FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	**Pocket-Sized Mobile Computer**
Model No.	:	**DL-MEMOR**
Brand Name	:	**Datalogic Memor™**
Filing Type	:	**New Application**
Applicant **Manufacturer**	:	**DATALOGIC MOBILE S.r.l.** Via S. Vitalino, 13 – 40012 Lippo di Calderara di Reno (Bologna) - ITALY
FCC ID	:	**U4GA030**
Received Date	:	Apr. 01, 2009
Final Test Date	:	Mar. 10, 2011

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 C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

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

SPORTON International Inc.

No.52 Hwa Ya 1st Rd, Hwa Ya Technology Park, Kwei-Shan Hsiang, Taoyuan Hsien, Taiwan, R.O.C.

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History of This Test Report

Original Issue Date: Mar. 17, 2011
Report No.: FR0O1814AD

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	Pocket-Sized Mobile Computer
Model No.	:	DL-MEMOR
Brand Name	:	Datalogic Memor™
Applicant	:	DATALOGIC MOBILE S.r.l. Via S. Vitalino, 13 – 40012 Lippo di Calderara di Reno (Bologna) - ITALY

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Apr. 01, 2009 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.

Wayne Hsu / Vice Manager

SPORTON International Inc.

No. 52 Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

1 SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	21.26 dB
3.2	15.247(b)(1)	Peak Output Power	Complies	27.77 dB
3.3	15.247(a)(1)	Hopping Channel Separation	Complies	-
3.4	15.247(b)(1)	Number of Hopping Frequency	Complies	-
3.5	15.247(a)(1)	Dwell Time	Complies	-
3.6	15.247(d)	Radiated Emissions	Complies	4.69 dB
3.7	15.247(d)	Band Edge Emissions	Complies	-
3.8	15.203	Antenna Requirements	Complies	-

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

2 GENERAL INFORMATION

2.1 Feature of Equipment under Test

Product Feature & Specification	
Model	DL-MEMOR
Equipment Description	DL-Memor+802.11+BT+1DGS+CE5
	DL-Memor+802.11+BT+2D+CE5
	DL-Memor+802.11+BT+1DGS+WM6.1
	DL-Memor+802.11+BT+2D+WM6.1
Sample A	DL-Memor+802.11+BT+1DGS+WM6.1 (P/N: 944201040)
Sample B	DL-Memor+802.11+BT+2D+WM6.1 (P/N: 944201041)
HW Version	R1
SW Version	4.0

Items	Description
Power Type	12V from Adapter；7.4Vdc from Li-ion Battery
Modulation	FHSS (GFSK/ π/4-DQPSK/ 8DPSK)
Data Rate (Mbps)	GFSK: 1/ π/4-DQPSK: 2/ 8DPSK: 3
Frequency Range	2400 ~ 2483.5MHz
Channel Number	79
Channel Band Width (99%)	1.156 MHz
Conducted Output Power	2.23 dBm

Antenna Type	Connector	Gain (dBi)
		2.4G
PIFA Antenna	I-PEX	-0.78

List of Accessory:

Product Feature & Specification	
AC Adapter	Brand/Model Name: AKII/A15P2-05MP Power Rating: /P: 100-240Vac, 47-63Hz, 0.5A; O/P: 5Vdc, 3.0A AC Power Cord Type: 1.5 meter shielded cable without ferrite core
Battery	Brand/Model Name: ETICA/ BP08-000600 Power Rating: 3.7Vdc, 1100mA Type: Li-ion
Earphone	Brand/Model Name: AATCC/ AEP-HA36D-04 Signal Line Type: 1.3 meter non-shielded cable without ferrite core
USB Cable	Brand/Model Name: CHIN SHONG/ S081219201 Signal Line Type: 1.2 meter non-shielded cable without ferrite core
RS232 Cable	Signal Line Type: 1.6 meter non-shielded cable without ferrite core
LCD Panel	Brand/Model Name: EVERVISION/ VGG2432B3-7UFLWA-S-REV5
1D Scan Module	Brand/Model Name: Motorola/SE950
2D Scan Module	Brand/Model Name: Motorola/SE4500
Bluetooth Module	Brand/Model Name: EGIGA/BC04 ROM

