
FCC ID	**XNNMD120FA**
Manufacturer's company	**Joymax Electronics Co., Ltd.**
Manufacturer Address	No. 5 Dong Yuan Rd. 2, Jhongli Industrial Park, Jhongli City, Tao Yuan 32063 Taiwan, R.O.C.

Product Name	ZigBee uFL High Power Module Family
Model Name	MD120FA
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2405 ~ 2475MHz
Received Date	Nov. 12, 2010
Final Test Date	Nov. 17, 2010
Submission Type	Original Equipment



Statement

Test result included is only for the IEEE 802.15.4 ZigBee part of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

Table of Contents

History of This Test Report

Original Issue Date: Nov. 22, 2010

Report No.: FR0N1114

■ No additional attachment.

□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No.: CB9911122

1. CERTIFICATE OF COMPLIANCE

Product Name	:	ZigBee uFL High Power Module Family
Model Name	:	MD120FA
Applicant	:	Joymax Electronics Co., Ltd.
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 Nov. 12, 2010 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 2010.11.23

Jordan Hsiao

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	9.78 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	11.47dB
4.3	15.247(e)	Power Spectral Density	Complies	1.99 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.97 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.13 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7℃	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Power Type	From Fixture
Modulation	DSSS (QPSK)
Data Rate (Mbps)	DSSS (250kbps)
Frequency Range	2405 ~ 2475MHz
Channel Number	15
Channel Band Width (99%)	2.35 MHz
Conducted Output Power	18.53 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3
Others	
Note: The test configuration for the Duty Cycle 1%, test mode and test software used in this test report are designated by the customer.	

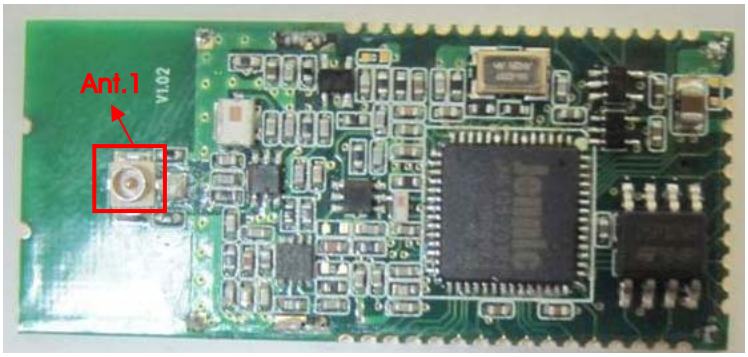
3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	JOYMAX	IHS-152XMPXX	Dipole Antenna	I-PEX	4

Note:This product has one antenna that supports transmitting and receiving function.



3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400 ~ 2483.5MHz	11	2405 MHz	19	2445 MHz
	12	2410 MHz	20	2450 MHz
	13	2415 MHz	21	2455 MHz
	14	2420 MHz	22	2460 MHz
	15	2425 MHz	23	2465 MHz
	16	2430 MHz	24	2470 MHz
	17	2435 MHz	25	2475 MHz
	18	2440 MHz	-	-

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	CTX Mode	250 kbps	-	-
Maximum Peak Conducted Output Power	TX Mode	250 kbps	11/18/25	1
Power Spectral Density 6dB Spectrum Bandwidth	TX Mode	250 kbps	11/18/25	1
Radiated Emissions 9kHz~1GHz	CTX Mode	250 kbps	-	-
Radiated Emissions 1GHz~10th Harmonic	TX Mode	250 kbps	11/18/25	1
Band Edge Emissions	TX Mode	250 kbps	11/18/25	1

Note: CTX=continuously transmitting.

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-SB	SAC	Hsin Chu	187376	IC 4086D	-
CO01-SB	Conduction	Hsin Chu	187376	IC 4086D	-
TH01-SB	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	E2K24GBRL
Fixture	-	-	-

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.

<For Duty Cycle 1%>:

Power Parameters of IEEE 802.15.4 ZigBee

Test Software Version	DOS		
Frequency	2405 MHz	2440 MHz	2475 MHz
IEEE 802.11b DSSS	5	5	5

<For Duty Cycle 100%>:

Power Parameters of IEEE 802.15.4 ZigBee

Test Software Version	DOS		
Frequency	2405 MHz	2440 MHz	2475 MHz
IEEE 802.11b DSSS	47	44	45

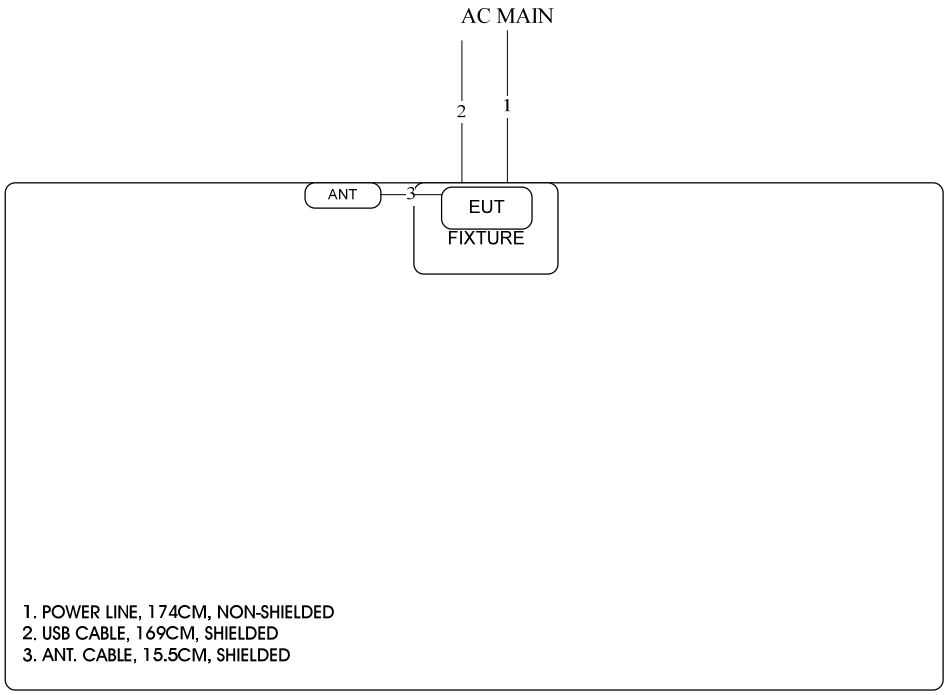
During the test, the following programs under WIN XP were executed:

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

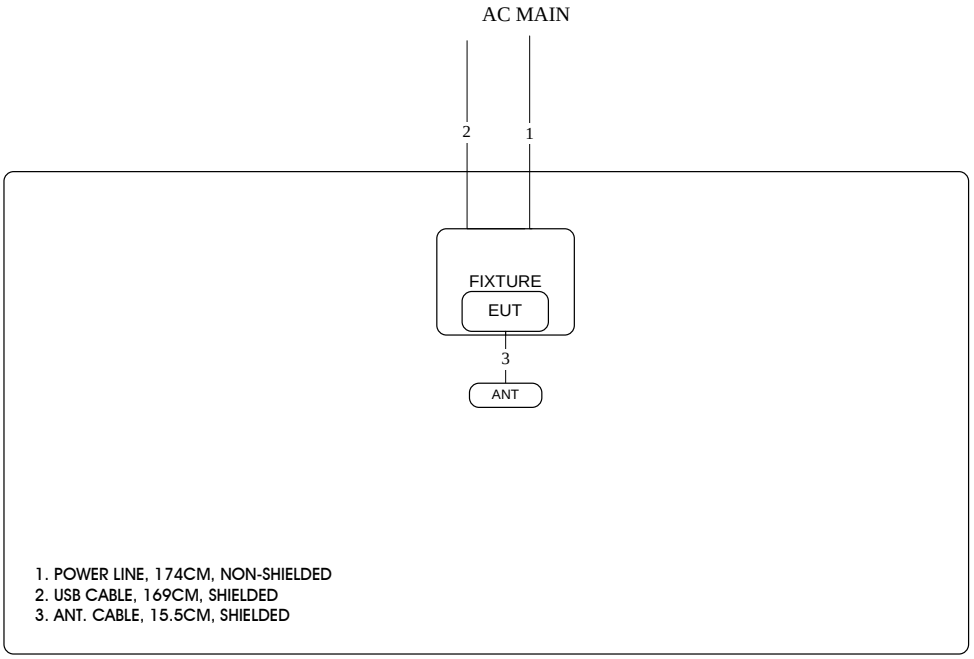
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

