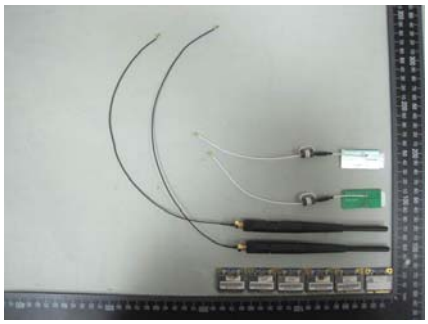
SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**Ralink Technology Corporation**
Applicant Address	5F., No.5, Taiyuan 1st St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.
FCC ID	**VQF-RT3290**
Manufacturer's company	**Ralink Technology Corporation**
Manufacturer Address	5F., No.5, Taiyuan 1st St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.

Product Name	802.11b/g/n 1T1R Combo Card
Brand Name	Ralink
Model Name	RT3290
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jan. 27, 2011
Final Test Date	Apr. 20, 2011
Submission Type	Original Equipment



Statement

Test result included is only for the Bluetooth 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 C63.10-2009** 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

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR112725AB	Rev. 01	Initial issue of report	Apr. 18, 2011

Certificate No.: CB10004044

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**802.11b/g/n 1T1R Combo Card**
Brand Name	:	**Ralink**
Model Name	:	**RT3290**
Applicant	:	**Ralink Technology Corporation**
Test Rule Part(s)	:	**47 CFR FCC Part 15 Subpart C § 15.247**

Sporton International as requ ested by the a pplicant to e valuate the EMC p erformance of the product sample received on Jan. 27, 2011 would like to declare that the tested sample has be en 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 2011.4.22

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	12.38 dB
4.2	15.247(b)(1)	Maximum Peak Conducted Output Power	Complies	21.07 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	1.11 dB
4.7	15.247(d)	Band Edge Emissions	Complies	3.77 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 sysytem
Modulation	FHSS (GFSK / π/4-DQPSK / 8DPSK)
Data Rate (Mbps)	GFSK: 1 ; π/4-QPSK: 2 ; 8DPSK: 3
Frequency Range	2400 ~ 2483.5MHz
Channel Number	79
Channel Band Width (99%)	For Ant. 1: 1.2680 kHz ; For Ant. 2: 1.2680 kHz
Conducted Output Power	For Ant. 1: 8.93 dBm ; For Ant. 2: 8.93 dBm
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)	Remark
1	ACON	APP6P-700119	PIFA Antenna	I-PEX	3.5	TX/RX
2	JOYMAX	IWX-1451RSXX-999	Dipole Antenna	Reversed-SMA	3.7	TX/RX

Note 1: There are six configurations of EUT.

RT3290 V24 Configuration (The same homologation for 6 configuration)		Antenna connector	antenna diversity	Features
Config.1	Dual Path Dual Transmit, with SW reg, 2-con	2 con.	WLAN/Bluetooth	WLAN/Bluetooth antenna diversity, with RF switch. With DC power switch regulator, low power consumption
Config. 2	Dual Path Dual Transmit, without SW reg, 2-con	2 con.	WLAN/Bluetooth	WLAN/Bluetooth antenna diversity, with RF switch.. Without DC power switch regulator, without low power consumption
Config. 3	Dual Path Single Transmit , without SW reg, 2-con	2 con.	N/A	Without antenna diversity, one path for WLAN the other for BT. Without DC power switch regulator, without low power consumption
Config. 4	Dual Path Single Transmit; with SW reg, 2-con	2 con.	N/A	Without antenna diversity, one path for WLAN the other for BT. With DC power switch regulator, low power consumption
Config. 5	Single Path Dual Transmit; without SW reg, 1-con	1 con.	WLAN/Bluetooth	Single antenna for WLAN and Bluetooth use Without DC power switch regulator, without low power consumption

Config. 6	Single Path Dual Transmit; with SW reg, 1-con	1 con.	WLAN/Bluetooth	Single antenna for WLAN and Bluetooth use With DC power switch regulator, low power consumption

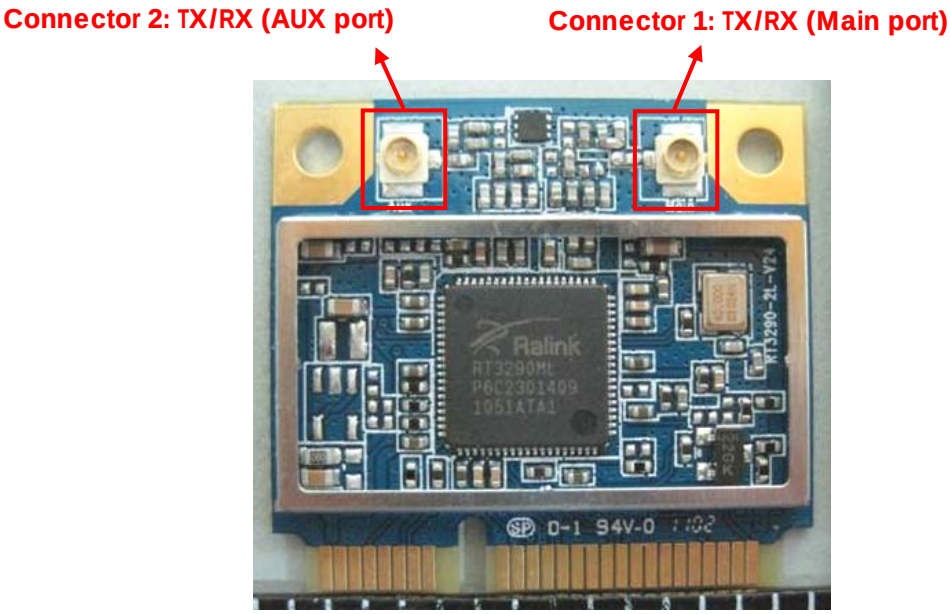
After pretest, Configuration 2 has been evaluated to be the worst case, so it was performed for RF test items in the report.

Note 2: The EUT has two types of antenna.

Both of Ant. 1 and Ant. 2 can be used as Bluetooth / WLAN antenna.

The EUT supports the antenna with TX/RX diversity function for WLAN and Bluetooth.

Due to Connector 1 generated higher output power than Connector 2, so all tests were base on this setting and recorded in this report.



3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	0	2402 MHz	40	2442 MHz
	1	2403 MHz	:	:
	:	:	77	2479 MHz
	38	2440 MHz	78	2480 MHz
	39	2441 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	Connector
AC Power Conducted Emissions	Normal Link	3 Mbps	Hopping 0~78	-
Max. Conducted Output Power	8DPSK	3 Mbps	0/39/78	1
Hopping Channel Separation	8DPSK	3 Mbps	0~1/39~40/77~78	1
Number of Hopping Frequency	8DPSK	3 Mbps	0~78	1
Dwell Time	3DH1/3DH3/3DH5	3 Mbps	0/39/78	1
Radiated Emissions Below 1GHz	8DPSK	3 Mbps	39	1
Radiated Emissions Above 1GHz	8DPSK	3 Mbps	0/39/78	1
Band Edge Emissions	8DPSK	3 Mbps	0/78	1

The following test modes were performed for all tests:

For Conducted Emission test:

The EUT was performed at Ant. 1 (PIFA antenna) and Ant. 2 (Dipole antenna) and the worst-case was found at Ant. 2 (Dipole antenna), thus measurement will follow this same test mode.

Mode 1. Configuration 1. DPDT type → Two Antenna Ports → Bluetooth / WLAN Diversity (With Power Switch)

Mode 2. Configuration 3. Fixed type → Two Antenna Ports → Main port is only for WLAN function; Aux port is only for Bluetooth function. (With power switch)

Mode 3. Configuration 5. SPDT type → One Antenna Port → Bluetooth / WLAN Function control by User (With power switch)

Mode 3 has been evaluated to be the worst case, thus measurement will follow this same test mode.

Mode 4. Configuration 6. SPDT type → One Antenna Port → Bluetooth / WLAN Function control by User (Without power switch)

Due to Mode 3 generated the worst test result, so it was recorded in this report.

Mode 3 was performed for WLAN function and Bluetooth function and the worst-case was found at WLAN function, so it was recorded in the report.

Note: The different types of antenna will not affect the test result of Conducted Emission test.

For Radiated Emission test below 1GHz:

Mode 1. Configuration 1. DPDT type → Two Antenna Ports → Bluetooth / WLAN Diversity (With Power Switch)

Mode 2. Configuration 3. Fixed type → Two Antenna Ports → Main port is only for WLAN function; Aux port is only for Bluetooth function. (With power switch)

Mode 3. Configuration 5. SPDT type → One Antenna Port → Bluetooth / WLAN Function control by User (With power switch)

Mode 1 has been evaluated to be the worst case, thus measurement will follow this same test mode.

Mode 4. Configuration 2. DPDT type → Two Antenna Ports → Bluetooth / WLAN Diversity (Without Power Switch)

Due to Mode 1 generated the worst test result, so it was performed at Ant. 1 (PIFA antenna) / Ant. 2 (Dipole antenna) and recorded in this report.

For Radiated Emission test above 1GHz:

Mode 1. Configuration 1. DPDT type → Two Antenna Ports → Bluetooth / WLAN Diversity (With Power Switch)

Mode 2. Configuration 2. DPDT type → Two Antenna Ports → Bluetooth / WLAN Diversity (Without Power Switch)

Mode 3. Configuration 3. Fixed type → Two Antenna Ports → Main port is only for WLAN function; Aux port is only for Bluetooth function. (With power switch)

Mode 4. Configuration 4. Fixed type → Two Antenna Ports → Main port is only for WLAN function; Aux port is only for Bluetooth function. (Without power switch)

Mode 5. Configuration 5. SPDT type → One Antenna Port → Bluetooth / WLAN Function control by User (With power switch)

Mode 6. Configuration 6. SPDT type → One Antenna Port → Bluetooth / WLAN Function control by User (Without power switch)

After pretest, Mode 2 has been evaluated to be the worst case, so it was recorded in the report.

<For MPE and Co-location Test>:

The EUT could be applied with WLAN and Bluetooth function; therefore Maximum Permissible Exposure (Please refer to Appendix C) and Co-location (please refer to Appendix D) tests are added for simultaneously transmit between Bluetooth and wireless LAN function.

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	M1330	E2KWM3945ABG
Modem	ACEEX	DM1414	IFAXDM1414
Mouse	FIRST PRICE	FP-M02	DoC
Wireless AP	Planex	GW-AP54SGX	N/A
Notebook	DELL	D400	E2K24GBRL
Notebook	DELL	M1330	E2KWM3945ABG

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.

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Power Parameters of Bluetooth

Test Software Version	QA 1.0.1.1		
Frequency	2402 MHz	2441 MHz	2480 MHz
Power Parameters	0x38(Max)	0x38(Max)	0x38(Max)

<Configuration 2 with Ant. 2 (Dipole Antenna)>

Power Parameters of Bluetooth

Test Software Version	QA 1.0.1.1		
Frequency	2402 MHz	2441 MHz	2480 MHz
Power Parameters	0x38(Max)	0x38(Max)	0x38(Max)

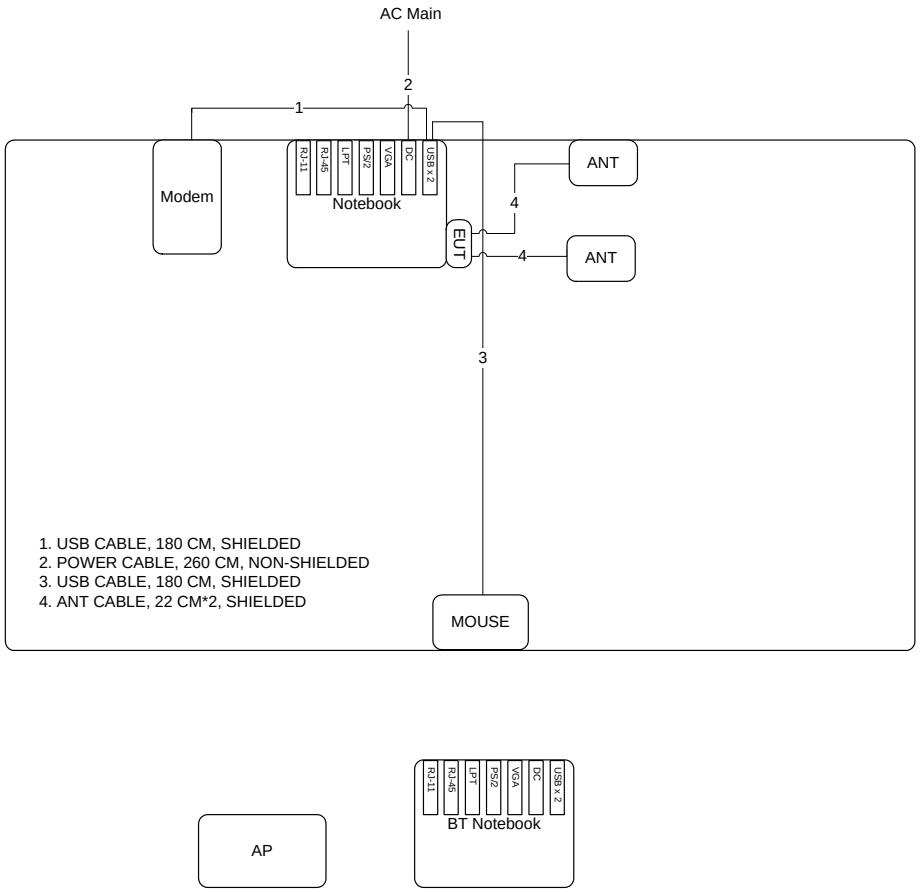
During the test, "QA 1.0.1.1" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

3.9. Test Configurations

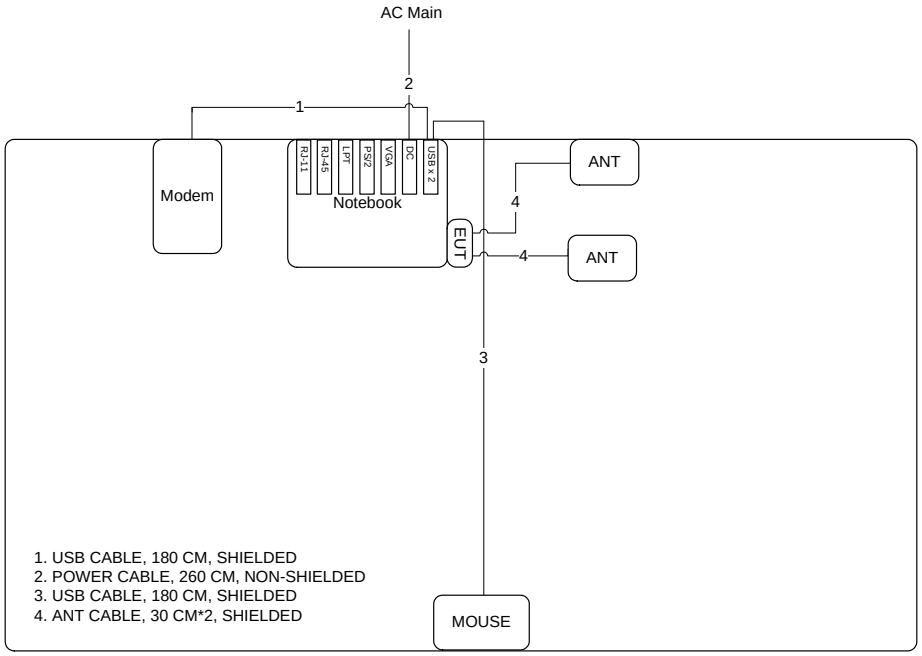
3.9.1. Radiation Emissions Test Configuration

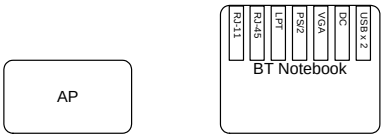
Test Configuration: 30MHz~1GHz

Test Mode: Mode 1 with Ant. 1 (PIFA Antenna)