2.2 Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2400~2483.5MHz	0	2402 MHz
	1	2403 MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

2.3 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
AC Power Conducted Emissions	Normal Mode	Auto	-
Max. Conducted Output Power	GFSK/ π/4-DQPSK/ 8DPSK	1 Mbps/ 2 Mbps/ 3 Mbps	0/39/78
Hopping Channel Separation	8DPSK	3 Mbps	0~1/39~40/77~78
Number of Hopping Frequency	8DPSK	3 Mbps	0~78
Dwell Time	8DPSK DH5	3 Mbps	39
Radiated Emissions	8DPSK	3 Mbps	0/39/78
Band Edge Emissions	8DPSK	3 Mbps	0/78

2.4 Table for Testing Locations

Test Site No.	Site Category	Location
CO05-HY	Conduction	Hwa Ya
TH02-HY	OVEN Room	Hwa Ya
03CH07-HY	SAC	Hwa Ya

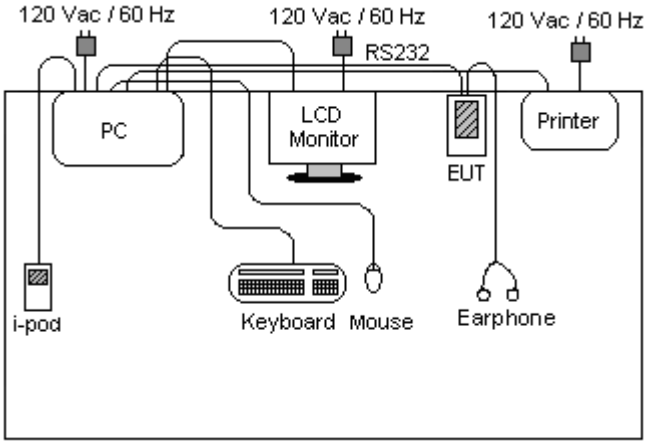
Semi Anechoic Chamber (SAC).

2.5 Table for Supporting Units

Support Unit	Brand	Model	FCC ID	Remark
Person Computer	HP	DC7700	N/A	Conducted Emissions
LCD Monitor	DELL	2408WFPb	N/A	
(PS/2) Keyboard	HP	KB-0133	DoC	
(PS/2) Mouse	HP	M-S69	DoC	
Micro SD Card	SanDisk	1GB	N/A	
Wireless AP (Remote workstation)	D-Link	DNS-G120	DoC	
Bluetooth Headset (Remote workstation)	Sony Ericsson	Hbh-pv702	DoC	
WLAN AP	D-Link	DIR-628	KADIR628A2	Radiated Emissions
Person Computer	DELL	T3400	DoC	
LCD Monitor	Lenovo	6135-AB1	DoC	
(PS2) Keyboard	Acer	KB-2971	DoC	
(PS2) Mouse	detrois	CM-201	DoC	
i-pod	Apple	A1199	DoC	
Printer	HP	LaserJet1300	DoC	
Bluetooth Earphone	Nokia	BH-100	PYA1YH	
Bluetooth Dongle	Ergotech	ET-BD201	PQY-4710874203662	

2.6 Test Configurations

<Radiated Emission>



3 TEST RESULT

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 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.