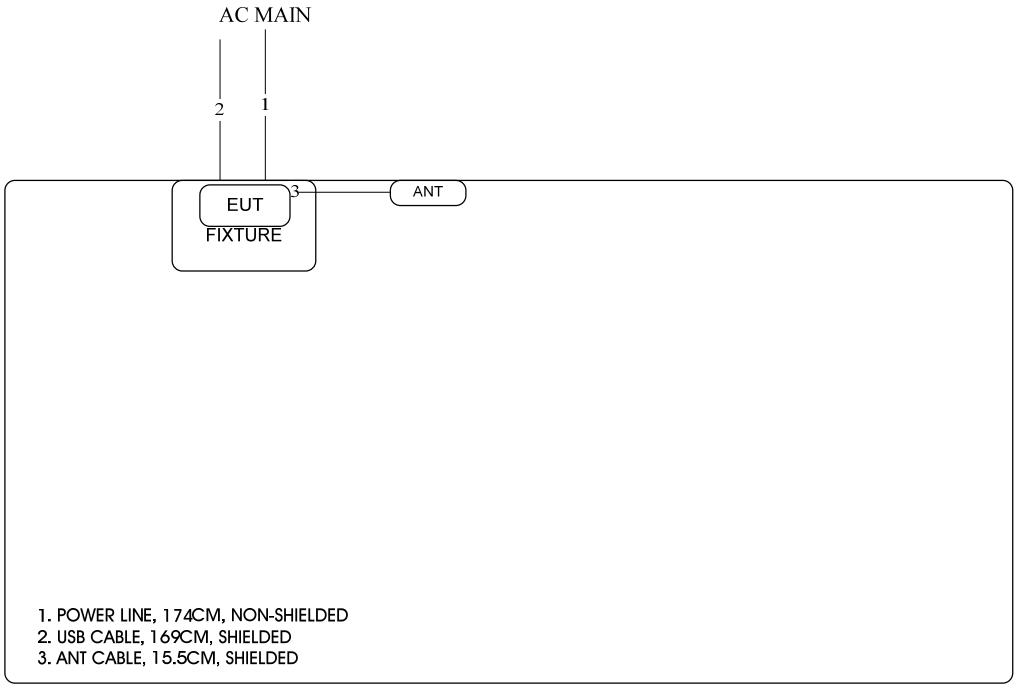
Test Configuration: 30MHz~1GHz



Test Configuration: Above 1GHz



3.9.2. AC Power Line Conduction Emissions Test Configuration



4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product 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

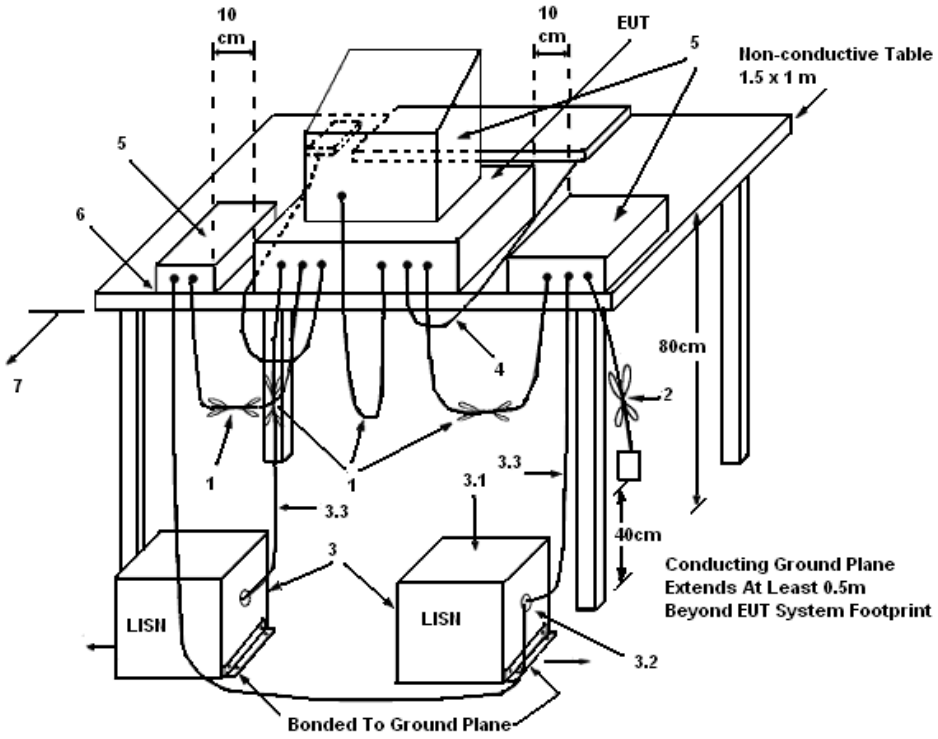
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

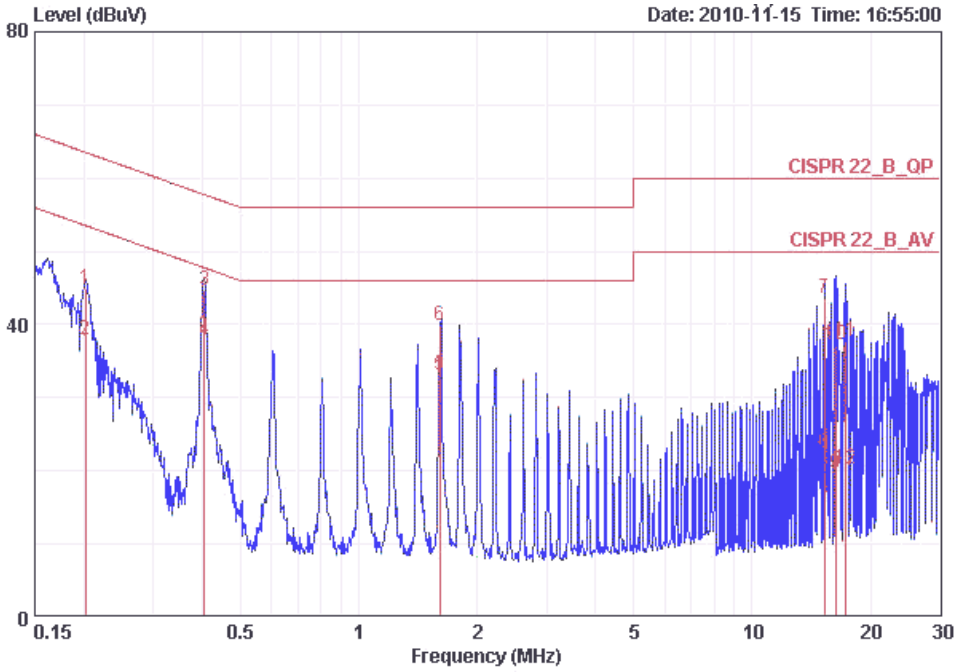
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

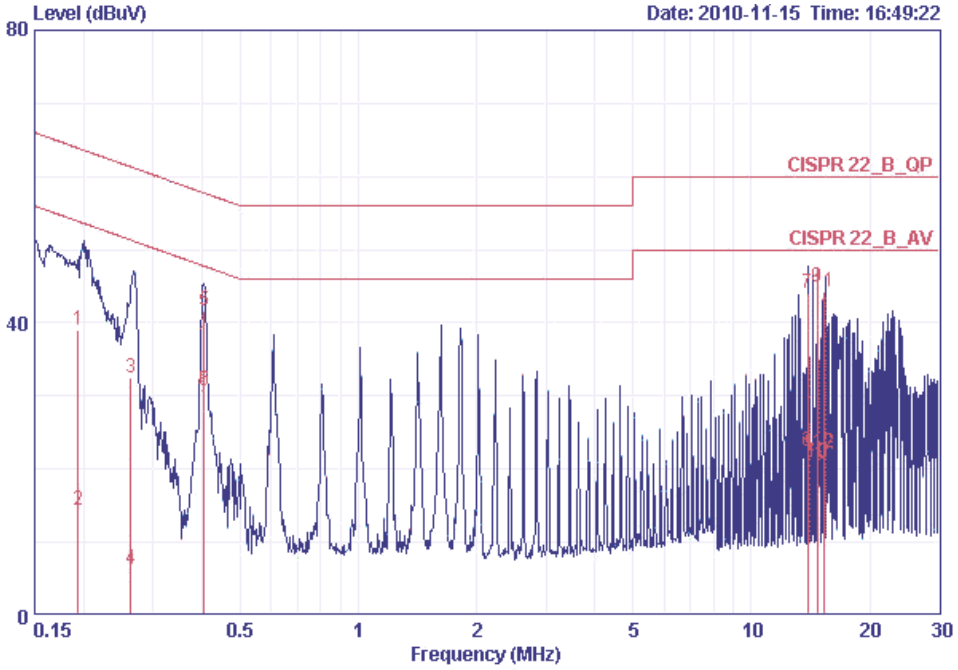
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	24°C	Humidity	55%
Test Engineer	Roy Gu	Phase	Line
Configuration	CTX Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.20181	44.82	-18.72	63.54	44.57	0.05	0.20	QP
2	0.20181	37.99	-15.55	53.54	37.74	0.05	0.20	AVERAGE
3	0.40400	44.78	-12.99	57.77	44.55	0.03	0.20	QP
4 @	0.40400	37.99	-9.78	47.77	37.76	0.03	0.20	AVERAGE
5	1.609	33.15	-12.85	46.00	32.98	0.04	0.12	AVERAGE
6	1.609	39.89	-16.11	56.00	39.72	0.04	0.12	QP
7	15.257	43.66	-16.34	60.00	42.69	0.57	0.40	QP
8	15.257	22.49	-27.51	50.00	21.52	0.57	0.40	AVERAGE
9	16.292	19.54	-30.46	50.00	18.50	0.63	0.41	AVERAGE
10	16.292	37.38	-22.62	60.00	36.34	0.63	0.41	QP
11	17.291	37.63	-22.38	60.00	36.44	0.69	0.50	QP
12	17.291	20.31	-29.70	50.00	19.12	0.69	0.50	AVERAGE