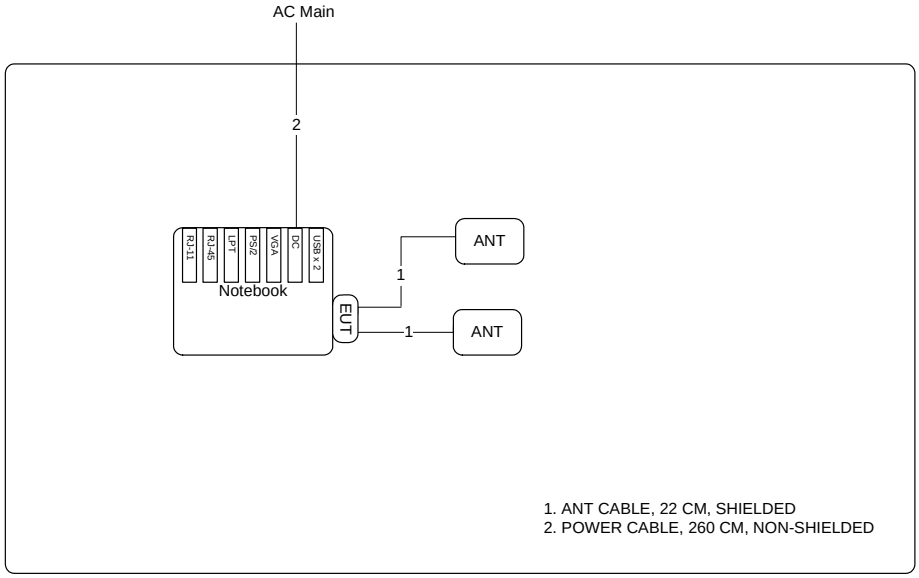
Test Mode: Mode 1 with Ant. 2 (Dipole Antenna)



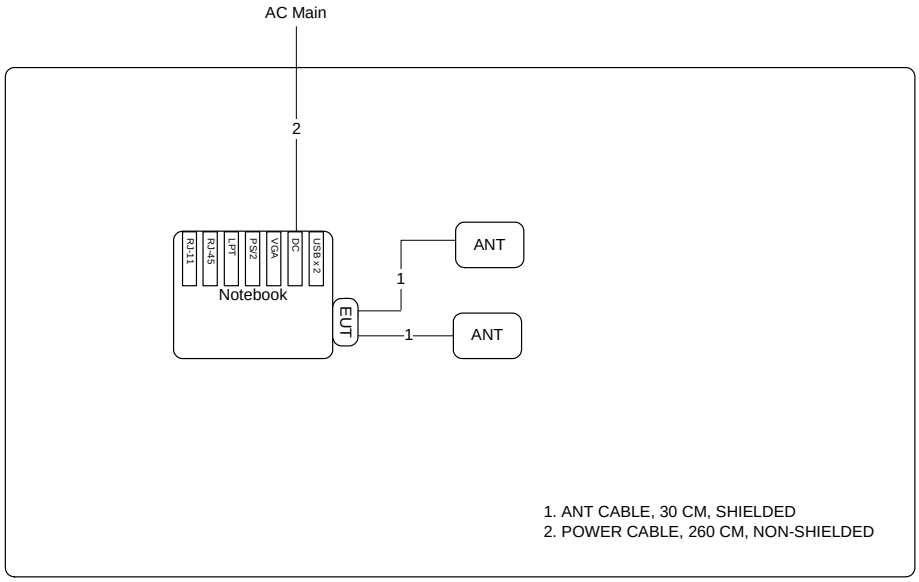


Test Configuration: above 1GHz

<Configuration 2 with Ant. 1 (PIFA Antenna)>

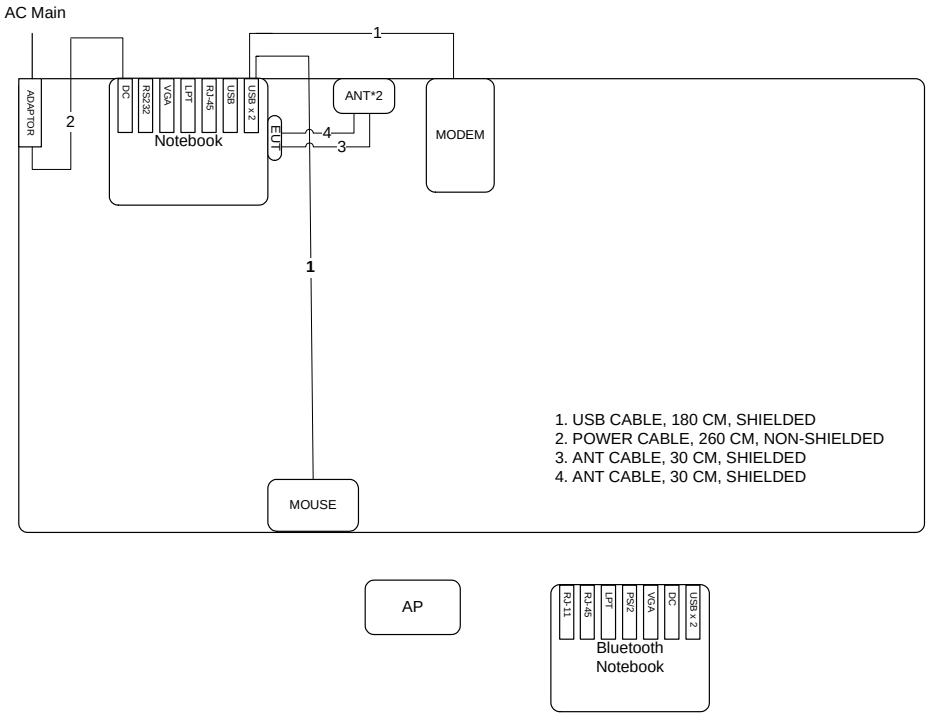


<Configuration 2 with Ant. 2 (Dipole Antenna)>



3.9.2. AC Power Line Conduction Emissions Test Configuration

Test Mode: Mode 3



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

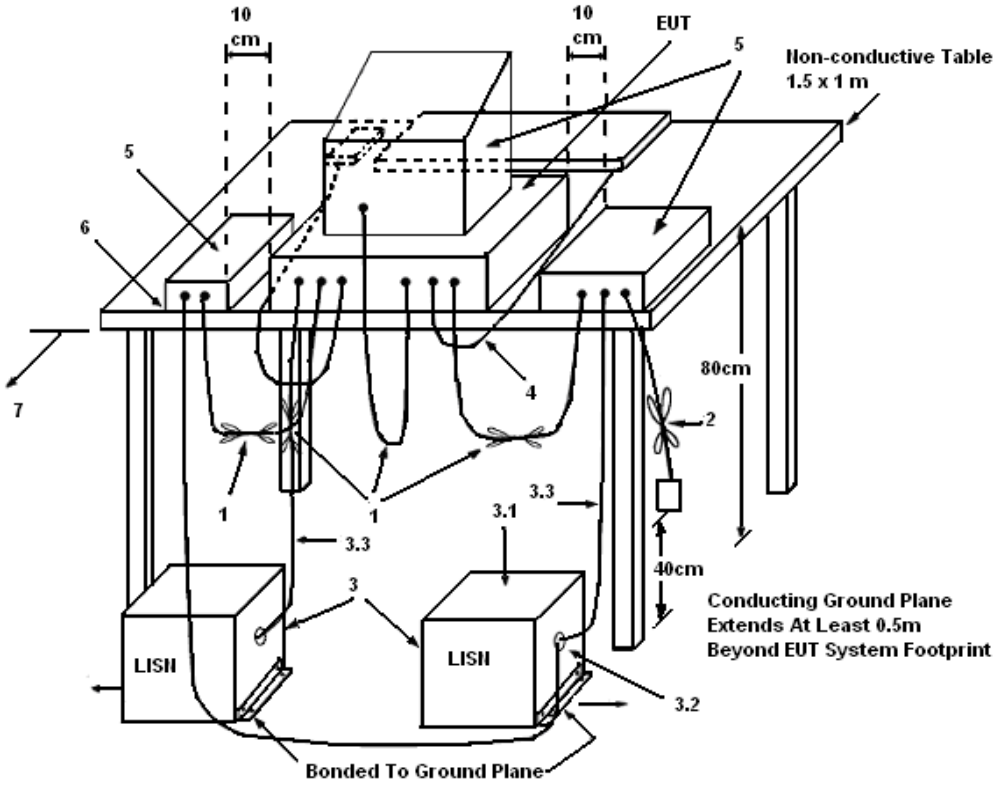
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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 C63.10. 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

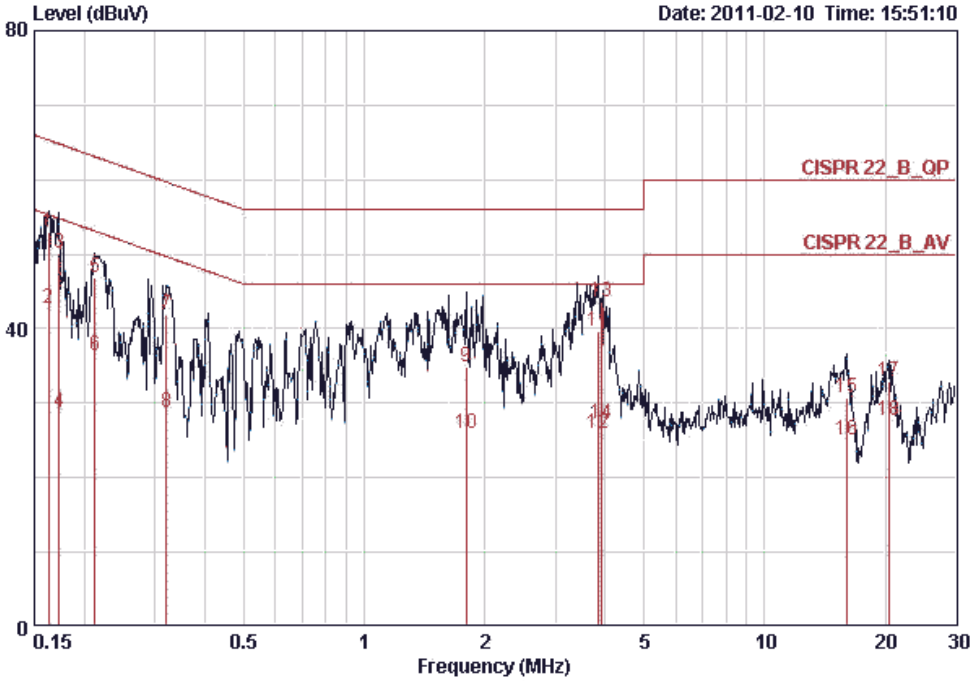
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

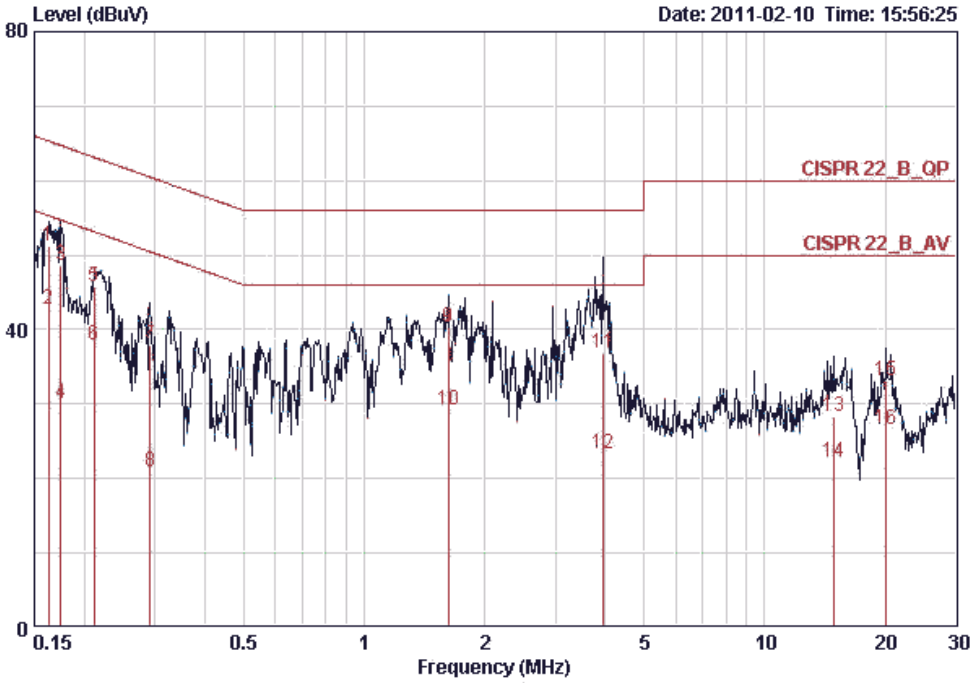
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	21℃	Humidity	61%
Test Engineer	Peter Wu	Phase	Line
Configuration	WLAN	Test Mode	Mode 3



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.16241	52.96	-12.38	65.34	52.69	0.07	0.20	QP
2 @	0.16241	42.73	-12.61	55.34	42.46	0.07	0.20	AVERAGE
3 @	0.17307	50.04	-14.77	64.81	49.78	0.06	0.20	QP
4	0.17307	28.69	-26.12	54.81	28.43	0.06	0.20	AVERAGE
5	0.21279	46.79	-16.31	63.10	46.54	0.05	0.20	QP
6	0.21279	36.51	-16.59	53.10	36.26	0.05	0.20	AVERAGE
7	0.31999	41.94	-17.77	59.71	41.70	0.04	0.20	QP
8	0.31999	28.69	-21.02	49.71	28.45	0.04	0.20	AVERAGE
9	1.800	34.91	-21.09	56.00	34.70	0.05	0.16	QP
10	1.800	26.01	-19.99	46.00	25.80	0.05	0.16	AVERAGE
11	3.840	39.62	-16.38	56.00	39.22	0.10	0.30	QP
12	3.840	26.04	-19.96	46.00	25.64	0.10	0.30	AVERAGE
13 @	3.927	43.62	-12.38	56.00	43.22	0.10	0.30	QP
14	3.927	27.25	-18.75	46.00	26.85	0.10	0.30	AVERAGE
15	15.970	30.75	-29.25	60.00	29.74	0.61	0.40	QP
16	15.970	25.04	-24.96	50.00	24.03	0.61	0.40	AVERAGE
17	20.377	33.02	-26.98	60.00	31.67	0.85	0.50	QP
18	20.377	27.69	-22.31	50.00	26.34	0.85	0.50	AVERAGE

Temperature	21℃	Humidity	61%
Test Engineer	Peter Wu	Phase	Neutral
Configuration	WLAN	Test Mode	Mode 3



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.16241	51.15	-14.19	65.34	50.85	0.10	0.20	QP
2 @	0.16241	42.63	-12.71	55.34	42.33	0.10	0.20	AVERAGE
3	0.17491	48.67	-16.05	64.72	48.38	0.09	0.20	QP
4	0.17491	30.16	-24.56	54.72	29.87	0.09	0.20	AVERAGE
5	0.21167	45.73	-17.41	63.14	45.45	0.08	0.20	QP
6	0.21167	37.98	-15.16	53.14	37.70	0.08	0.20	AVERAGE
7	0.29243	37.87	-22.58	60.46	37.60	0.07	0.20	QP
8	0.29243	20.87	-29.58	50.46	20.60	0.07	0.20	AVERAGE
9	1.619	40.38	-15.62	56.00	40.17	0.08	0.13	QP
10	1.619	29.14	-16.86	46.00	28.93	0.08	0.13	AVERAGE
11	3.943	36.82	-19.18	56.00	36.38	0.14	0.30	QP
12	3.943	23.33	-22.67	46.00	22.89	0.14	0.30	AVERAGE
13	14.828	28.30	-31.70	60.00	27.33	0.57	0.40	QP
14	14.828	22.30	-27.70	50.00	21.33	0.57	0.40	AVERAGE
15	20.162	33.22	-26.78	60.00	31.91	0.81	0.50	QP
16	20.162	26.50	-23.50	50.00	25.19	0.81	0.50	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 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, the limit for peak output power is 1Watt (30dBm). For all other frequency hopping systems in the 2400-2483.5 MHz 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

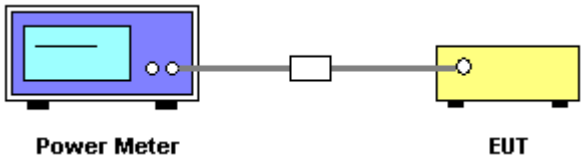
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.2.3. Test Procedures

7. The transmitter output (antenna port) was connected to the power meter.
8. Turn on the EUT and power meter and then record the peak power value.
9. 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 continuously transmitting mode.