Class B

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

3.1.2 Measuring Instruments and Setting

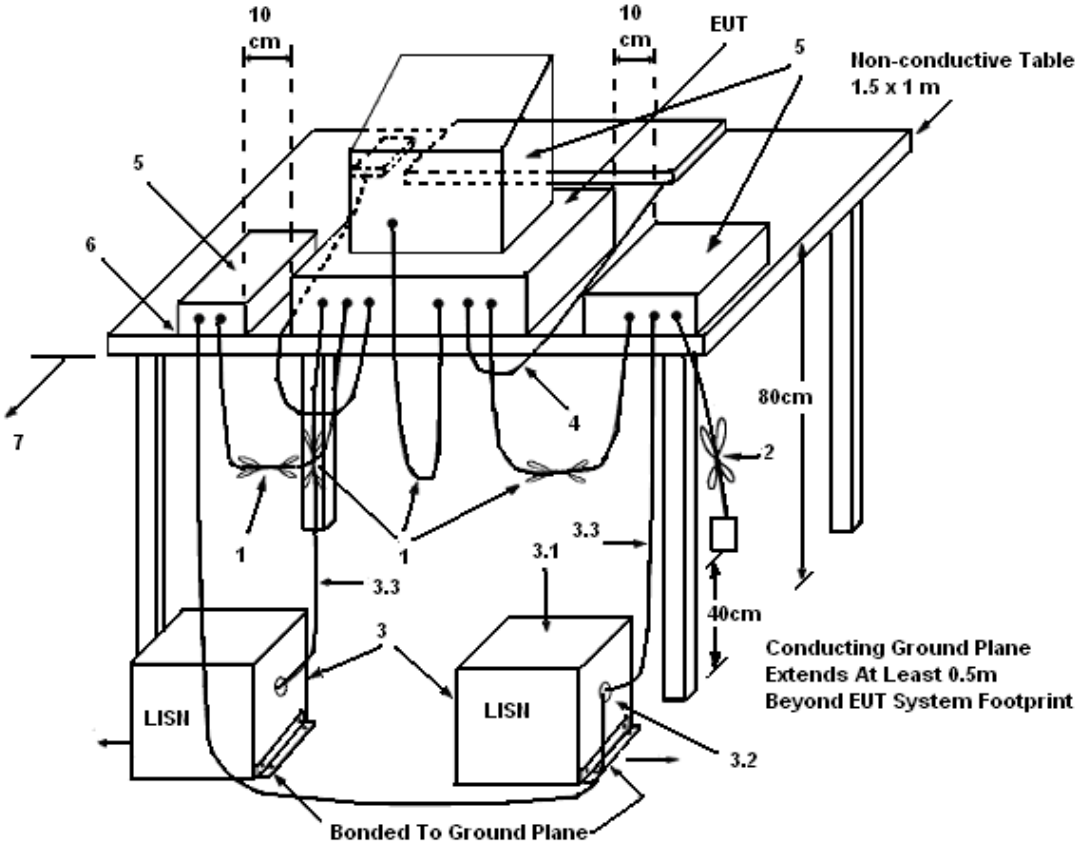
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

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

3.1.3 Test Procedures

1. The EUT warm up about 15 minutes then start test.
2. 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.
3. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. The measurement has to be done between each power line and ground at the power terminal.

3.1.4 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.

3.1.5 Test Deviation

There is no deviation with the original standard.