Temperature	24°C	Humidity	55%
Test Engineer	Roy Gu	Phase	Neutral
Configuration	CTX Mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.19366	39.07	-24.81	63.88	38.79	0.08	0.20	QP
2	0.19366	14.43	-39.45	53.88	14.15	0.08	0.20	AVERAGE
3	0.26366	32.41	-28.91	61.32	32.13	0.08	0.20	QP
4	0.26366	6.36	-44.96	51.32	6.08	0.08	0.20	AVERAGE
5	0.40400	41.69	-16.08	57.77	41.42	0.07	0.20	QP
6	0.40400	30.74	-17.03	47.77	30.47	0.07	0.20	AVERAGE
7	13.912	44.02	-15.98	60.00	43.08	0.54	0.40	QP
8	13.912	22.46	-27.54	50.00	21.52	0.54	0.40	AVERAGE
9	14.702	44.80	-15.20	60.00	43.84	0.56	0.40	QP
10	14.702	21.01	-28.99	50.00	20.05	0.56	0.40	AVERAGE
11	15.291	44.22	-15.78	60.00	43.23	0.59	0.40	QP
12	15.291	22.14	-27.86	50.00	21.15	0.59	0.40	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Peak Output Power Measurement

4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. 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

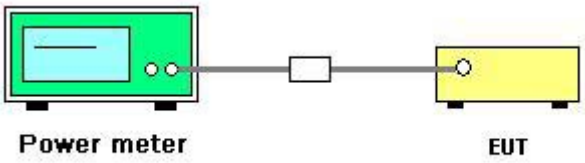
Please refer to section 5 of equipments list in this report. The following table is the setting of the peak power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak

4.2.3. Test Procedures

Spectrum Parameter	Setting
RF Output Power Method	☒ ANSI C63.10 clause 6.10.2.1 (a) power meter method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.2.1 (b) channel integration method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.1 Method 1 - spectral trace averaging
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.2 Method 2 - zero-span mode with trace averaging

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Maximum Conducted Output Power

<For Duty Cycle 1%>:

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee
Test Date	Nov. 17, 2010		

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
11	2405 MHz	18.53	30.00	Complies
18	2440 MHz	17.62	30.00	Complies
25	2475 MHz	17.46	30.00	Complies

<For Duty Cycle 100%>:

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee
Test Date	Nov. 15, 2010		

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
11	2405 MHz	18.04	30.00	Complies
18	2440 MHz	16.52	30.00	Complies
25	2475 MHz	16.03	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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	30 kHz
RB	3 kHz
VB	30 kHz
Detector	Peak

4.3.3. Test Procedures

Spectrum Parameter	Setting
Power Density Method	☒ UNII for ANSI C63.10 clause 6.11.2.3 Method 1 - peak measurement
Power Density Method	☐ UNII for ANSI C63.10 clause 6.11.2.4 Method 2 - trace averaging

4.3.4. Test Setup Layout

4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Power Spectral Density

<For Duty Cycle 1%>:

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
11	2405 MHz	4.02	8.00	Complies
18	2440 MHz	3.62	8.00	Complies
25	2475 MHz	1.11	8.00	Complies

<For Duty Cycle 100%>:

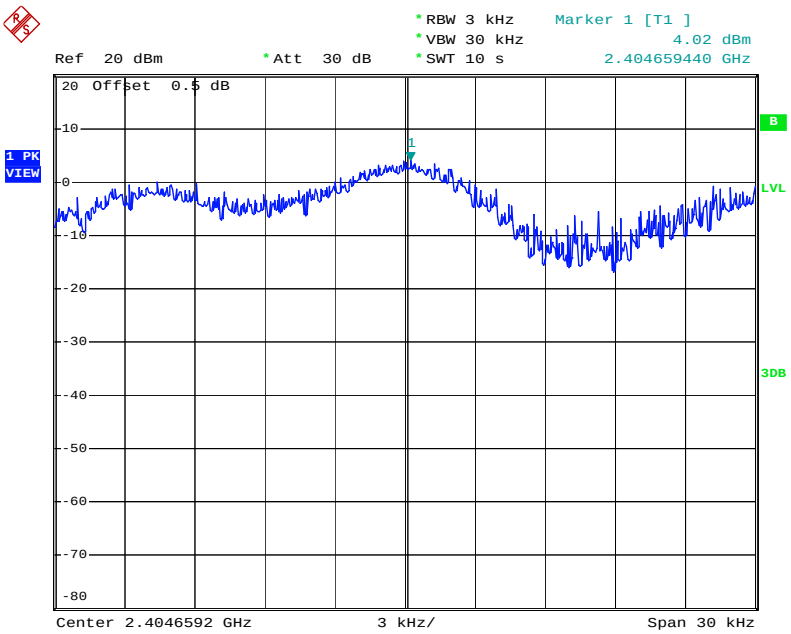
Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
11	2405 MHz	6.01	8.00	Complies
18	2440 MHz	4.11	8.00	Complies
25	2475 MHz	4.39	8.00	Complies

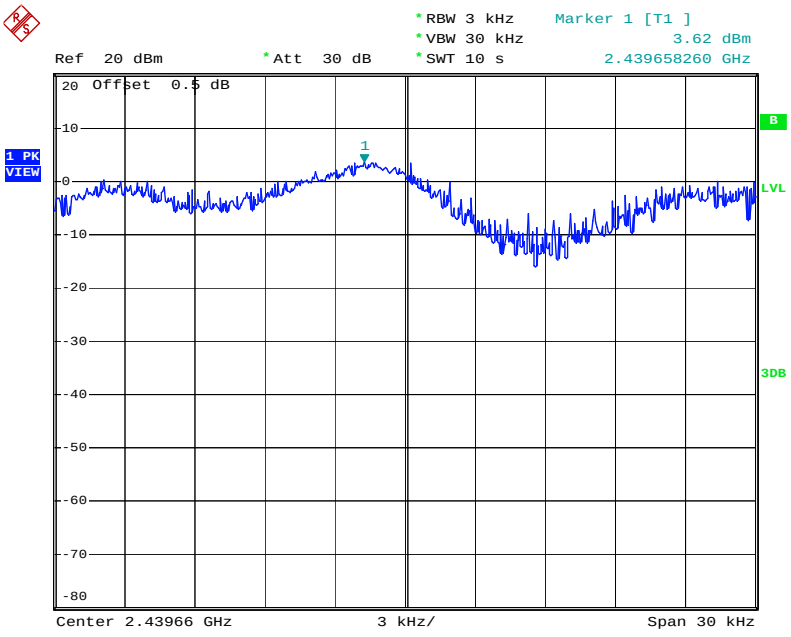
<For Duty Cycle 1%>:

Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



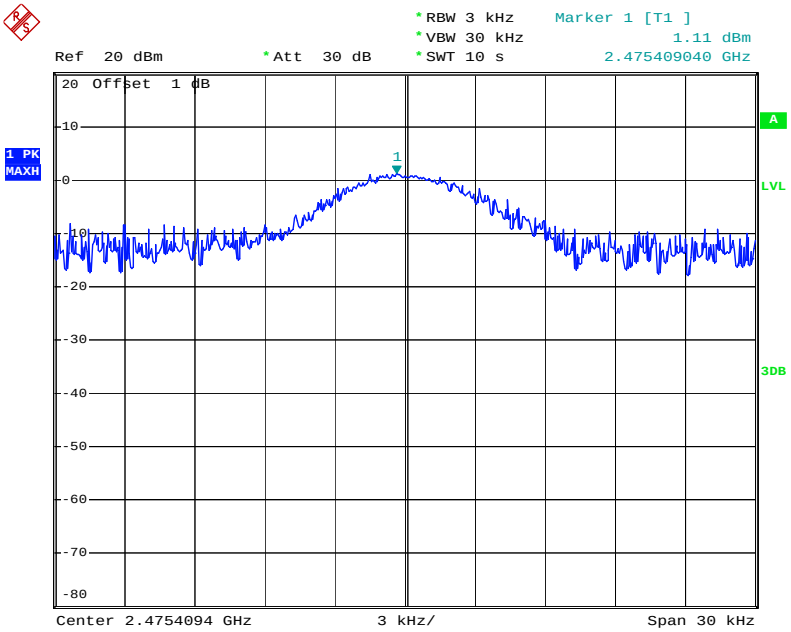
Date: 17.NOV.2010 11:49:47

Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2440 MHz



Date: 17.NOV.2010 11:48:05

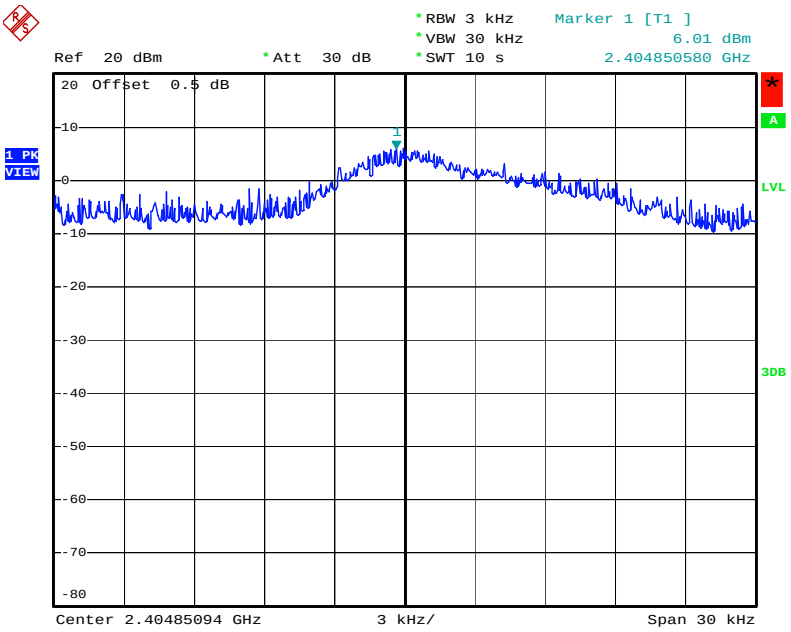
Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2475 MHz



Date: 17.NOV.2010 17:03:06

<For Duty Cycle 100%>:

Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



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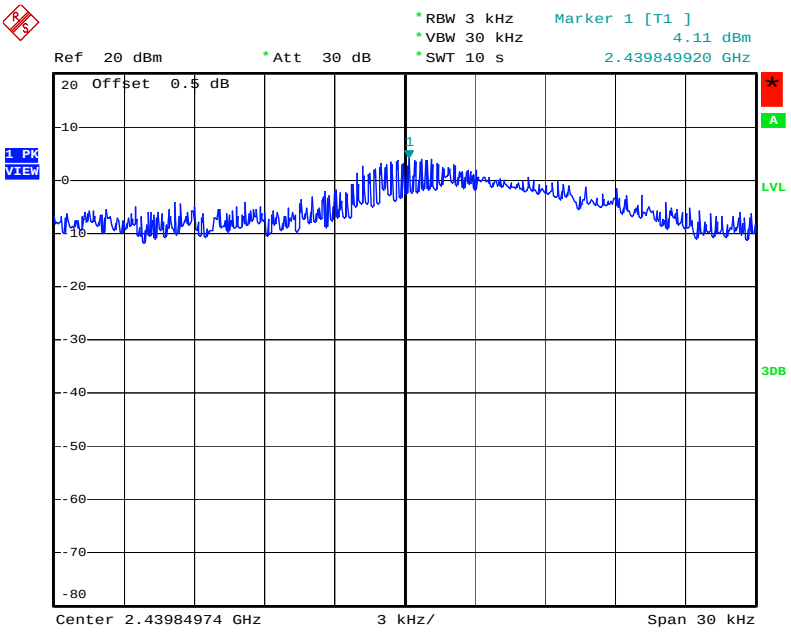
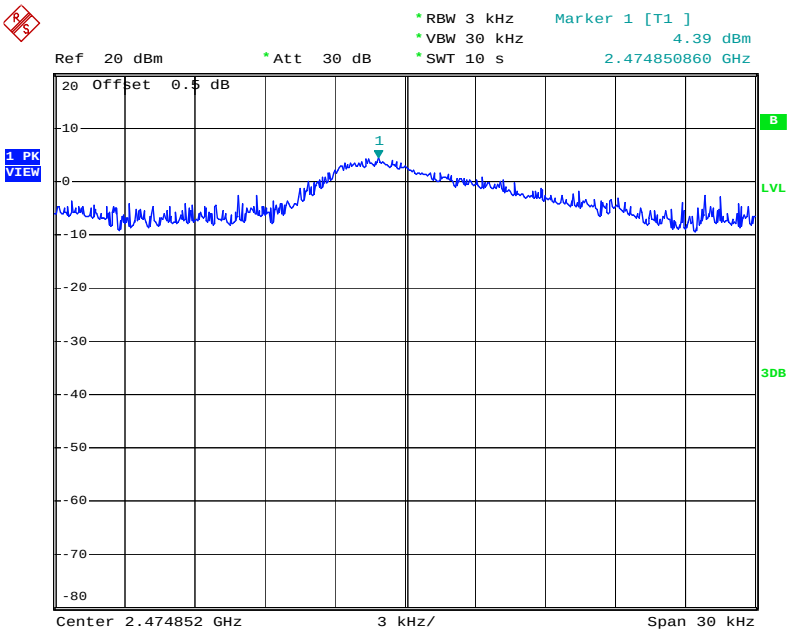
Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2440 MHz



Date: 15.NOV.2010 11:03:16

Power Density Plot on Configuration IEEE 802.15.4 Zigbee / 2475 MHz



Date: 15.NOV.2010 11:49:09

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

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

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 the spectrum analyzer.

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

4.4.3. Test Procedures

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

4.4.4. 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 continuously transmitting mode.

4.4.7. Test Result of 6dB Spectrum Bandwidth

<For Duty Cycle 1%>:

Temperature	23℃	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
11	2405 MHz	1.57	2.18	500	Complies
18	2440 MHz	1.40	2.22	500	Complies
25	2475 MHz	1.40	2.35	500	Complies

<For Duty Cycle 100%>:

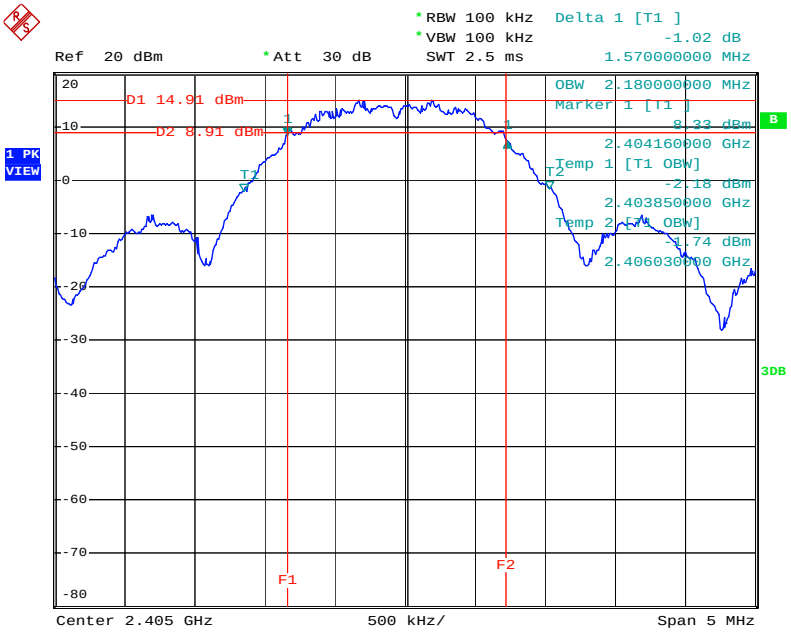
Temperature	23℃	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 Zigbee

Configuration IEEE 802.15.4 Zigbee

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
11	2405 MHz	1.55	2.18	500	Complies
18	2440 MHz	1.56	2.23	500	Complies
25	2475 MHz	1.54	2.25	500	Complies