4.2.7. Test Result of Maximum Peak Output Power

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 1 / Connector 1
Test Date	Apr. 13, 2011		

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
0	2402 MHz	8.93	30.00	**Complies**
39	2441 MHz	7.97	30.00	**Complies**
78	2480 MHz	6.89	30.00	**Complies**

<Configuration 2 with Ant. 2 (Dipole Antenna)>

Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 2 / Connector 1
Test Date	Apr. 13, 2011		

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
0	2402 MHz	8.93	30.00	**Complies**
39	2441 MHz	7.97	30.00	**Complies**
78	2480 MHz	6.89	30.00	**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

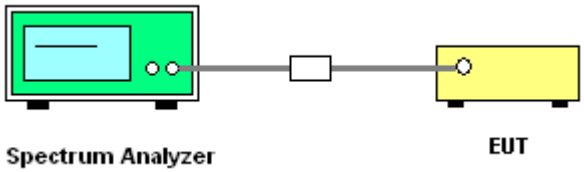
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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) / 300 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 analyzer 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 300 kHz were utilized for channel separation measurement.

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 Hopping Channel Separation

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 1 / Connector 1

Frequency	Ch. Separation (kHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (MHz)	99% Occupied Bandwidth (kHz)	Result
2402 MHz	1.00	1.3440	0.896	1.2680	**Complies**
2441 MHz	1.00	1.3440	0.896	1.2680	**Complies**
2480 MHz	1.00	1.3440	0.896	1.2680	**Complies**

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

<Configuration 2 with Ant. 2 (Dipole Antenna)>

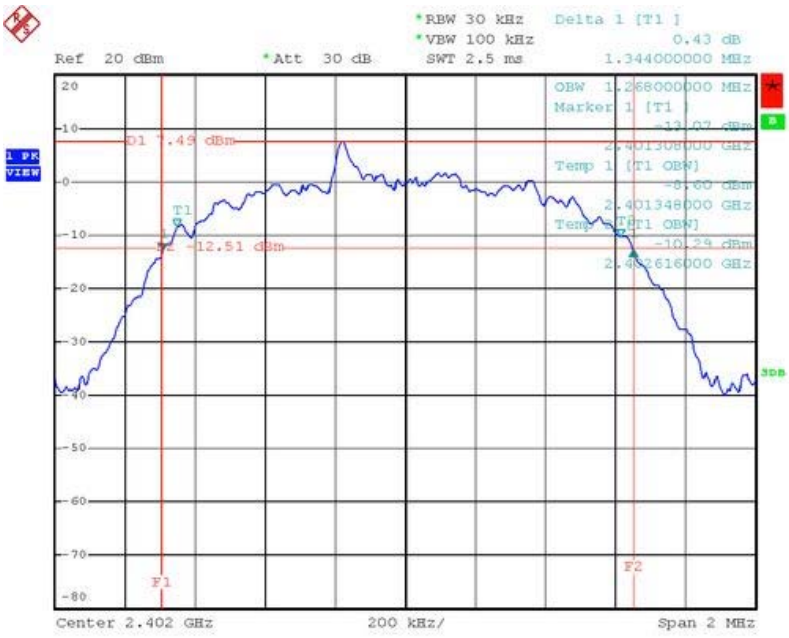
Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 2 / Connector 1

Frequency	Ch. Separation (kHz)	20dB Bandwidth (kHz)	2/3 of 20dB Bandwidth (MHz)	99% Occupied Bandwidth (kHz)	Result
2402 MHz	1.00	0.896	0.896	1.2680	**Complies**
2441 MHz	1.00	0.896	0.896	1.2680	**Complies**
2480 MHz	1.00	0.896	0.896	1.2680	**Complies**

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

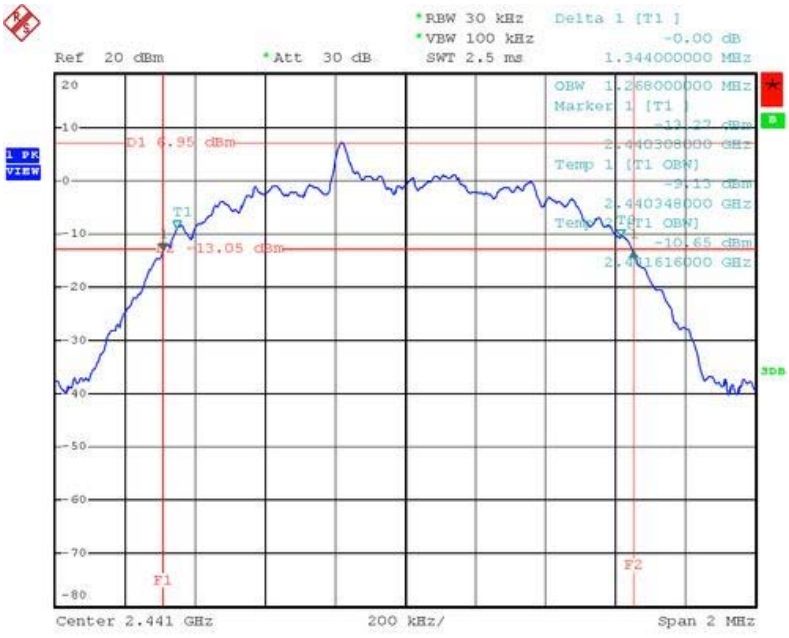
<Configuration 2 with Ant. 1 (PIFA Antenna)>

20 dB Bandwidth Plot on Channel 0 / Ant. 1 / Connector 1 / 2402 MHz



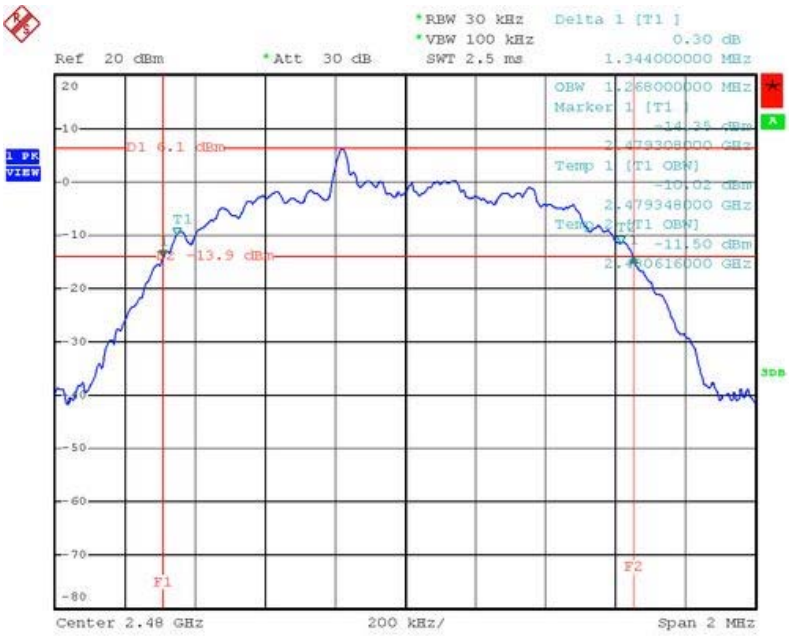
Date: 13.APR.2011 09:17:51

20 dB Bandwidth Plot on Channel 39 / Ant. 1 / Connector 1 / 2441 MHz



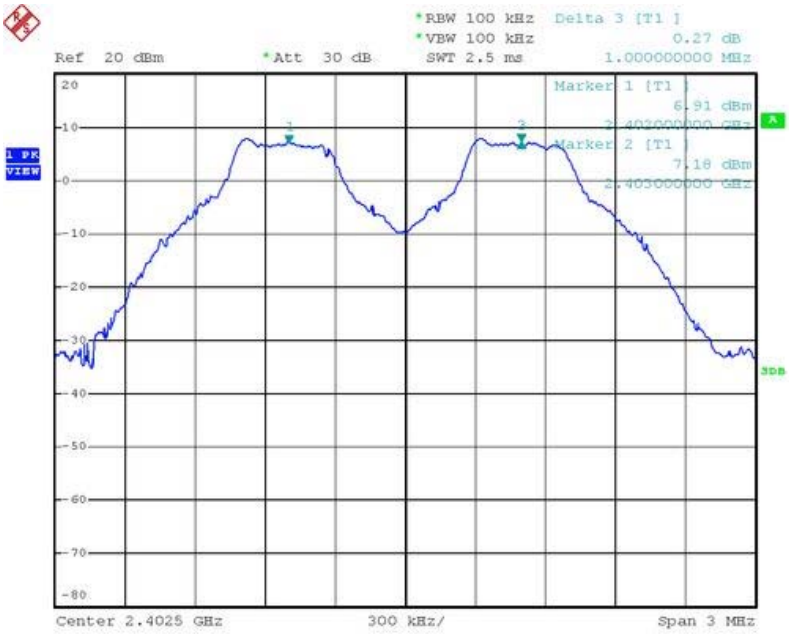
Date: 13.APR.2011 09:15:38

20 dB Bandwidth Plot on Channel 78 / Ant. 1 / Connector 1 / 2480 MHz



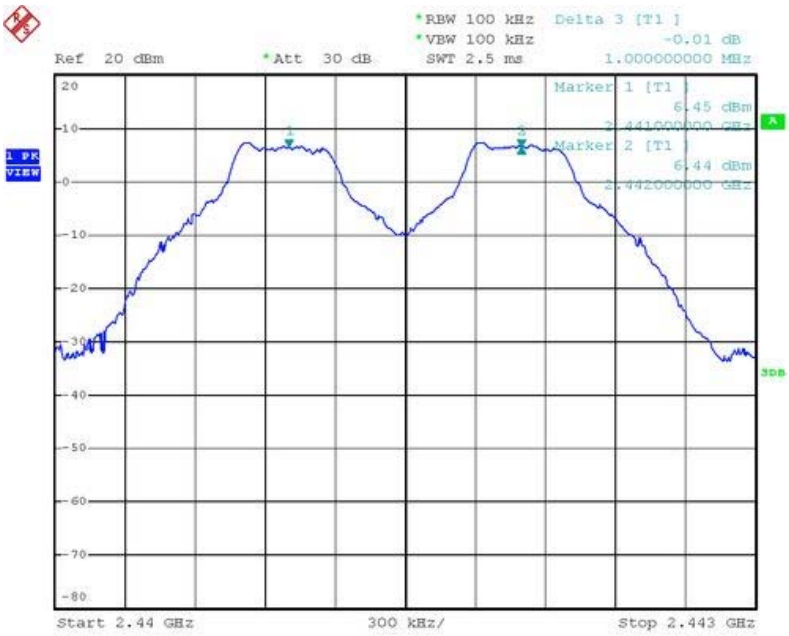
Date: 13.APR.2011 09:07:24

Channel Separation Plot on Channel 0~1 / Ant. 1 / Connector 1 / 2402 MHz ~ 2403 MHz



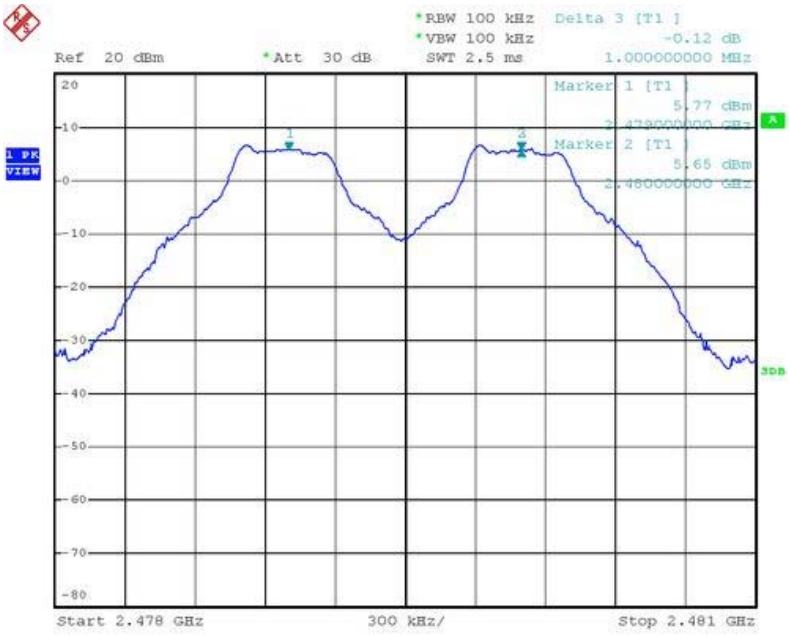
Date: 13.APR.2011 09:53:16

Channel Separation Plot on Channel 39~40 / Ant. 1 / Connector 1 / 2441 MHz ~ 2442 MHz



Date: 13.APR.2011 09:54:31

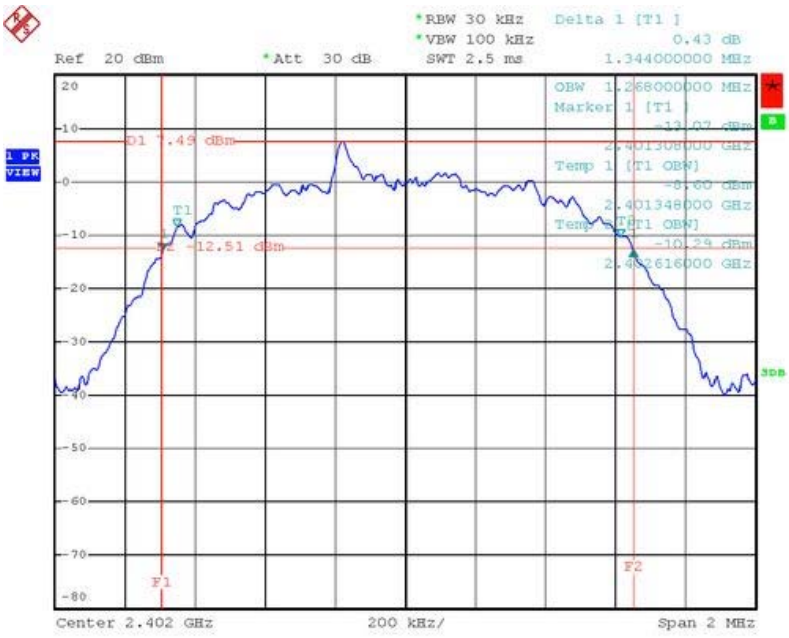
Channel Separation Plot on Channel 77~78 / Ant. 1 / Connector 1 / 2479 MHz ~ 2480 MHz



Date: 13.APR.2011 09:55:33

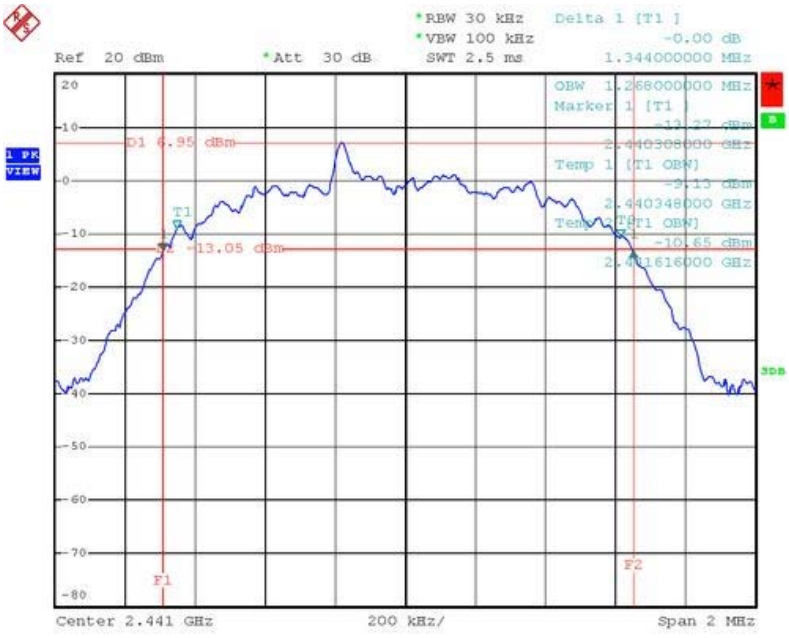
<Configuration 2 with Ant. 2 (Dipole Antenna)>