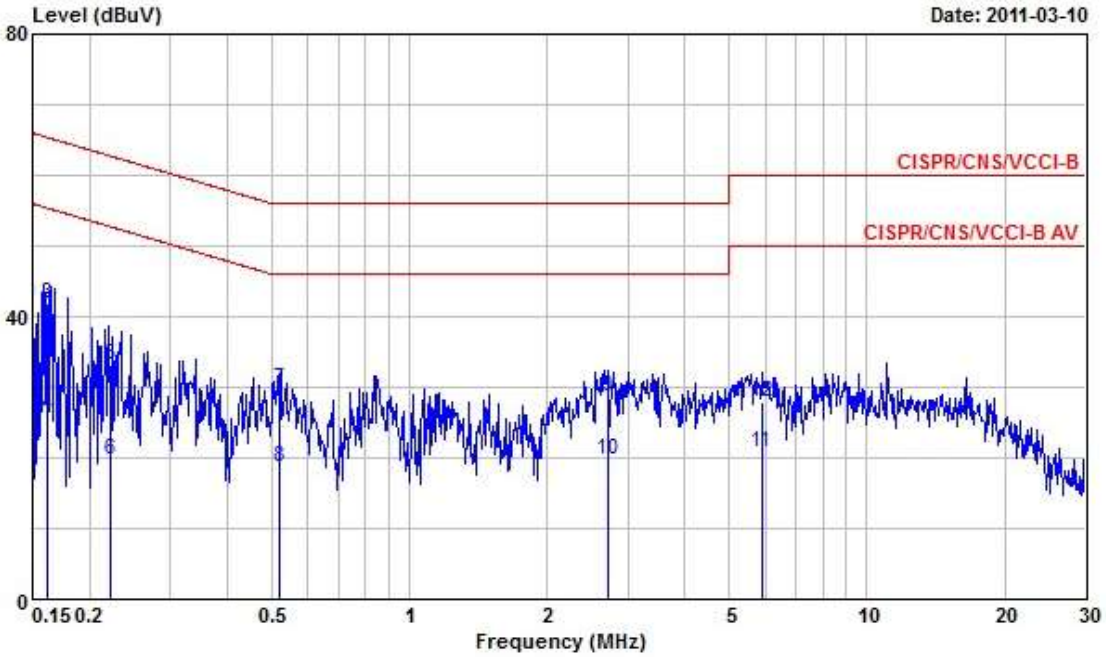
3.1.6 EUT Operation during Test

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

3.1.7 Results of AC Power Line Conducted Emissions Measurement

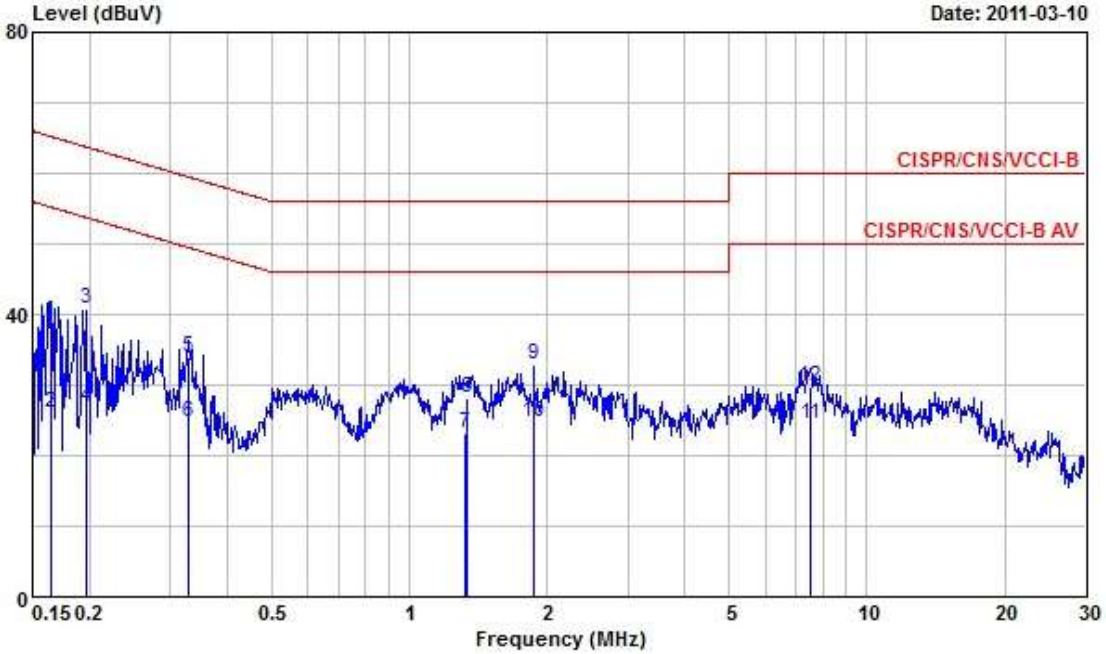
Final Test Date	Mar. 10, 2011	**Test Site No.**	CO04-HY
Temperature	22.3℃	**Humidity**	54.6%
Test Engineer	Jason	**Configuration**	Normal Mode