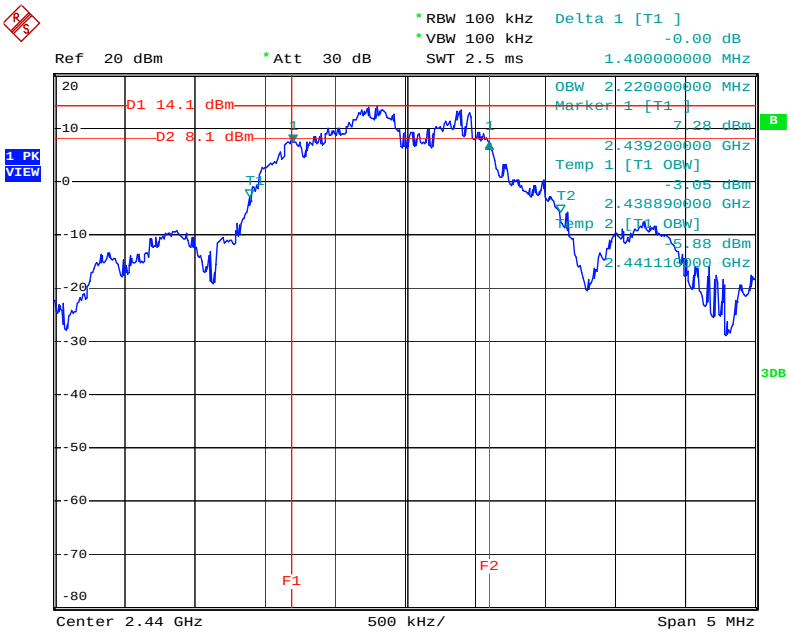
<For Duty Cycle 1%>:

6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



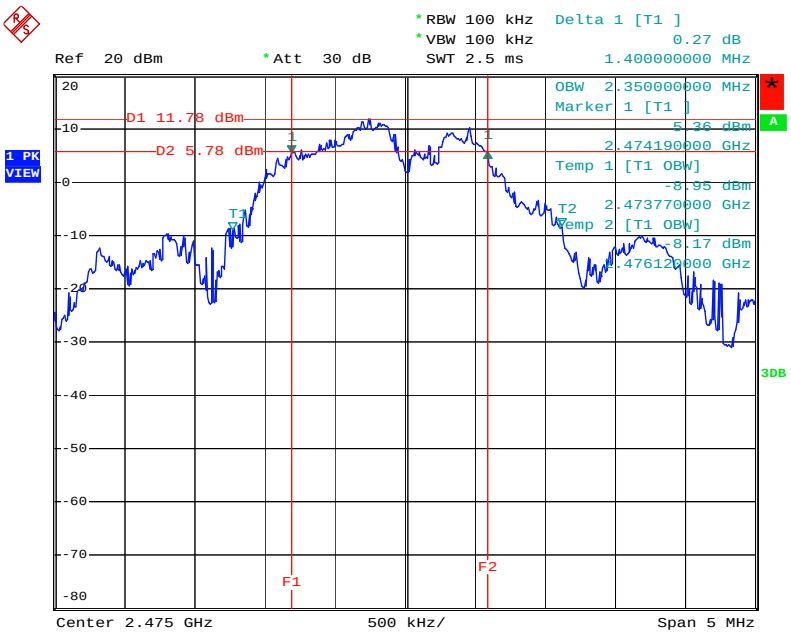
Date: 17.NOV.2010 12:09:07

6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2440 MHz



Date: 17.NOV.2010 12:06:56

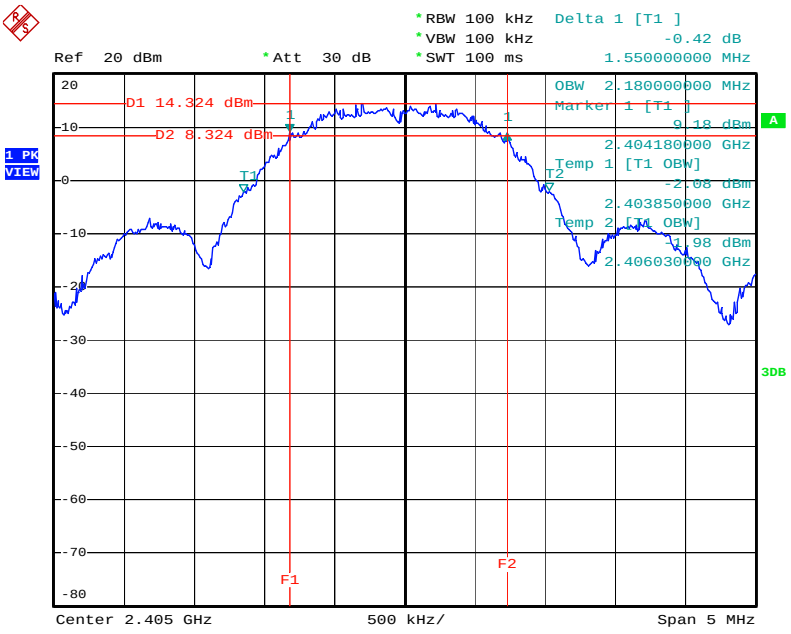
6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2475MHz



Date: 17.NOV.2010 17:00:22

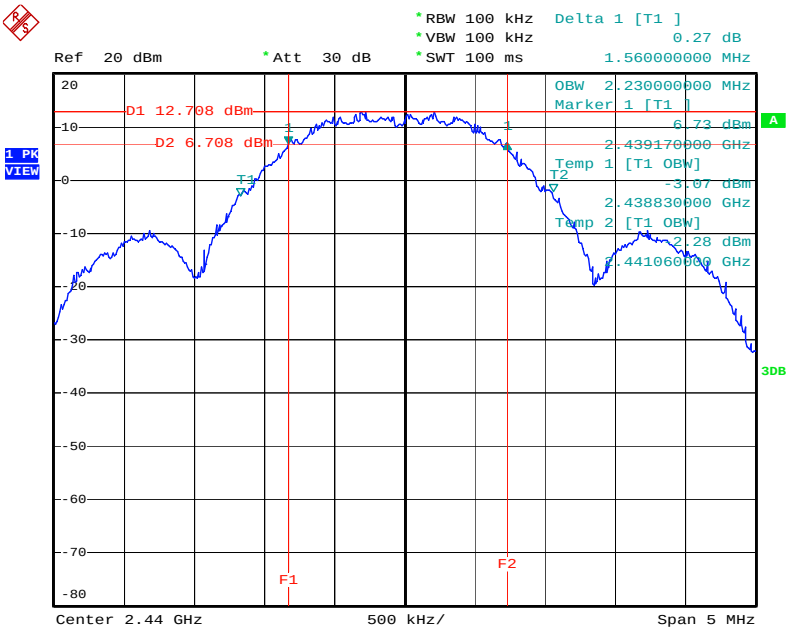
<For Duty Cycle 100%>:

6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



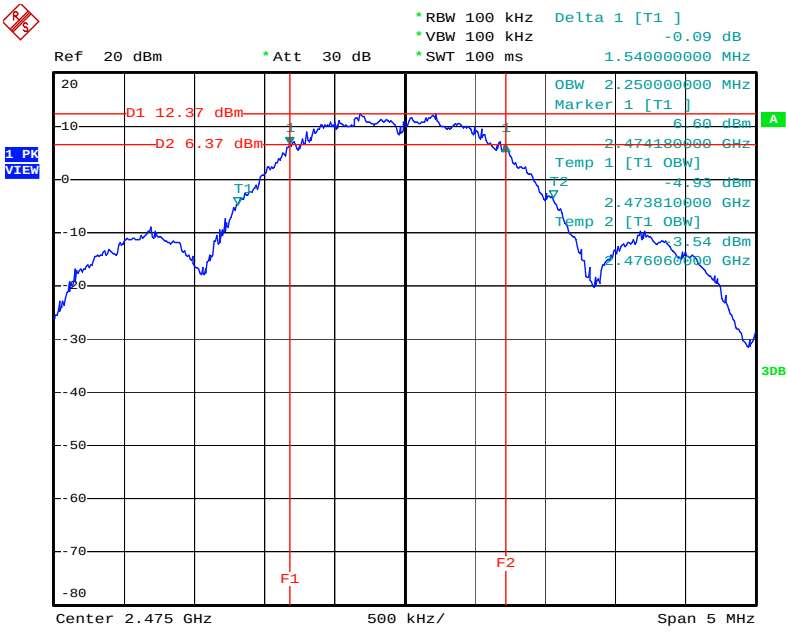
Date: 15.NOV.2010 11:01:27

6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2440 MHz



Date: 15.NOV.2010 11:02:58

6 dB Bandwidth Plot on Configuration IEEE 802.15.4 Zigbee / 2475MHz



Date: 15.NOV.2010 11:04:28

4.5. Radiated Emissions Measurement

4.5.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of 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)	1MHz / 1MHz for peak