20 dB Bandwidth Plot on Channel 0 / Ant. 2 / Connector 1 / 2402 MHz



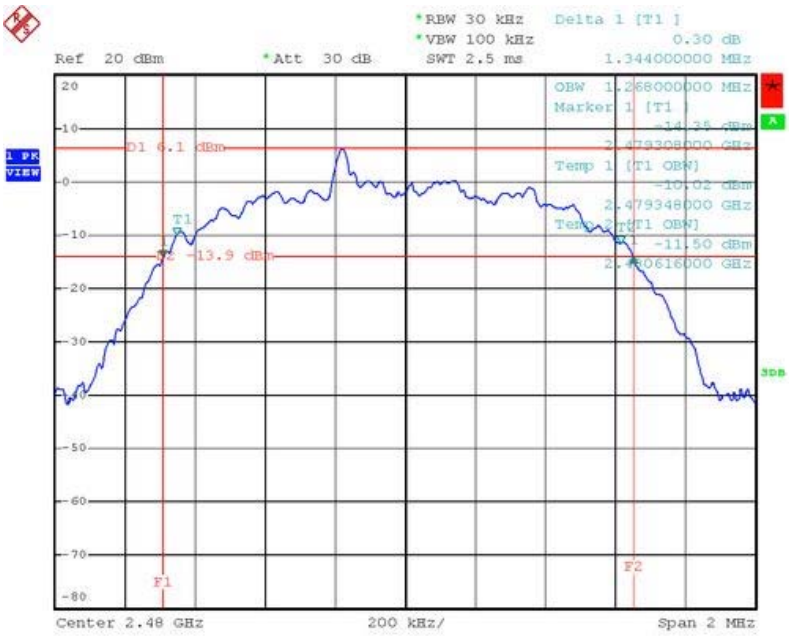
Date: 13.APR.2011 09:17:51

20 dB Bandwidth Plot on Channel 39 / Ant. 2 / Connector 1 / 2441 MHz



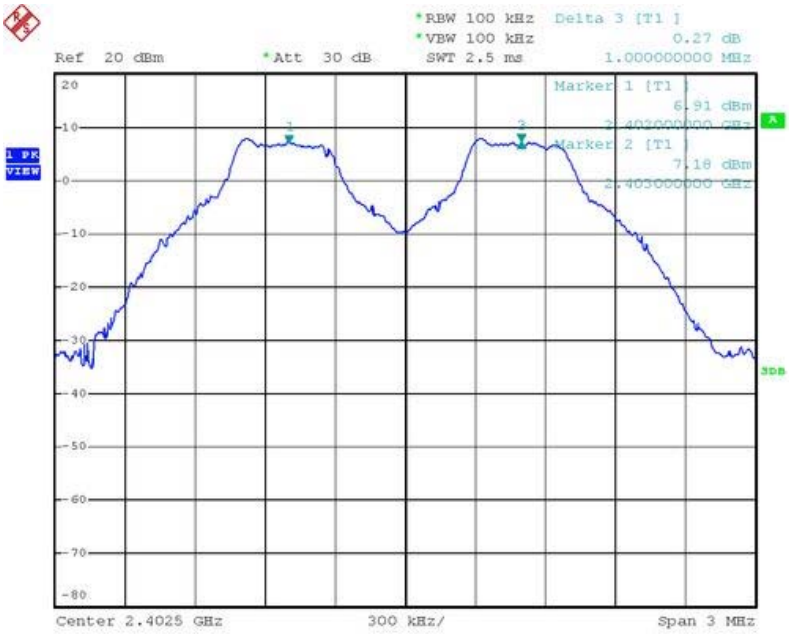
Date: 13.APR.2011 09:15:38

20 dB Bandwidth Plot on Channel 78 / Ant. 2 / Connector 1 / 2480 MHz



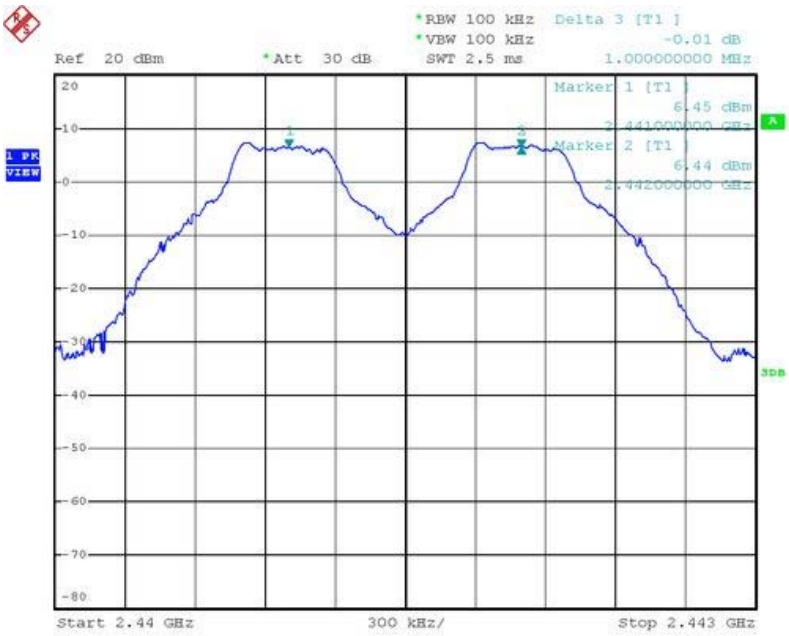
Date: 13.APR.2011 09:07:24

Channel Separation Plot on Channel 0~1 / Ant. 2 / Connector 1 / 2402 MHz ~ 2403 MHz



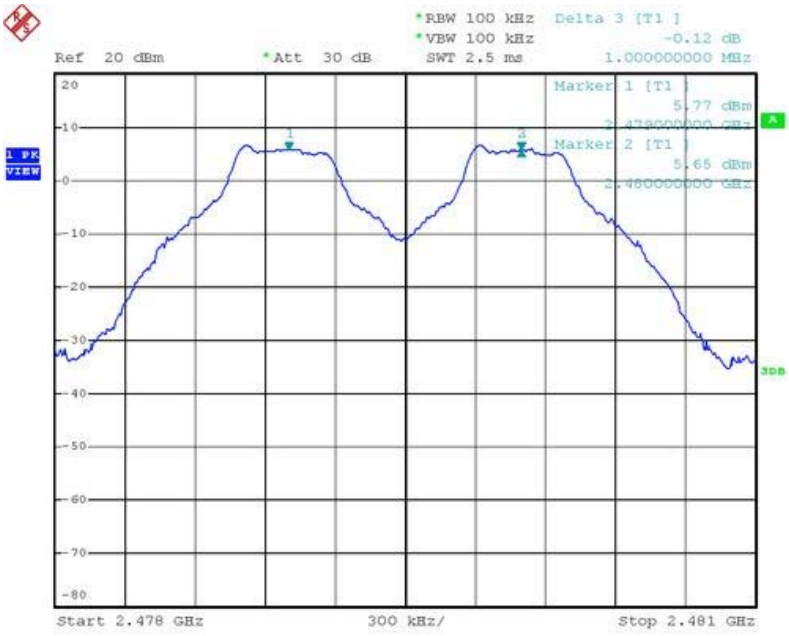
Date: 13.APR.2011 09:53:16

Channel Separation Plot on Channel 39~40 / Ant. 2 / Connector 1 / 2441 MHz ~ 2442 MHz



Date: 13.APR.2011 09:54:31

Channel Separation Plot on Channel 77~78 / Ant. 2 / Connector 1 / 2479 MHz ~ 2480 MHz



Date: 13.APR.2011 09:55:33

4.4. Number of Hopping Frequency Measurement

4.4.1. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

4.4.2. Measuring Instruments and Setting

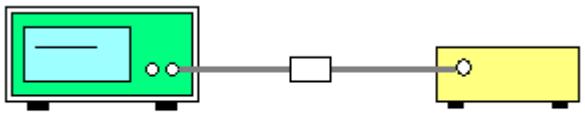
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

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 analyzer in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilized.
3. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 75 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 continuously transmitting mode.

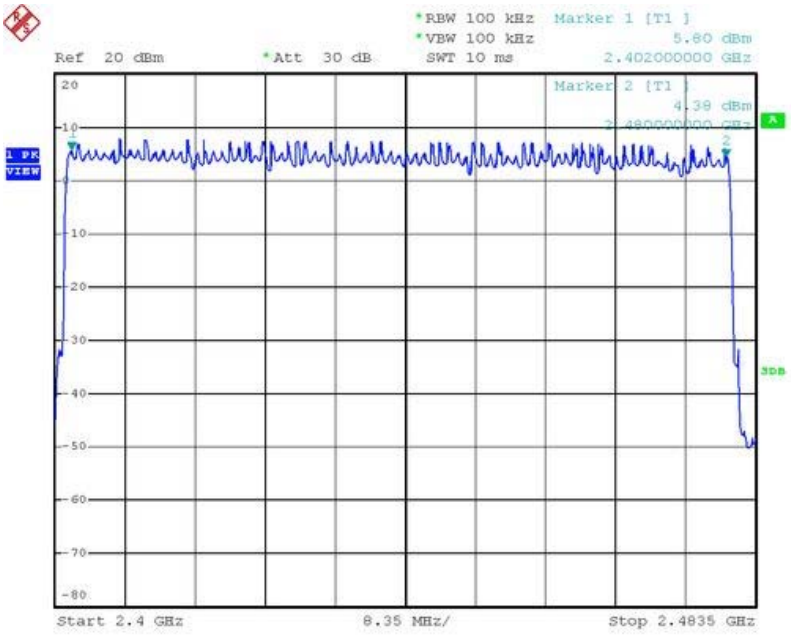
4.4.7. Test Result of Number of Hopping Frequency

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 1 / Connector 1

Modulation Type	Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
GFSK	0 ~ 78	2402 ~ 2480	79	75	**Complies**

Number of Hopping Channel Plot on Channel 0~78 / 2402 MHz ~ 2480 MHz

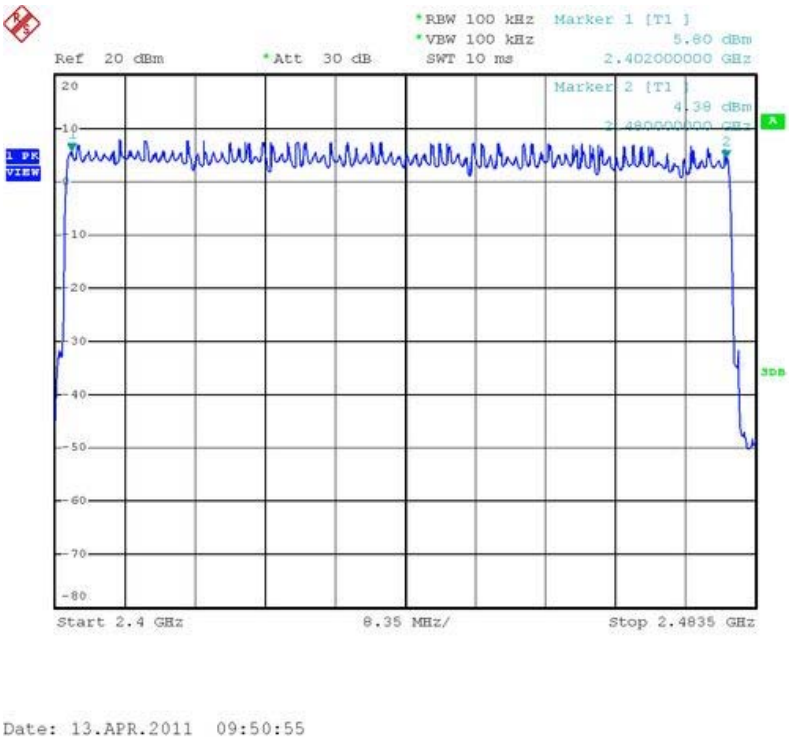


<Configuration 2 with Ant. 2 (Dipole Antenna)>

Temperature	25℃	**Humidity**	63%
Test Engineer	Alan Liu	**Configurations**	8DPSK / Ant. 2 / Connector 1

Modulation Type	Channel No.	Frequency (MHz)	Hopping Ch. (Channels)	Min. Limit (Channels)	Test Result
GFSK	0 ~ 78	2402 ~ 2480	79	75	**Complies**

Number of Hopping Channel Plot on Channel 0~78 / 2402 MHz ~ 2480 MHz



4.5. Dwell Time Measurement

4.5.1. Limit

Frequency hopping systems in the 2400-2483.5 MHz band 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

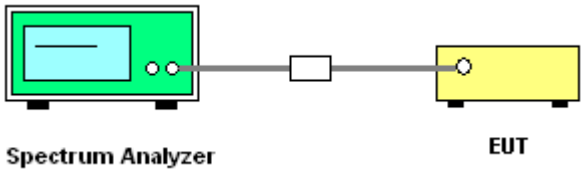
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	0 MHz
RB	1000 kHz
VB	1000 kHz
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 1000kHz and VBW to 1000kHz.
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 set the frequency span to zero span.
6. Measure the maximum time duration of one single pulse.
7. Set the EUT for 3DH5, 3DH3 and 3DH1 packet transmitting.
8. Measure the maximum time duration of one single pulse.

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 continuously transmitting mode.

4.5.7. Test Result of Dwell Time

<Configuration 2 with Ant. 1 (PIFA Antenna) / Ant. 2 (Dipole Antena)>

Temperature	20℃	Humidity	65%
Test Engineer	Alan Liu	Configurations	Bluetooth / 3DH1 / Connector 1

Frequency (MHz)	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell Time in (s)	Dwell Time (s)	Limits (s)	Test Result
2402	0.3900	50	5	32	0.1232	0.4000	**Complies**
2441	0.3800	52	5	32	0.1249	0.4000	**Complies**
2480	0.4000	50	5	32	0.1264	0.4000	**Complies**

Note: Pulse Duration * Number of Pulses*(Dwell time / measure time)

Temperature	20℃	Humidity	65%
Test Engineer	Alan Liu	Configurations	Bluetooth / 3DH3 / Connector 1

Frequency (MHz)	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell Time in (s)	Dwell Time (s)	Limits (s)	Test Result
2402	1.6400	21	5	32	0.2177	0.4000	**Complies**
2441	1.6400	23	5	32	0.2384	0.4000	**Complies**
2480	1.6300	25	5	32	0.2575	0.4000	**Complies**

Note: Pulse Duration * Number of Pulses*(Dwell time / measure time)

Temperature	20℃	Humidity	65%
Test Engineer	Alan Liu	Configurations	Bluetooth / 3DH5 / Connector 1

Frequency (MHz)	Pulse Duration (ms)	Number of Pulses	Measure Time (s)	Dwell Time in (s)	Dwell Time (s)	Limits (s)	Test Result
2402	2.8900	16	5	32	0.2922	0.4000	**Complies**
2441	2.8900	11	5	32	0.2009	0.4000	**Complies**
2480	2.8900	12	5	32	0.2192	0.4000	**Complies**

Note: Pulse Duration * Number of Pulses*(Dwell time / measure time)

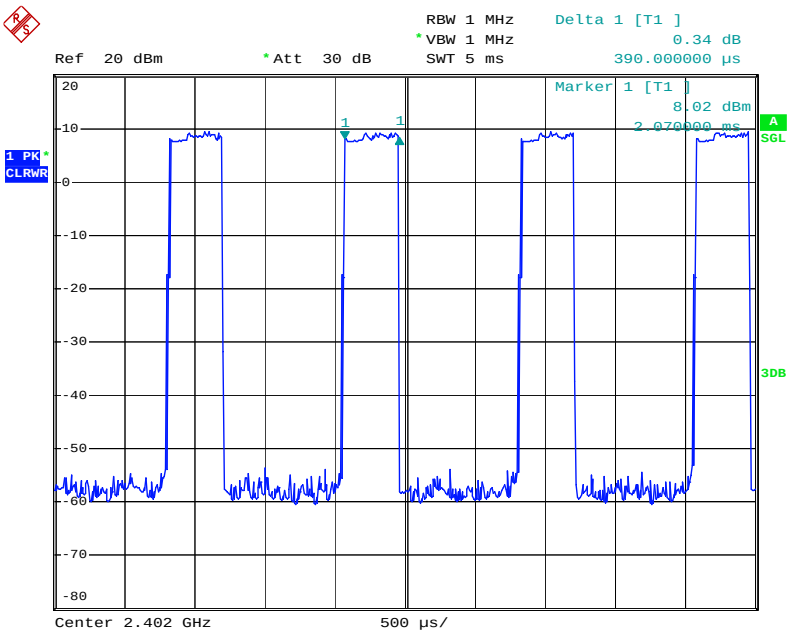
Remark:

Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time (us)

79 channels come from the Hopping Channel number.

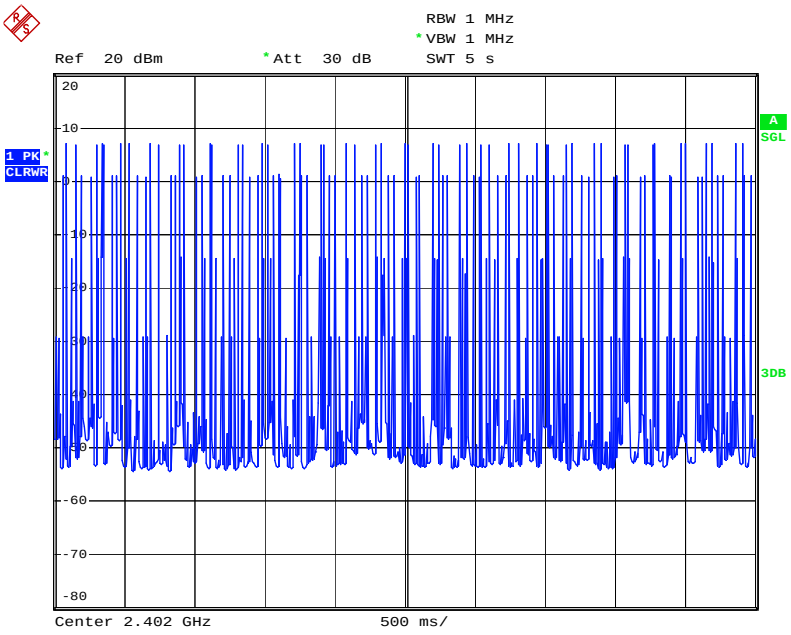
Average Hopping Channel = hops / sweep time