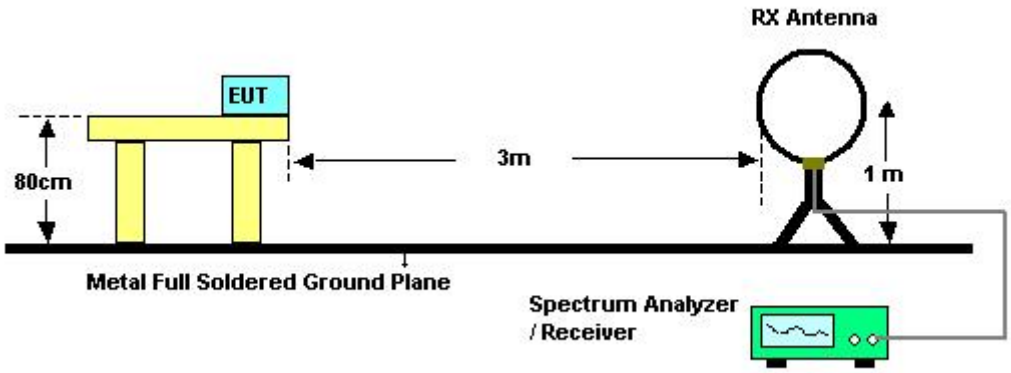
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.5.3. Test Procedures

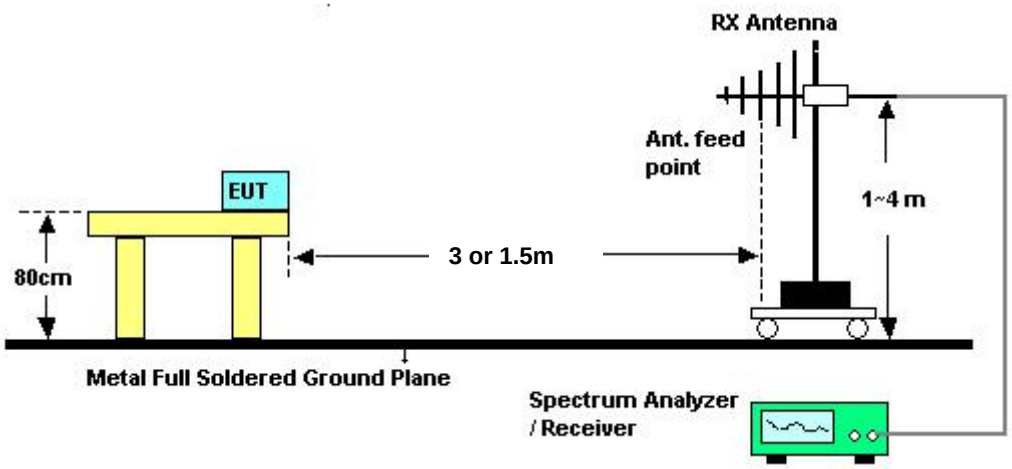
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

4.5.4. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

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

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

4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Evaluating Date	Nov. 15, 2010

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

Note:

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

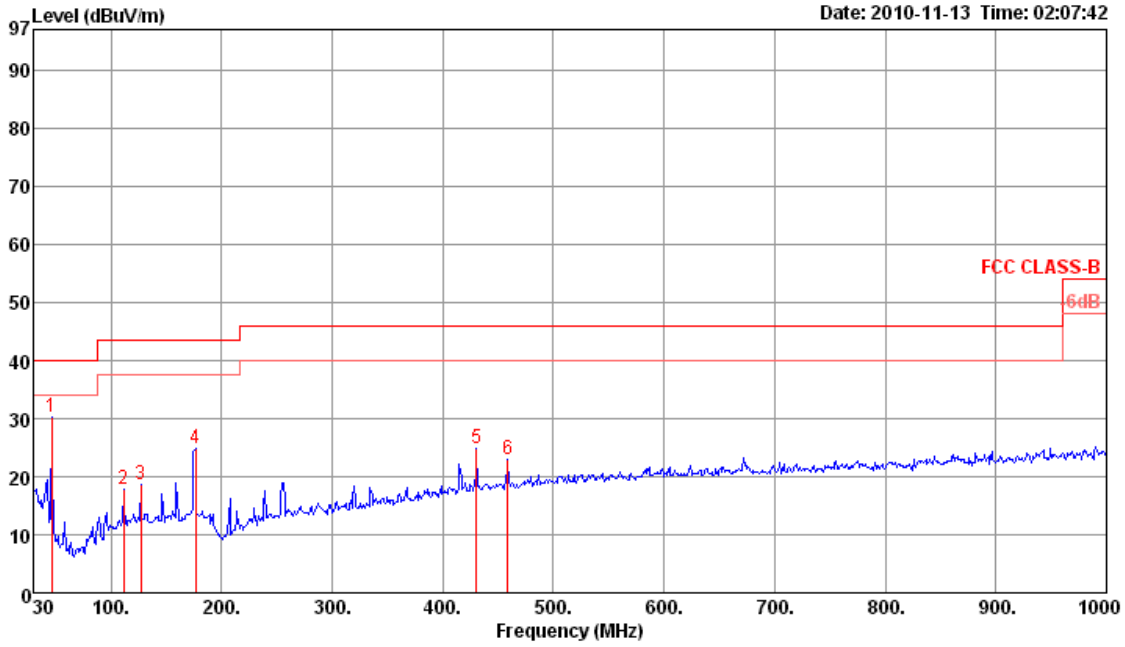
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

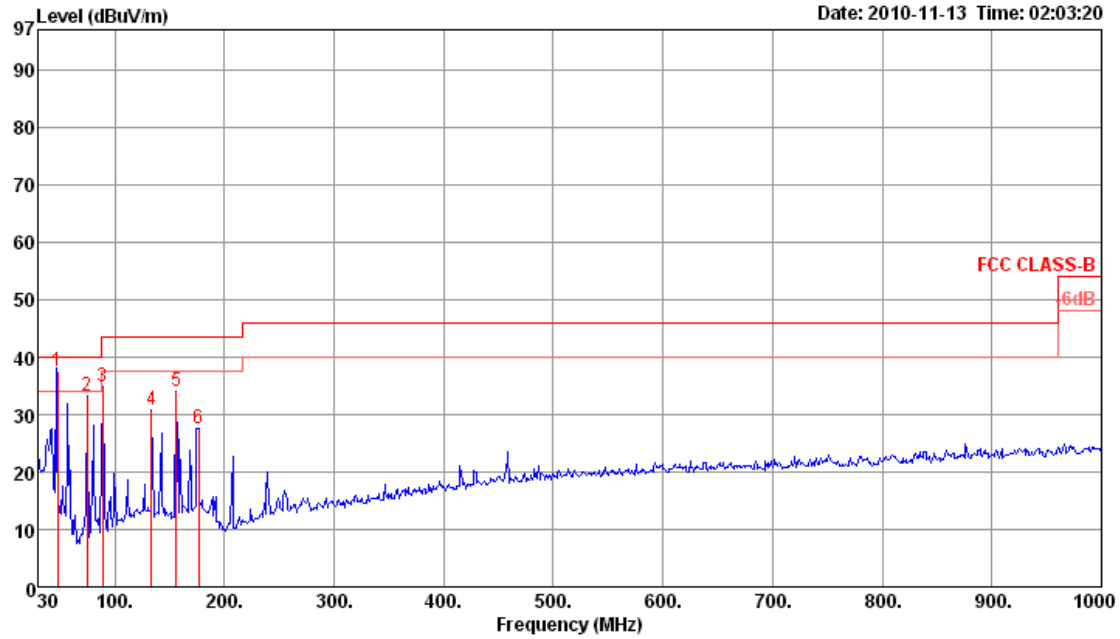
Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	CTX Mode

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	46.49	30.37	40.00	-9.63	47.75	0.70	27.80	9.72	0	100	Peak	HORIZONTAL
2	111.48	17.95	43.50	-25.55	32.42	1.20	27.54	11.87	0	100	Peak	HORIZONTAL
3	127.00	18.69	43.50	-24.81	32.66	1.27	27.47	12.23	0	100	Peak	HORIZONTAL
4	176.47	24.82	43.50	-18.68	37.33	1.58	27.22	13.13	0	100	Peak	HORIZONTAL
5	430.61	24.94	46.00	-21.06	33.67	2.48	27.75	16.54	0	100	Peak	HORIZONTAL
6	458.74	22.95	46.00	-23.05	31.24	2.62	27.89	16.98	0	100	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 q	48.00	37.53	40.00	-2.47	55.50	0.70	27.80	9.13	331	100	QP	VERTICAL
2 p	74.62	33.29	40.00	-6.71	53.21	0.90	27.70	6.88	0	400	Peak	VERTICAL
3	89.17	34.91	43.50	-8.59	52.66	1.10	27.65	8.80	0	400	Peak	VERTICAL
4	133.79	30.87	43.50	-12.63	44.67	1.34	27.43	12.29	0	400	Peak	VERTICAL
5	156.10	34.13	43.50	-9.37	48.01	1.48	27.32	11.96	0	400	Peak	VERTICAL
6	176.47	27.56	43.50	-15.94	40.07	1.58	27.22	13.13	0	400	Peak	VERTICAL