Single Pulse Plot on Channel 0 / 3DH1 / 2402 MHz



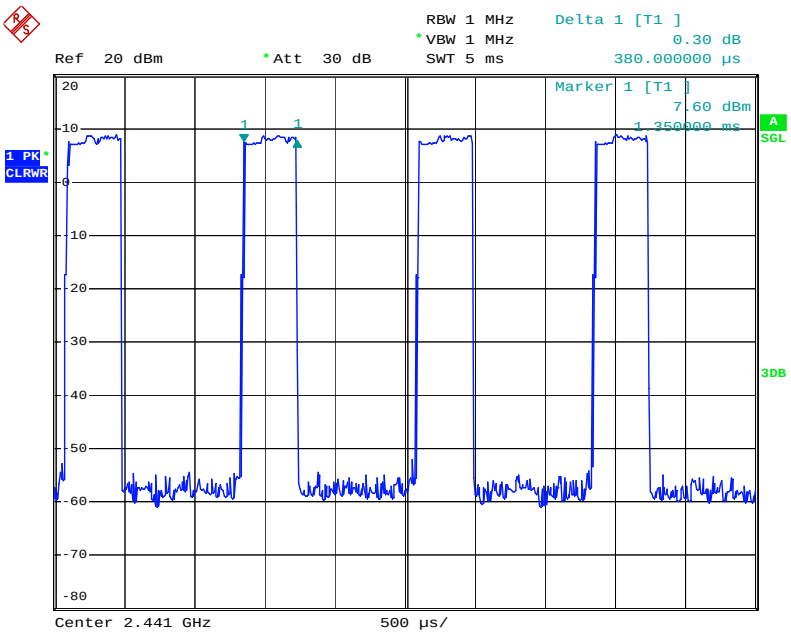
Date: 13.APR.2011 09:31:48

Number of Pulses Plot on Channel 0 / 3DH1 / 2402 MHz



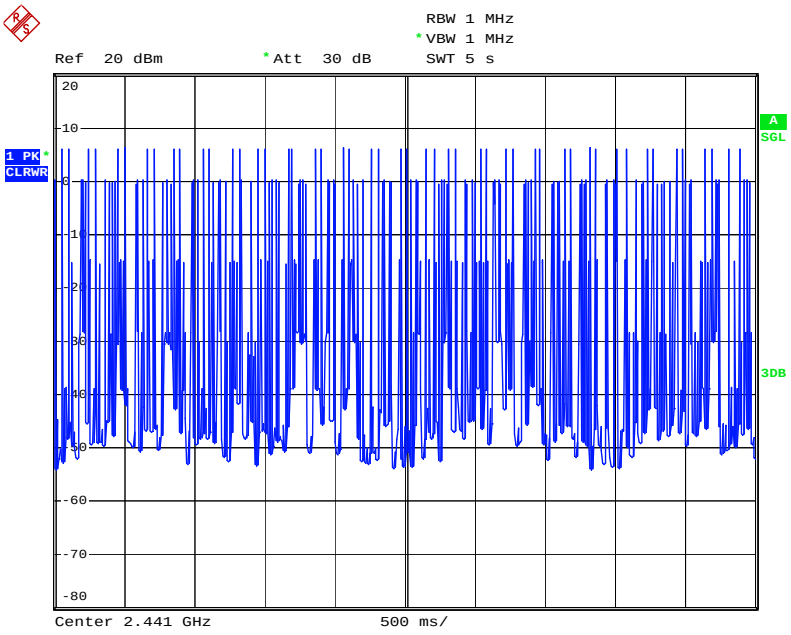
Date: 19.APR.2011 10:16:57

Single Pulse Plot on Channel 39 / 3DH1 / 2441 MHz



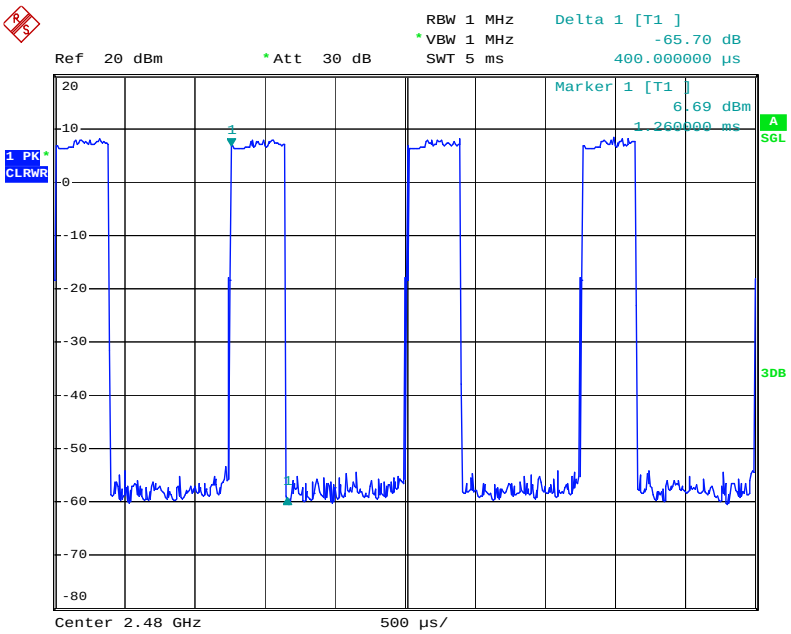
Date: 13.APR.2011 09:32:34

Number of Pulses Plot on Channel 39 / 3DH1 / 2441 MHz



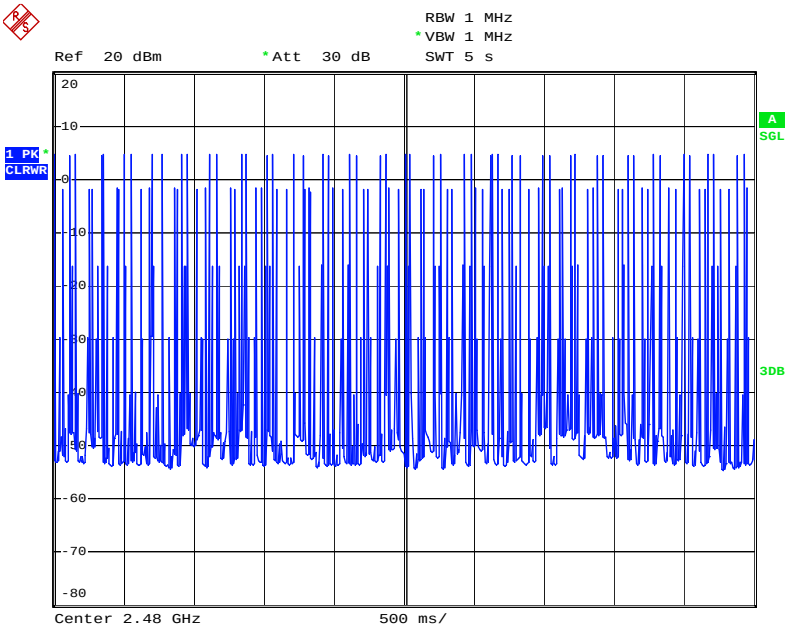
Date: 19.APR.2011 10:15:14

Single Pulse Plot on Channel 78 / 3DH1 / 2480 MHz



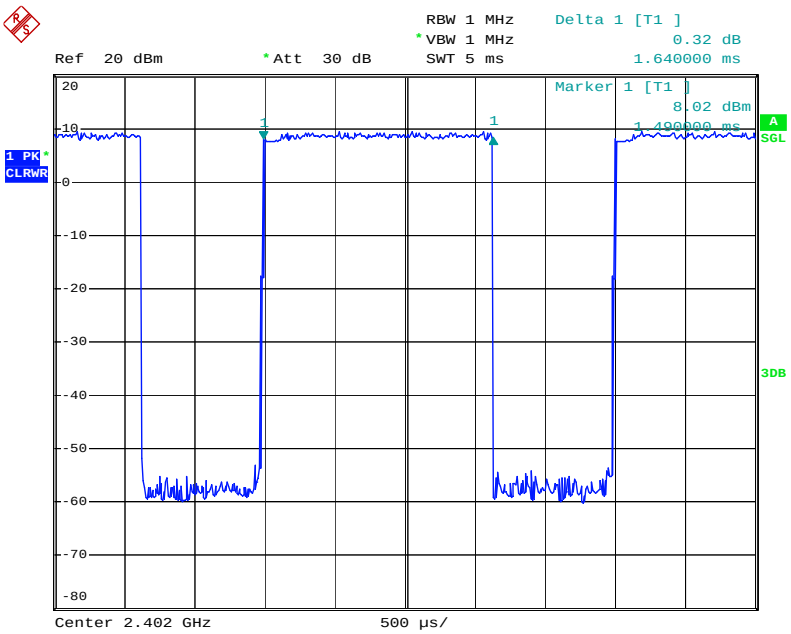
Date: 13.APR.2011 09:33:14

Number of Pulses Plot on Channel 78 / 3DH1 / 2480 MHz



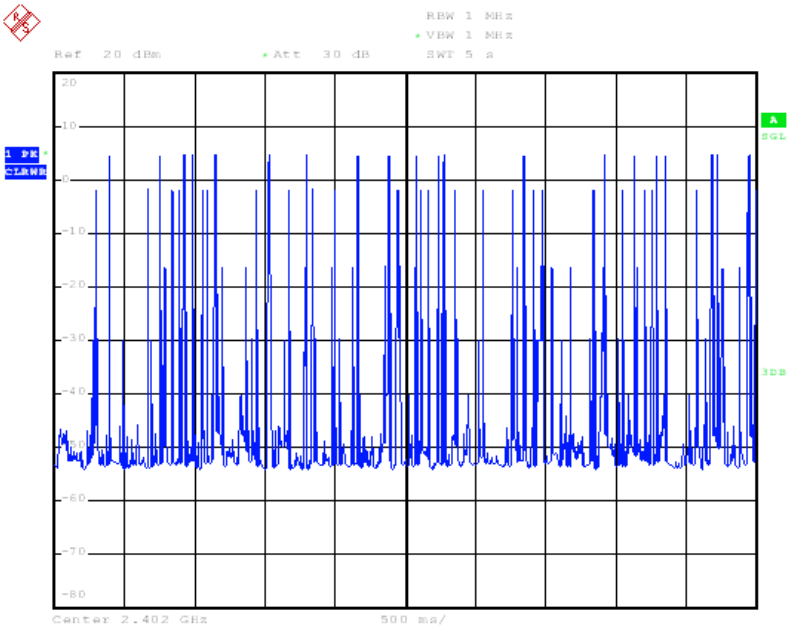
Date: 19.APR.2011 10:13:30

Single Pulse Plot on Channel 0 / 3DH3 / 2402 MHz



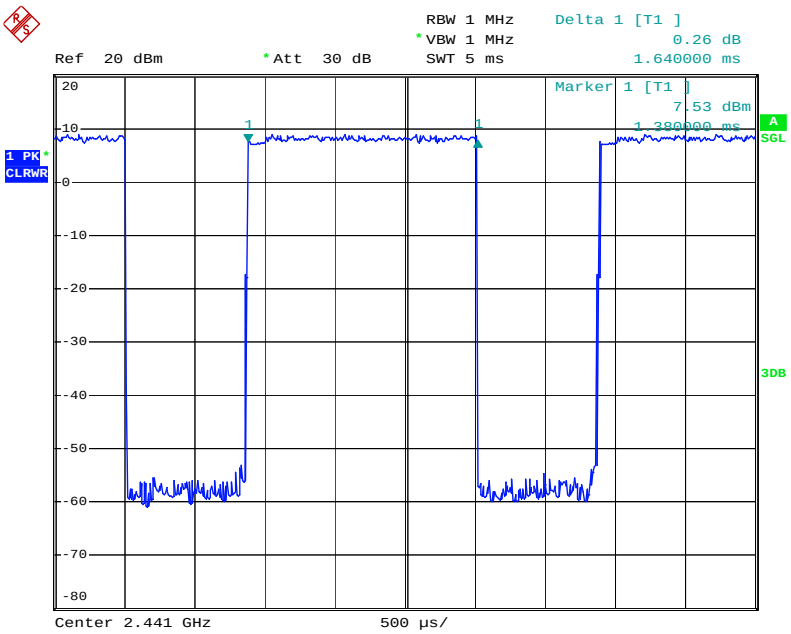
Date: 13.APR.2011 09:31:04

Number of Pulses Plot on Channel 0 / 3DH3 / 2402 MHz



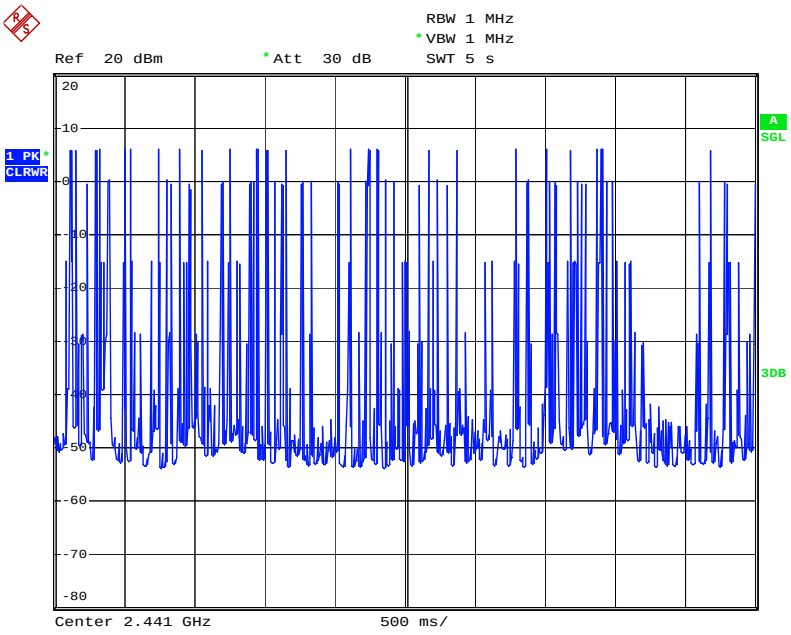
Date: 19.APR.2011 10:10:47

Single Pulse Plot on Channel 39 / 3DH3 / 2441 MHz



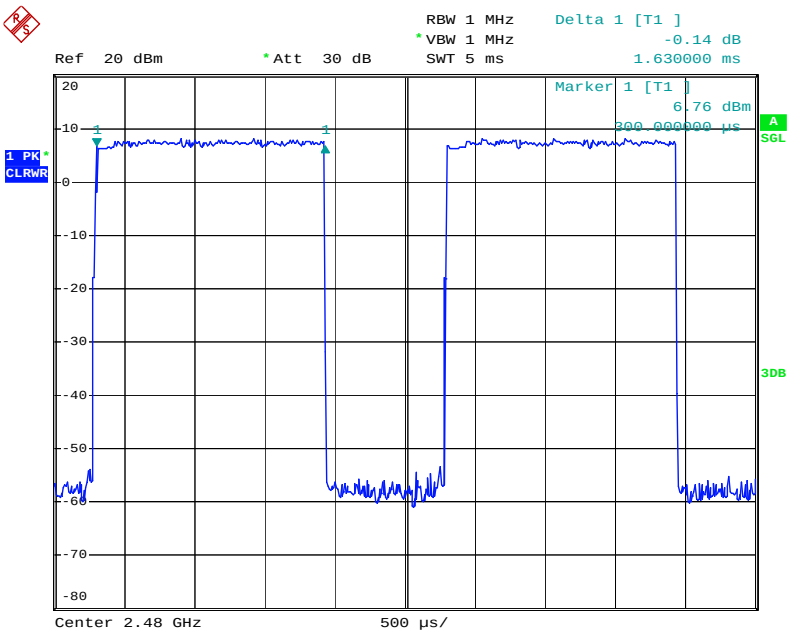
Date: 13.APR.2011 09:30:21

Number of Pulses Plot on Channel 39 / 3DH3 / 2441 MHz



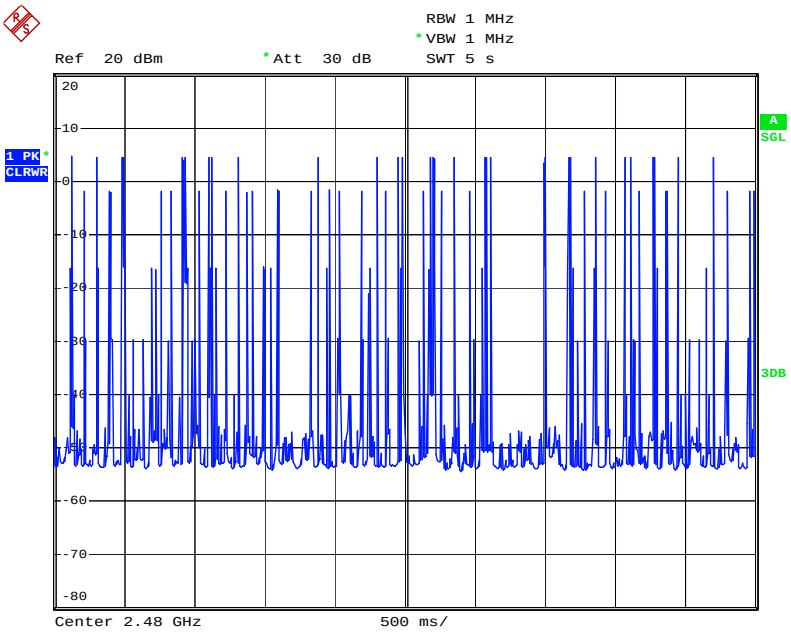
Date: 19.APR.2011 10:12:11

Single Pulse Plot on Channel 78 / 3DH3 / 2480 MHz



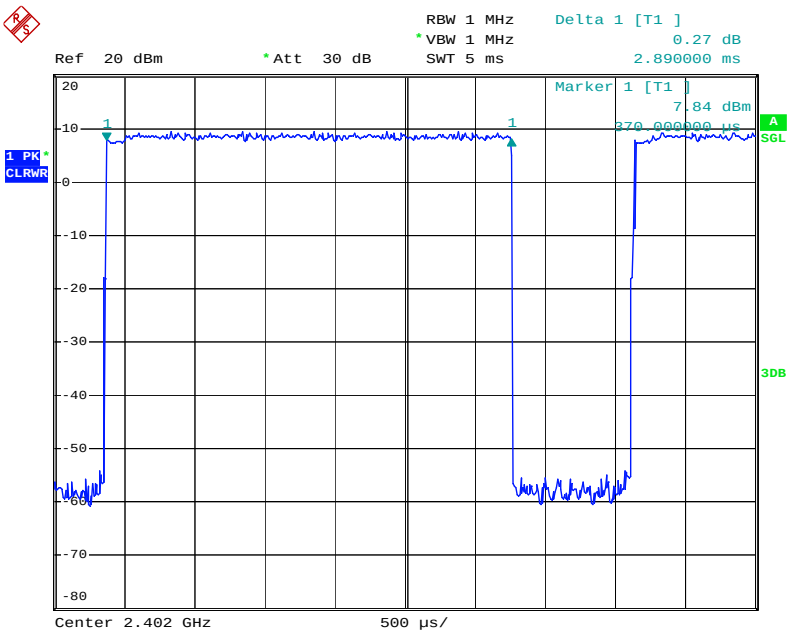
Date: 13.APR.2011 09:29:14

Number of Pulses Plot on Channel 78 / 3DH3 / 2480 MHz



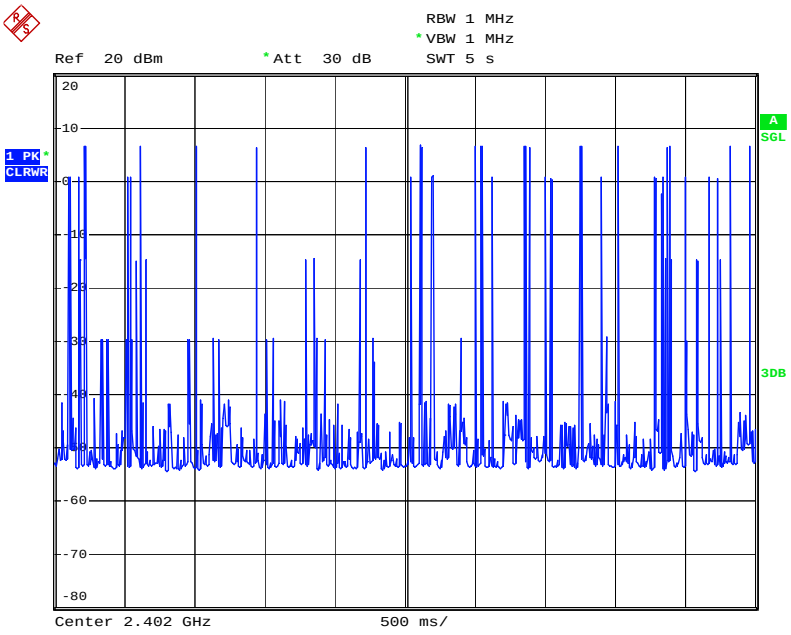
Date: 19.APR.2011 10:12:59

Single Pulse Plot on Channel 0 / 3DH5 / 2402 MHz



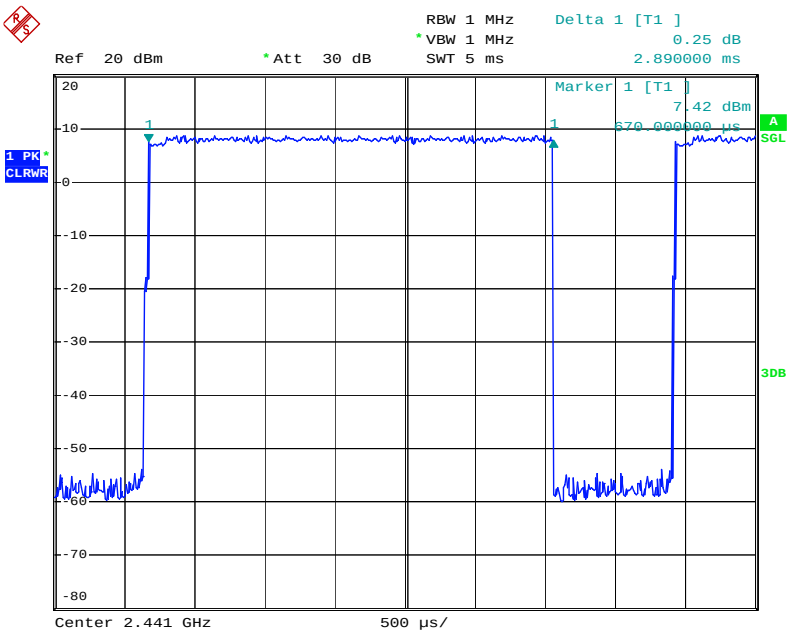
Date: 13.APR.2011 09:23:47

Number of Pulses Plot on Channel 0 / 3DH5 / 2402 MHz



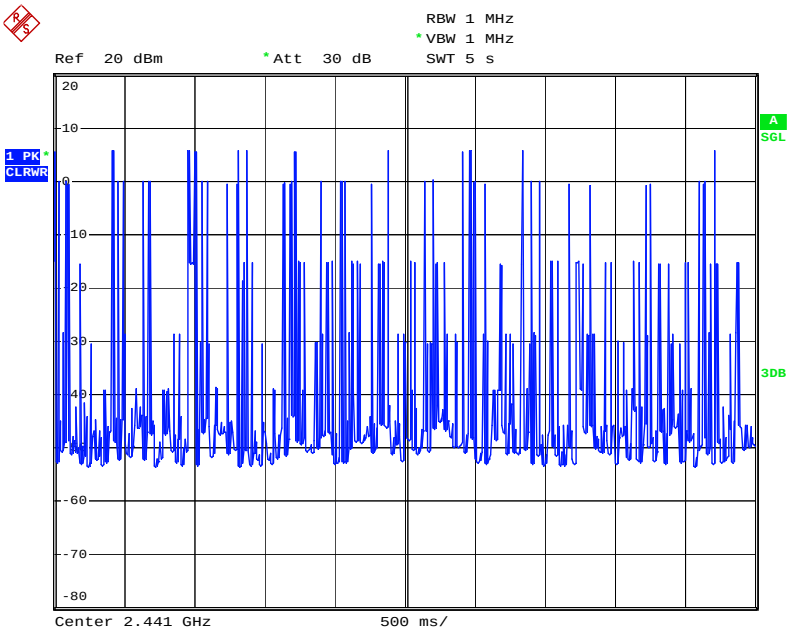
Date: 19.APR.2011 10:03:51

Single Pulse Plot on Channel 39 / 3DH5 / 2441 MHz



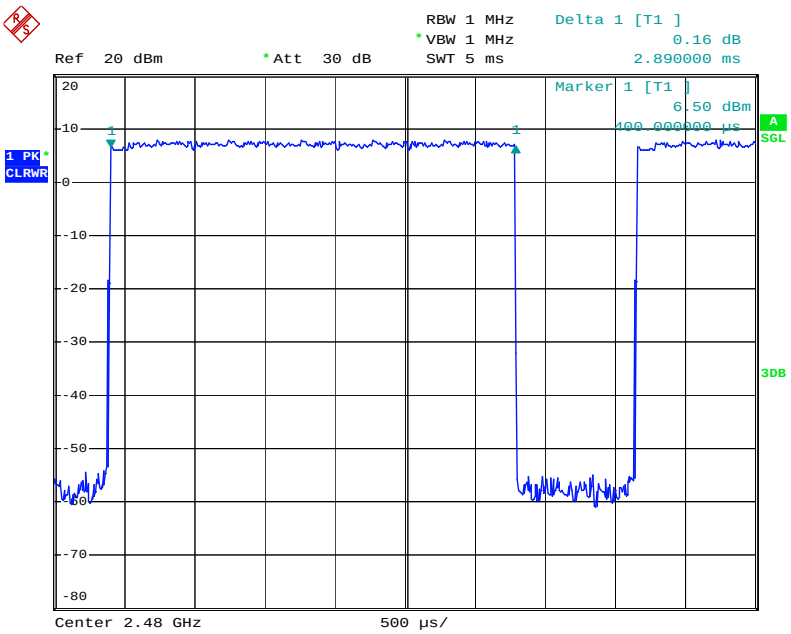
Date: 13.APR.2011 09:24:56

Number of Pulses Plot on Channel 39 / 3DH5 / 2441 MHz



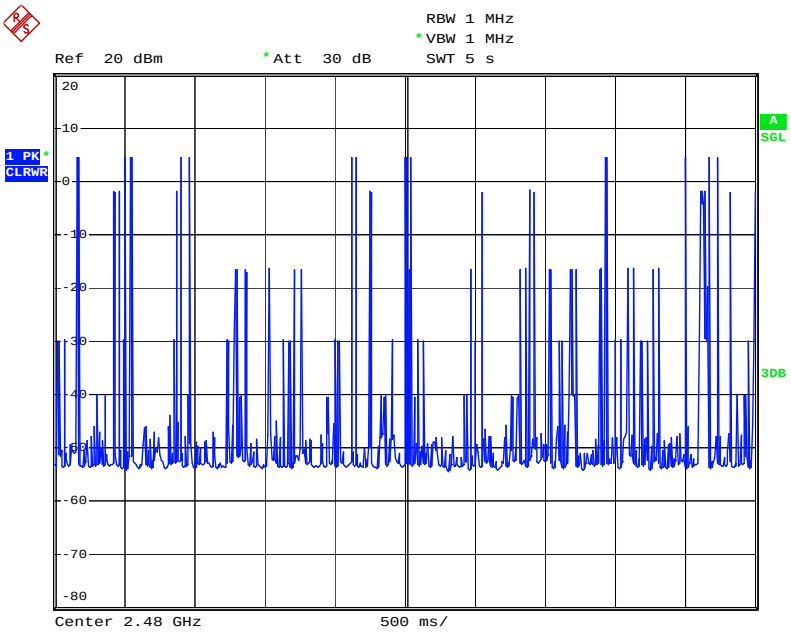
Date: 19.APR.2011 10:04:49

Single Pulse Plot on Channel 78 / 3DH5 / 2480 MHz



Date: 13.APR.2011 09:25:29

Number of Pulses Plot on Channel 78 / 3DH5 / 2480 MHz



Date: 19.APR.2011 10:05:46

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

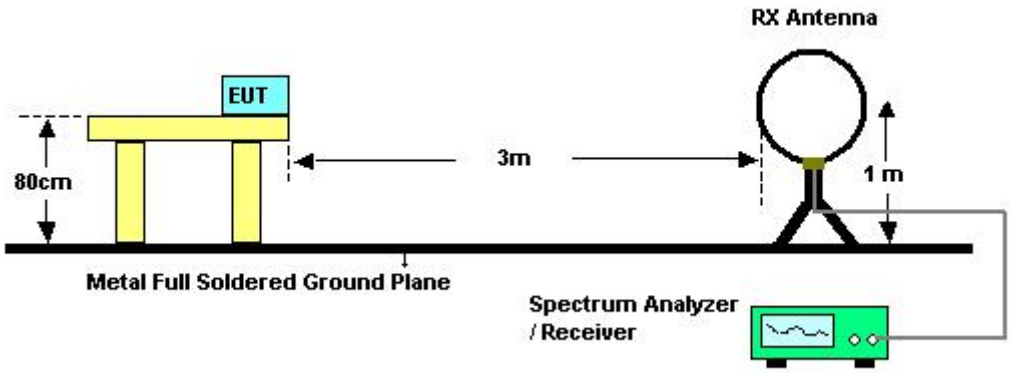
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.6.3. Test Procedures

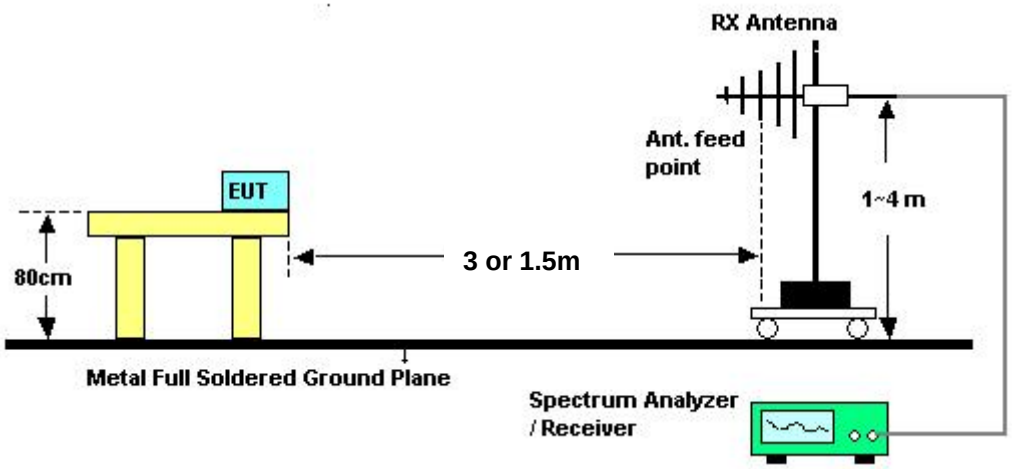
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.6.4. 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].

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

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Test Date	Apr. 20, 2011

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);

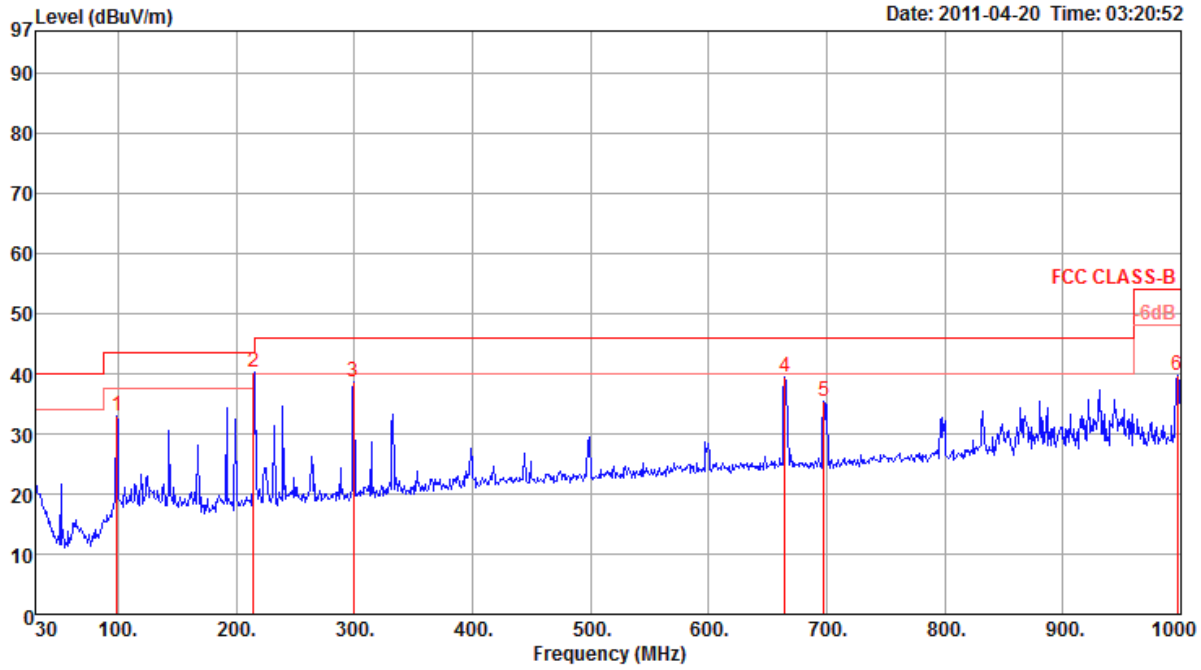
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

<Mode 1. Configuration 1 with Ant. 1 (PIFA Antenna)>

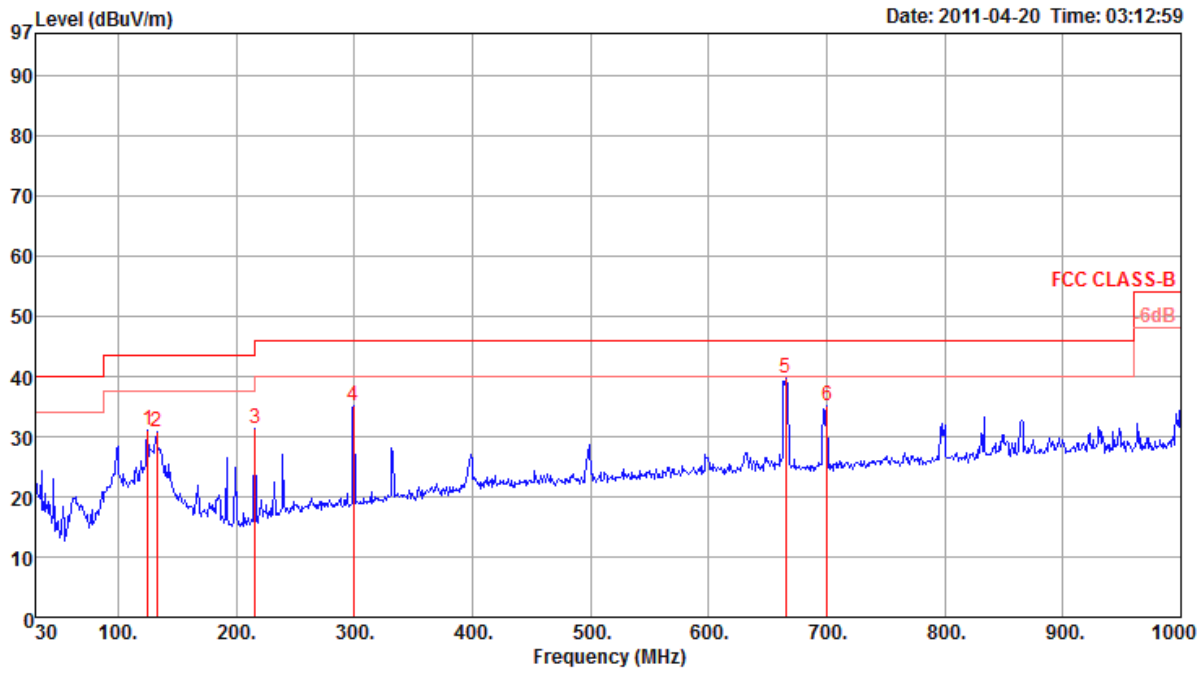
Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Normal Link / Mode 1 / Ant. 1

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	98.87	32.85	43.50	-10.65	48.67	1.18	27.61	10.61	0	100	Peak	HORIZONTAL
2 p	215.00	40.30	43.50	-3.20	55.20	1.76	27.07	10.41	0	100	Peak	HORIZONTAL
3	299.66	38.65	46.00	-7.35	49.99	2.10	26.90	13.46	0	100	Peak	HORIZONTAL
4	664.38	39.53	46.00	-6.47	45.14	3.44	28.04	18.99	0	100	Peak	HORIZONTAL
5	697.36	35.44	46.00	-10.56	41.05	3.31	28.00	19.08	0	100	Peak	HORIZONTAL
6	997.09	39.70	54.00	-14.30	41.40	3.69	27.02	21.63	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	125.06	31.11	43.50	-12.39	45.03	1.25	27.48	12.31	0	400	Peak	VERTICAL
2	132.82	30.81	43.50	-12.69	45.09	1.33	27.43	11.82	0	400	Peak	VERTICAL
3	216.24	31.29	46.00	-14.71	46.12	1.77	27.07	10.47	0	400	Peak	VERTICAL
4	299.66	35.20	46.00	-10.80	46.54	2.10	26.90	13.46	0	400	Peak	VERTICAL
5 p	665.35	39.71	46.00	-6.29	45.30	3.44	28.03	19.00	0	400	Peak	VERTICAL
6	700.27	35.09	46.00	-10.91	40.69	3.30	27.99	19.09	0	400	Peak	VERTICAL

Note:

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

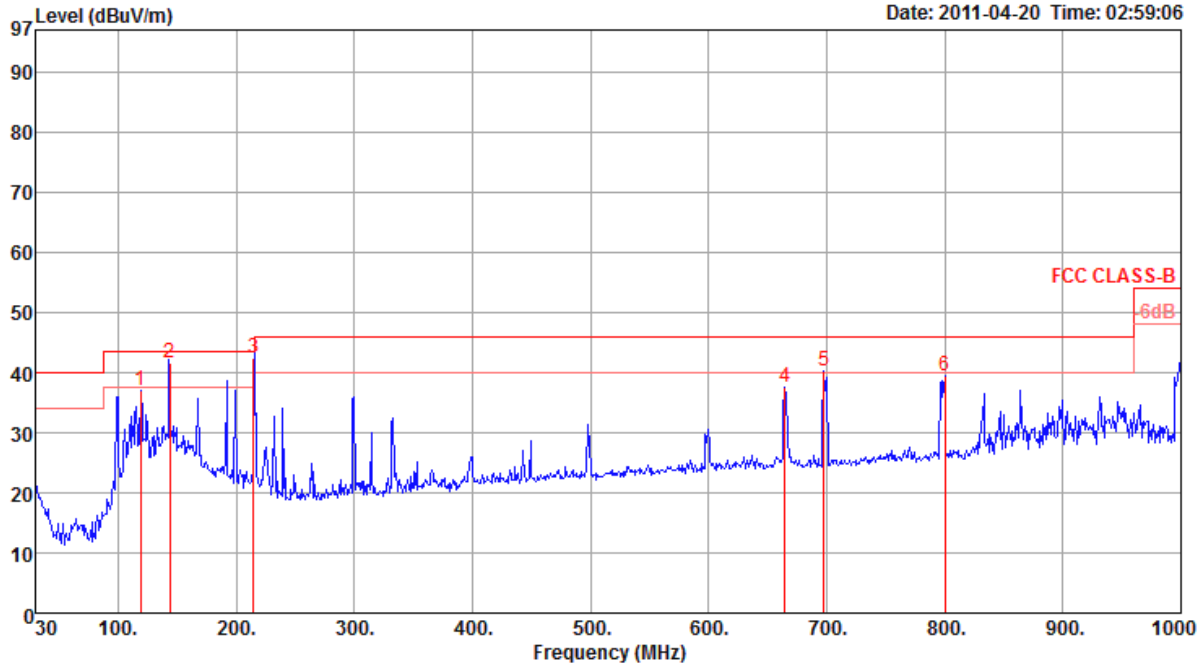
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

<Mode 1. Configuration 1 with Ant. 2 (Dipole Antenna)>

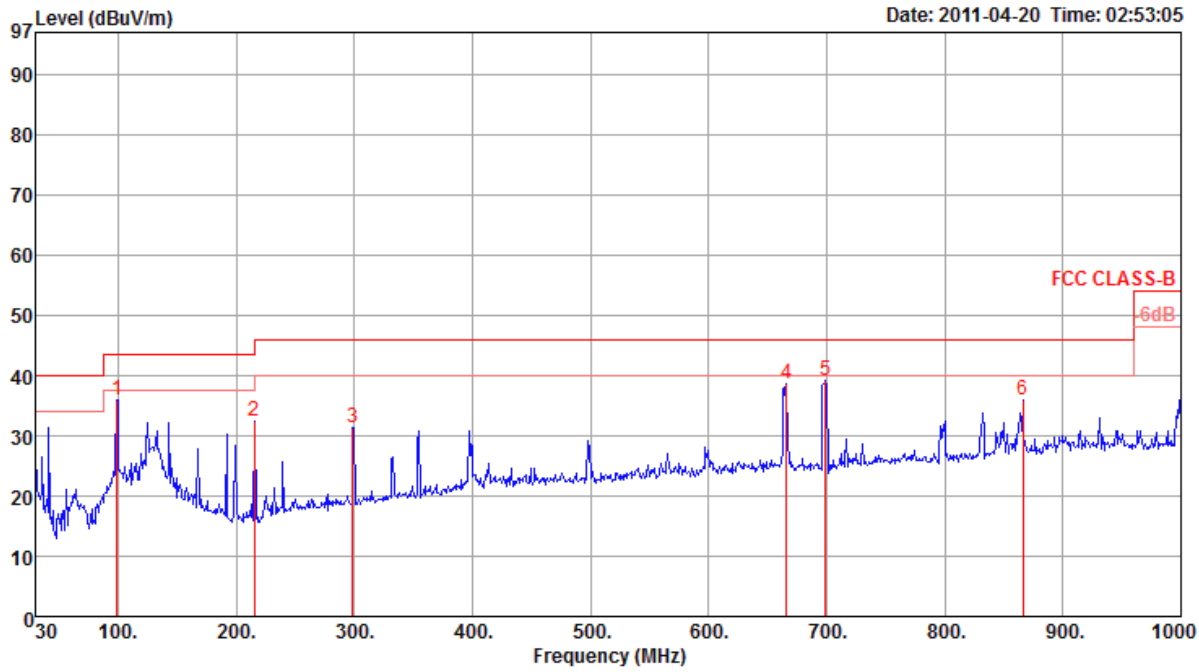
Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Normal Link / Mode 1 / Ant. 2

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	119.24	37.06	43.50	-6.44	51.01	1.20	27.50	12.35	0	100	Peak	HORIZONTAL
2	144.00	41.65	43.50	-1.85	56.56	1.42	27.38	11.05	265	176	QP	HORIZONTAL
3 q	215.00	42.39	43.50	-1.11	57.29	1.76	27.07	10.41	270	178	QP	HORIZONTAL
4	664.38	37.68	46.00	-8.32	43.29	3.44	28.04	18.99	0	100	Peak	HORIZONTAL
5 p	697.36	40.16	46.00	-5.84	45.77	3.31	28.00	19.08	0	100	Peak	HORIZONTAL
6	800.18	39.39	46.00	-6.61	43.42	3.30	27.60	20.27	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	98.87	35.84	43.50	-7.66	51.66	1.18	27.61	10.61	0	400	Peak	VERTICAL
2	215.27	32.54	43.50	-10.96	47.44	1.76	27.07	10.41	0	400	Peak	VERTICAL
3	298.69	31.33	46.00	-14.67	42.69	2.10	26.90	13.44	0	400	Peak	VERTICAL
4	666.32	38.73	46.00	-7.27	44.33	3.43	28.03	19.00	0	400	Peak	VERTICAL
5 p	699.30	39.06	46.00	-6.94	44.67	3.30	28.00	19.09	0	400	Peak	VERTICAL
6	866.14	35.85	46.00	-10.15	38.98	3.47	27.47	20.87	0	400	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.