Note:

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

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

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

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

<For Duty Cycle 1%>:

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 11
Test Date	Nov. 15, 2010		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4810.94	24.77	54.00	-29.23	23.50	3.29	33.02	35.04	20	151	Average	HORIZONTAL
2	4810.94	59.71	74.00	-14.29	58.44	3.29	33.02	35.04	20	151	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4810.92	23.65	54.00	-30.35	22.38	3.29	33.02	35.04	23	118	Average	VERTICAL
2	4810.92	58.59	74.00	-15.41	57.32	3.29	33.02	35.04	23	118	Peak	VERTICAL

Temperature	25°C	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 18
Test Date	Nov. 15, 2010		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4880.88	29.27	54.00	-24.73	27.81	3.33	33.16	35.03	385	127	Average	HORIZONTAL
2	4880.88	64.21	74.00	-9.79	62.75	3.33	33.16	35.03	385	127	Peak	HORIZONTAL
3	7321.36	35.96	54.00	-18.04	31.34	4.06	35.96	35.40	22	115	Average	HORIZONTAL
4	7321.36	70.90	74.00	-3.10	66.28	4.06	35.96	35.40	22	115	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4880.78	29.34	54.00	-24.66	27.88	3.33	33.16	35.03	36	113	Average	VERTICAL
2	4880.78	64.28	74.00	-9.72	62.82	3.33	33.16	35.03	36	113	Peak	VERTICAL
3	7321.28	36.27	54.00	-17.73	31.65	4.06	35.96	35.40	43	100	Average	VERTICAL
4	7321.28	71.21	74.00	-2.79	66.59	4.06	35.96	35.40	43	100	Peak	VERTICAL

Temperature	25°C	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 25
Test Date	Nov. 15, 2010		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4950.70	21.51	54.00	-32.49	19.85	3.37	33.30	35.01	343	169	Average	HORIZONTAL
2	4950.70	56.45	74.00	-17.55	54.79	3.37	33.30	35.01	343	169	Peak	HORIZONTAL
3	7426.22	22.09	54.00	-31.91	17.26	4.07	36.16	35.40	16	100	Average	HORIZONTAL
4	7426.22	57.03	74.00	-16.97	52.20	4.07	36.16	35.40	16	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	4948.96	27.83	54.00	-26.17	26.17	3.37	33.30	35.01	3	110	Average	VERTICAL
2	4948.96	62.77	74.00	-11.23	61.11	3.37	33.30	35.01	3	110	Peak	VERTICAL
3	7426.20	25.47	54.00	-28.53	20.64	4.07	36.16	35.40	324	100	Average	VERTICAL
4	7426.20	60.41	74.00	-13.59	55.58	4.07	36.16	35.40	324	100	Peak	VERTICAL

Note:

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

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

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

<For Duty Cycle 100%>:

Temperature	23°C	Humidity	60%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 11
Test Date	Nov. 15, 2010		

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 a	4810.41	43.18	54.00	-10.82	40.79	4.23	35.20	33.36	109	100	Average	HORIZONTAL
2 p	4810.83	52.74	74.00	-21.26	50.35	4.23	35.20	33.36	109	100	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	4808.95	57.06	74.00	-16.94	54.67	4.23	35.20	33.36	41	100	Peak	VERTICAL
2 a	4809.20	48.32	54.00	-5.68	45.93	4.23	35.20	33.36	41	100	Average	VERTICAL

Temperature	25°C	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 18
Test Date	Nov. 15, 2010		

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	4878.86	60.20	74.00	-13.80	57.59	4.33	35.20	33.48	298	148	Peak	HORIZONTAL
2 a	4878.87	50.44	54.00	-3.56	47.83	4.33	35.20	33.48	298	148	Average	HORIZONTAL
3 !	7318.48	49.87	54.00	-4.13	43.42	5.37	35.43	36.51	321	148	Average	HORIZONTAL
4 p	7321.26	60.42	74.00	-13.58	53.97	5.37	35.43	36.51	321	148	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 !	4878.87	49.52	54.00	-4.48	46.91	4.33	35.20	33.48	35	100	Average	VERTICAL
2	4878.94	59.66	74.00	-14.34	57.05	4.33	35.20	33.48	35	100	Peak	VERTICAL
3 a	7318.45	51.93	54.00	-2.07	45.48	5.37	35.43	36.51	18	182	Average	VERTICAL
4 p	7321.22	62.42	74.00	-11.58	55.97	5.37	35.43	36.51	18	182	Peak	VERTICAL

Temperature	25℃	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 25
Test Date	Nov. 15, 2010		

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	a	4950.51	50.90	54.00	-3.10	48.07	4.42	35.20	33.61	296	143	Average	HORIZONTAL
2		4950.90	60.36	74.00	-13.64	57.53	4.42	35.20	33.61	296	143	Peak	HORIZONTAL
3	p	7423.22	60.49	74.00	-13.51	53.87	5.42	35.47	36.67	25	137	Peak	HORIZONTAL
4	!	7425.76	50.75	54.00	-3.25	44.13	5.42	35.47	36.67	25	137	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	!	4950.54	52.71	54.00	-1.29	49.88	4.42	35.20	33.61	320	143	Average	VERTICAL
2		4950.91	62.21	74.00	-11.79	59.38	4.42	35.20	33.61	320	143	Peak	VERTICAL
3	a	7425.76	53.03	54.00	-0.97	46.41	5.42	35.47	36.67	106	183	Average	VERTICAL
4	p	7426.34	62.59	74.00	-11.41	55.97	5.42	35.47	36.67	106	183	Peak	VERTICAL

Note:

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

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

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

4.6. Band Edge 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 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

4.6.3. 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.

4.6.4. Test Setup Layout

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

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 continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

<For Duty Cycle 1%>:

Temperature	25°C	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 11, 18, 25
Test Date	Nov. 15, 2010		

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2389.60	32.88	54.00	-21.12	2.50	2.21	28.17	0.00	27	100	Average	VERTICAL
2	2389.60	67.82	74.00	-6.18	37.44	2.21	28.17	0.00	27	100	Peak	VERTICAL
3	2405.40	80.47	54.00			2.22	28.21	0.00	27	100	Average	VERTICAL
4	2405.40	115.41	74.00			2.22	28.21	0.00	27	100	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 2405 MHz.

Channel 18

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2440.60	83.45	54.00			2.23	28.29	0.00	25	101	Average	VERTICAL
2	2440.60	118.39	74.00			2.23	28.29	0.00	25	101	Peak	VERTICAL
3	2483.90	24.67	54.00	-29.33	-5.96	2.26	28.37	0.00	25	101	Average	VERTICAL
4	2483.90	58.65	74.00	-15.35	28.02	2.26	28.37	0.00	25	101	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 2440 MHz.

Channel 25

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	2475.60	83.97	54.00			2.26	28.37	0.00	25	100	Average	VERTICAL
2	2475.60	118.91	74.00			2.26	28.37	0.00	25	100	Peak	VERTICAL
3	2484.10	38.93	54.00	-15.07	8.30	2.26	28.37	0.00	25	100	Average	VERTICAL
4	2484.10	73.87	74.00	-0.13	43.24	2.26	28.37	0.00	25	100	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 2475 MHz.

<For Duty Cycle 100%>:

Temperature	25°C	Humidity	52%
Test Engineer	Sean Ku	Configurations	802.15.4 ZigBee CH 11, 18, 25
Test Date	Nov. 15, 2010		

Channel 11

		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	!	2389.36	50.47	54.00	-3.53	19.56	2.86	0.00	28.05	78	100	Average	VERTICAL
2		2389.71	62.40	74.00	-11.60	31.49	2.86	0.00	28.05	78	100	Peak	VERTICAL
3	p	2404.42	113.34	74.00			2.88	0.00	28.09	78	100	Peak	VERTICAL
4	a	2404.86	110.37	54.00			2.88	0.00	28.09	78	100	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 2405 MHz.

Channel 18

		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	55.70	74.00	-18.30	24.77	2.88	0.00	28.05	78	100	Peak	VERTICAL
2		2390.00	44.72	54.00	-9.28	13.79	2.88	0.00	28.05	78	100	Average	VERTICAL
3	p	2439.42	114.18	74.00			2.89	0.00	28.18	78	100	Peak	VERTICAL
4	a	2439.86	110.94	54.00			2.89	0.00	28.18	78	100	Average	VERTICAL
5		2483.50	44.93	54.00	-9.07	13.74	2.93	0.00	28.26	78	100	Average	VERTICAL
6		2486.25	57.93	74.00	-16.07	26.70	2.93	0.00	28.30	78	100	Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 2440 MHz.

Channel 25

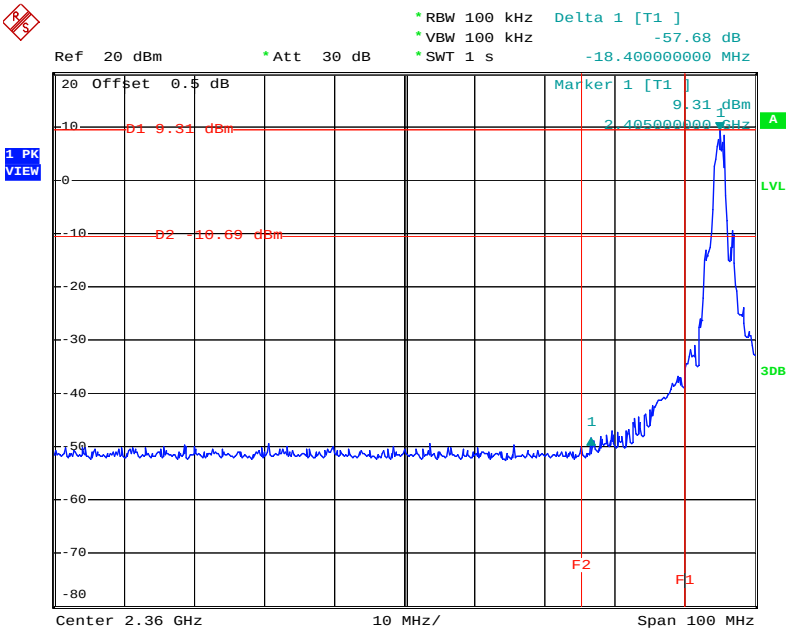
		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	a	2474.86	110.44	54.00			2.93	0.00	28.26	79	100	Average	VERTICAL
2	p	2475.43	113.66	74.00			2.93	0.00	28.26	79	100	Peak	VERTICAL
3		2483.50	66.16	74.00	-7.84	34.97	2.93	0.00	28.26	79	100	Peak	VERTICAL
4	!	2483.64	52.49	54.00	-1.51	21.30	2.93	0.00	28.26	79	100	Average	VERTICAL

Item 1, 2 are the fundamental frequency at 2475 MHz.

For Emission not in Restricted Band

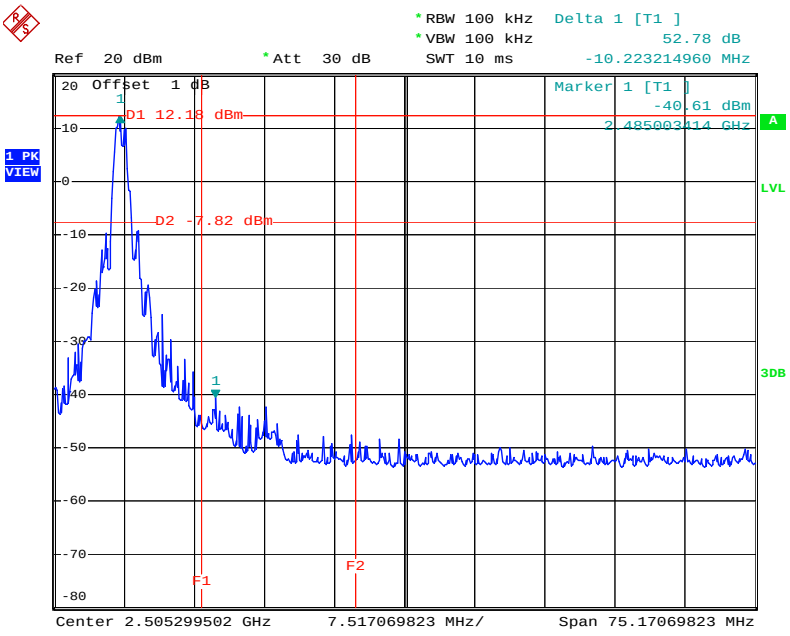
<For Duty Cycle 1%>:

Low Band Edge Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



Date: 17.NOV.2010 09:16:50

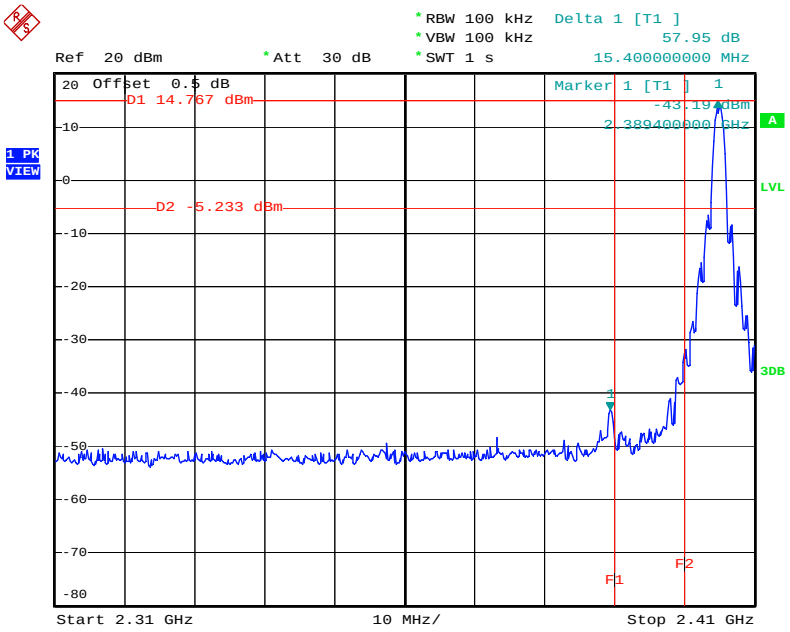
High Band Edge Plot on Configuration IEEE 802.15.4 Zigbee / 2475 MHz



Date: 17.NOV.2010 17:07:47

<For Duty Cycle 1%>:

Low Band Edge Plot on Configuration IEEE 802.15.4 Zigbee / 2405 MHz



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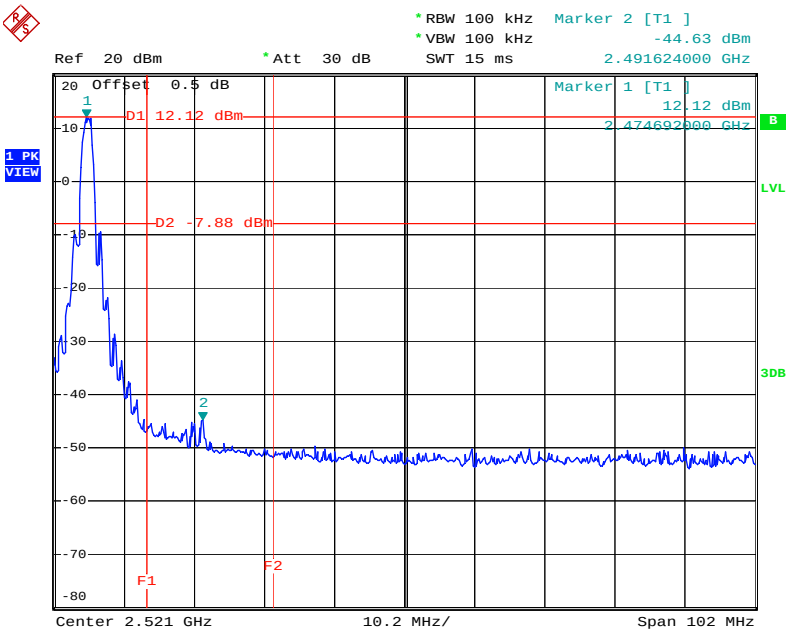
High Band Edge Plot on Configuration IEEE 802.15.4 Zigbee / 2475 MHz



Date: 15.NOV.2010 11:20:32

4.7. Antenna Requirements

4.7.1. 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.

4.7.2. 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. 01,2010	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Oct. 28,2010	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Oct. 30, 2010	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K~30MHz	Jan. 04, 2010	Conduction (CO01-CB)
COND Cable		Cable		0.15MHz~30MHz	Dec.4,2009	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 28,2010	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 13, 2010	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Oct. 08, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Oct. 08, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 06, 2010	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 02, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP	100304	9kHz ~ 40GHz	Nov. 06, 2010	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 06, 2010	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2010*	Radiation (10CH01-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. 10, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 10, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 10, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 10, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 10, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP30	100023	9KHz~30GHz	Mar. 05, 2010	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	May. 21, 2010	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 25, 2009	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)
Signal generator	R&S	SMU200A	102782	10MHz-40GHz	Mar. 09, 2010	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	Apr. 16, 2010	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071042	1GHz – 18GHz	Oct. 14, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 09, 2010	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 13, 2010	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 08, 2010	Conducted (TH01-CB)

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

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

TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2596-2468
	FAX	:	886-2-2596-2255
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	:	886-2-2501-1640
	FAX	:	886-2-2501-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2531-4739
	FAX	:	886-2-2531-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2525
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

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

P1, total 22 pages

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