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

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 0 / Ant. 1 / Connector 1 / Configuration 2
Test Date	Feb. 17, 2011		

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	4803.87	51.80	74.00	-22.20	49.41	4.23	35.20	33.36	67	117	Peak	HORIZONTAL
2 a	4804.09	44.71	54.00	-9.29	42.32	4.23	35.20	33.36	67	117	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	4803.95	53.04	74.00	-20.96	50.65	4.23	35.20	33.36	90	180	Peak	VERTICAL
2 a	4804.09	46.88	54.00	-7.12	44.49	4.23	35.20	33.36	90	180	Average	VERTICAL

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 39 / Ant. 1 / Connector 1 / Configuration 2
Test Date	Feb. 17, 2011		

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	4881.91	51.47	74.00	-22.53	48.86	4.33	35.20	33.48	94	137	Peak	HORIZONTAL
2 a	4882.10	44.38	54.00	-9.62	41.77	4.33	35.20	33.48	94	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 a	4882.06	49.00	54.00	-5.00	46.39	4.33	35.20	33.48	90	114	Average	VERTICAL
2 p	4882.23	55.12	74.00	-18.88	52.51	4.33	35.20	33.48	90	114	Peak	VERTICAL

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 78 / Ant. 1 / Connector 1 / Configuration 2
Test Date	Feb. 17, 2011		

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	4959.81	49.73	74.00	-24.27	46.87	4.42	35.20	33.64	101	138	Peak	HORIZONTAL
2 a	4960.09	40.54	54.00	-13.46	37.68	4.42	35.20	33.64	101	138	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	4959.98	53.30	74.00	-20.70	50.44	4.42	35.20	33.64	90	126	Peak	VERTICAL
2 a	4960.09	46.66	54.00	-7.34	43.80	4.42	35.20	33.64	90	126	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.

<Configuration 2 with Ant. 2 (Dipole Antenna)>

Temperature	21℃	**Humidity**	61%
Test Engineer	Magic Lai	**Configurations**	Channel 0 / Ant. 2 / Connector 1 / Configuration 2
Test Date	Feb. 16, 2011		

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	4803.96	43.80	54.00	-10.20	41.41	4.23	35.20	33.36	319	136	Average	HORIZONTAL
2	p	4804.25	51.22	74.00	-22.78	48.83	4.23	35.20	33.36	319	136	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	a	4803.93	50.65	54.00	-3.35	48.26	4.23	35.20	33.36	222	115	Average	VERTICAL
2	p	4804.24	56.43	74.00	-17.57	54.04	4.23	35.20	33.36	222	115	Peak	VERTICAL

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 39 / Ant. 2 / Connector 1 / Configuration 2
Test Date	Feb. 16, 2011		

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	4881.91	42.19	54.00	-11.81	39.58	4.33	35.20	33.48	316	193	Average	HORIZONTAL
2 p	4882.30	50.60	74.00	-23.40	47.99	4.33	35.20	33.48	316	193	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 a	4881.91	49.26	54.00	-4.74	46.65	4.33	35.20	33.48	88	125	Average	VERTICAL
2 p	4882.03	55.72	74.00	-18.28	53.11	4.33	35.20	33.48	88	125	Peak	VERTICAL

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 78 / Ant. 2 / Connector 1 / Configuration 2
Test Date	Feb. 16, 2011		

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	4959.66	46.17	74.00	-27.83	43.31	4.42	35.20	33.64	63	100	Peak	HORIZONTAL
2 a	4959.82	36.44	54.00	-17.56	33.58	4.42	35.20	33.64	63	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 a	4959.91	45.31	54.00	-8.69	42.45	4.42	35.20	33.64	83	140	Average	VERTICAL
2 p	4960.26	52.50	74.00	-21.50	49.64	4.42	35.20	33.64	83	140	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.

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 continuously transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

<Configuration 2 with Ant. 1 (PIFA Antenna)>

Temperature	21℃	Humidity	61%
Test Engineer	Magic Lai	Configurations	Channel 0, 39, 78 / Ant. 1 / Connector 1 / Configuration 2
Test Date	Feb. 17, 2011		

Channel 0

		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		2388.20	54.28	74.00	-19.72	23.37	2.86	0.00	28.05	118	126	Peak	HORIZONTAL
2		2390.00	43.23	54.00	-10.77	12.30	2.88	0.00	28.05	118	126	Average	HORIZONTAL
3	p	2402.00	104.09	74.00			2.88	0.00	28.09	118	126	Peak	HORIZONTAL
4	a	2402.00	100.32	54.00			2.88	0.00	28.09	118	126	Average	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2402 MHz.

Channel 39

		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	2440.80	103.97	74.00			2.91	0.00	28.18	186	155	Peak	VERTICAL
2	a	2441.00	100.15	54.00			2.91	0.00	28.18	186	155	Average	VERTICAL
3		2483.50	43.24	54.00	-10.76	12.05	2.93	0.00	28.26	186	155	Average	VERTICAL
4		2485.50	54.42	74.00	-19.58	23.19	2.93	0.00	28.30	186	155	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 2441 MHz.

Channel 78

		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	2480.00	104.56	74.00			2.93	0.00	28.26	267	177	Peak	HORIZONTAL
2	a	2480.00	100.74	54.00			2.93	0.00	28.26	267	177	Average	HORIZONTAL
3		2483.50	56.49	74.00	-17.51	25.30	2.93	0.00	28.26	267	177	Peak	HORIZONTAL
4	!	2483.50	49.02	54.00	-4.98	17.83	2.93	0.00	28.26	267	177	Average	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2480 MHz.

Note:

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

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

<Configuration 2 with Ant. 2 (Dipole Antenna)>

Temperature	21℃	**Humidity**	61%
Test Engineer	Magic Lai	**Configurations**	Channel 0, 39, 78 / Ant. 2 / Connector 1 / Configuration 2
Test Date	Feb. 16, 2011		

Channel 0

		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		2388.00	54.40	74.00	-19.60	23.49	2.86	0.00	28.05	264	100	Peak	VERTICAL
2		2390.00	43.82	54.00	-10.18	12.89	2.88	0.00	28.05	264	100	Average	VERTICAL
3	p	2402.00	107.21	74.00			2.88	0.00	28.09	264	100	Peak	VERTICAL
4	a	2402.00	103.37	54.00			2.88	0.00	28.09	264	100	Average	VERTICAL

Item 3, 4 are the fundamental frequency at 2402 MHz.

Channel 39

		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	2441.00	104.12	54.00			2.91	0.00	28.18	332	100	Average	VERTICAL
2	p	2441.20	107.67	74.00			2.91	0.00	28.18	332	100	Peak	VERTICAL
3		2483.50	43.27	54.00	-10.73	12.08	2.93	0.00	28.26	332	100	Average	VERTICAL
4		2484.70	52.83	74.00	-21.17	21.64	2.93	0.00	28.26	332	100	Peak	VERTICAL

Item 1, 2 are the fundamental frequency at 2441 MHz.

Channel 78

		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	2480.00	102.61	54.00			2.93	0.00	28.26	267	100	Average	VERTICAL
2	p	2480.20	105.99	74.00			2.93	0.00	28.26	267	100	Peak	VERTICAL
3		2483.50	58.09	74.00	-15.91	26.90	2.93	0.00	28.26	267	100	Peak	VERTICAL
4	!	2483.50	50.23	54.00	-3.77	19.04	2.93	0.00	28.26	267	100	Average	VERTICAL

Item 1, 2 are the fundamental frequency at 2480 MHz.

Note:

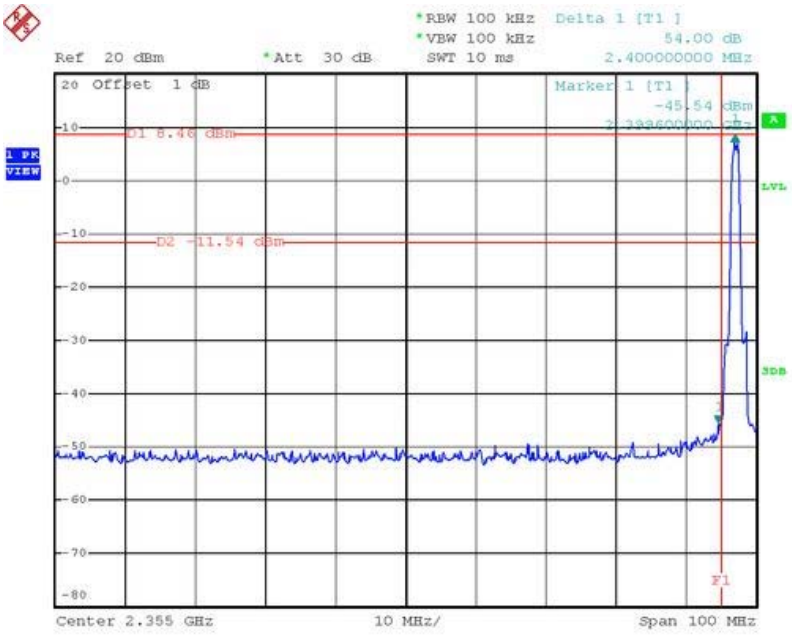
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

For Emission not in Restricted Band

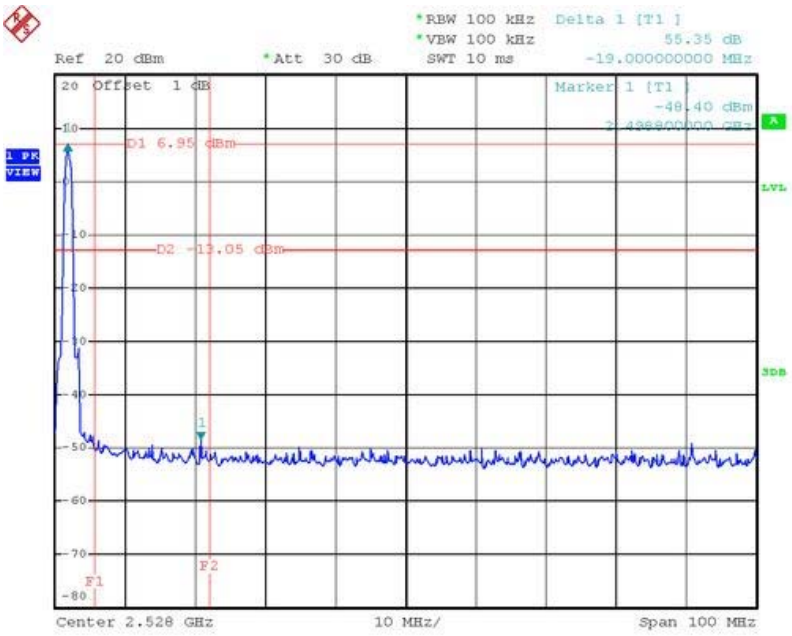
<Configuration 2 with Ant. 1 (PIFA Antenna)>

Low Band Edge Plot on Channel 0 / Ant. 1 / 2402 MHz



Date: 13.APR.2011 09:20:42

High Band Edge Plot on Channel 78 / Ant. 1 / 2480 MHz

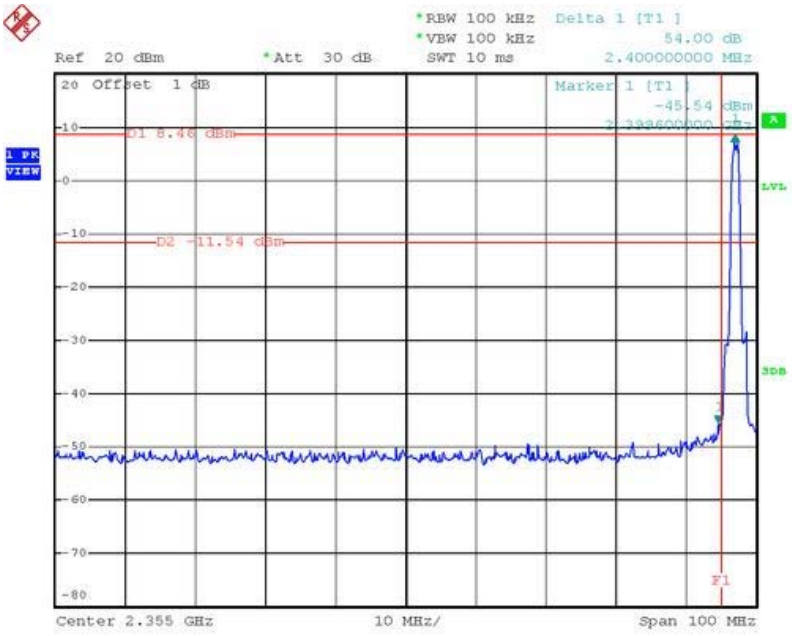


Date: 13.APR.2011 09:12:26

For Emission not in Restricted Band

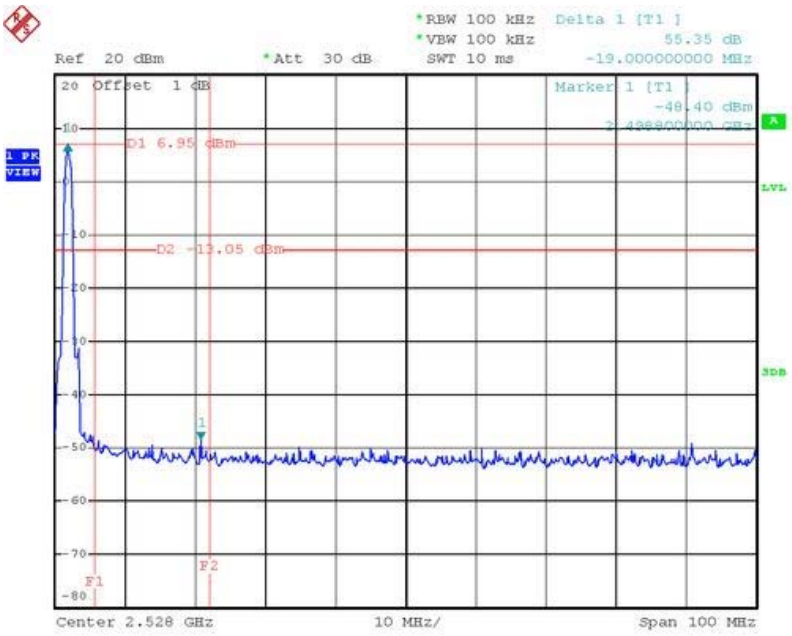
<Configuration 2 with Ant. 2 (Dipole Antenna)>

Low Band Edge Plot on Channel 0 / Ant. 2 / 2402 MHz



Date: 13.APR.2011 09:20:42

High Band Edge Plot on Channel 78 / Ant. 2 / 2480 MHz



Date: 13.APR.2011 09:12:26

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, 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	Nov. 16, 2010	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K~30MHz	Jan. 04, 2011	Conduction (CO01-CB)
COND Cable	-	Cable	-	0.15MHz~30MHz	Dec. 04, 2010	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 17, 2010	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 22, 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	Nov. 17, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2010	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP	100304	9kHz ~ 40GHz	Nov. 22, 2010	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 22, 2010	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 22, 2011	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2010*	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, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP30	100023	9KHz~30GHz	Mar. 15, 2011	Conducted (TH01-CB)
Spectrum analyzer	R&S	FSV30	101026	9KHz~30GHz	Jul. 23, 2010	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	May 21, 2010	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2010	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 19, 2010	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)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	Mar. 18, 2010	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071042	1GHz – 18GHz	Oct. 14, 2010	Radiation (05CH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 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: * Calibration Interval of instruments listed above is two years.

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 728, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085

7. TAF CERTIFICATE OF ACCREDITATION

Certificate No.：L1190-091230

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	：	ISO/IEC 17025:2005
Accreditation Number	：	1190
Originally Accredited	：	December 15, 2003
Effective Period	：	January 10, 2010 to January 09, 2013
Accredited Scope	：	Testing Field, see described in the Appendix
Specific Accreditation Program	：	Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangment with Foreign Authorities

Jay-San Chen
President, Taiwan Accreditation Foundation
Date：December 30, 2009

P1, total 22 pages

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