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	41.94	-24.06	66.00	41.58	0.30	0.06	QP
2	0.1500000	23.17	-32.83	56.00	22.81	0.30	0.06	Average
3	0.1616020	41.97	-23.41	65.38	41.60	0.30	0.07	QP
4	0.1616020	26.07	-29.31	55.38	25.70	0.30	0.07	Average
5	0.2215340	33.13	-29.63	62.76	32.75	0.30	0.08	QP
6	0.2215340	19.79	-32.97	52.76	19.41	0.30	0.08	Average
7	0.5175120	29.82	-26.18	56.00	29.50	0.29	0.03	QP
8	0.5175120	18.73	-27.27	46.00	18.41	0.29	0.03	Average
9	2.710	28.56	-27.44	56.00	28.14	0.32	0.10	QP
10	2.710	19.78	-26.22	46.00	19.36	0.32	0.10	Average
11	5.900	20.73	-29.27	50.00	20.24	0.39	0.10	Average
12	5.900	27.77	-32.23	60.00	27.28	0.39	0.10	QP

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1641380	39.05	-26.20	65.25	38.72	0.26	0.07	QP
2	0.1641380	26.04	-29.21	55.25	25.71	0.26	0.07	Average
3	0.1972380	40.67	-23.06	63.73	40.32	0.25	0.10	QP
4	0.1972380	26.94	-26.79	53.73	26.59	0.25	0.10	Average
5	0.3303280	33.99	-25.45	59.44	33.72	0.24	0.03	QP
6	0.3303280	24.69	-24.75	49.44	24.42	0.24	0.03	Average
7	1.326	23.11	-22.89	46.00	22.75	0.26	0.10	Average
8	1.330	28.15	-27.85	56.00	27.79	0.26	0.10	QP
9	1.870	32.93	-23.07	56.00	32.56	0.27	0.10	QP
10 @	1.870	24.74	-21.26	46.00	24.37	0.27	0.10	Average
11	7.530	24.51	-25.49	50.00	24.05	0.36	0.10	Average
12	7.530	29.70	-30.30	60.00	29.24	0.36	0.10	QP

Note:
Level = Read Level + LISN Factor + Cable Loss.

3.2 Peak Output Power Measurement

3.2.1 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 125 mW. The limited has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

3.2.2 Measuring Instruments and Setting

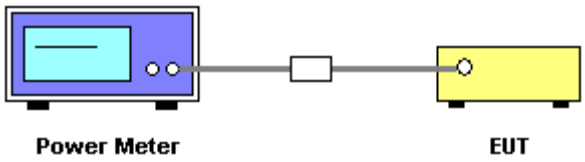
Please refer to section 4 of equipments list in this report. The following table is the setting of the power meter.

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

3.2.3 Test Procedures

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

3.2.4 Test Setup Layout



3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7 Test Result of Maximum Peak Output Power

Final Test Date	Apr. 13, 2009	**Test Site No.**	TH02-HY
Temperature	23~24℃	**Humidity**	43~44%
Test Engineer	Eric Huang	**Configurations**	GFSK / π/4-DQPSK / 8DPSK

1Mbps

Channel	Frequency	Conducted Power (dBm)	Max. Limit (mW)	Result
0	2402 MHz	0.64	125	**Complies**
39	2441 MHz	0.55	125	**Complies**
78	2480 MHz	-0.12	125	**Complies**

2Mbps

Channel	Frequency	Conducted Power (dBm)	Max. Limit (mW)	Result
0	2402 MHz	1.87	125	**Complies**
39	2441 MHz	1.21	125	**Complies**
78	2480 MHz	-0.13	125	**Complies**

3Mbps

Channel	Frequency	Conducted Power (dBm)	Max. Limit (mW)	Result
0	2402 MHz	2.23	125	**Complies**
39	2441 MHz	1.60	125	**Complies**
78	2480 MHz	0.24	125	**Complies**

3.3 Hopping Channel Separation Measurement

3.3.1 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.

3.3.2 Measuring Instruments and Setting

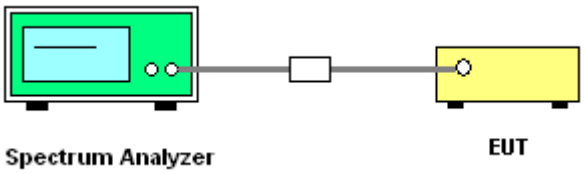
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

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

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilized for 20 dB bandwidth measurement.
3. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were utilized for channel separation measurement.

3.3.4 Test Setup Layout



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

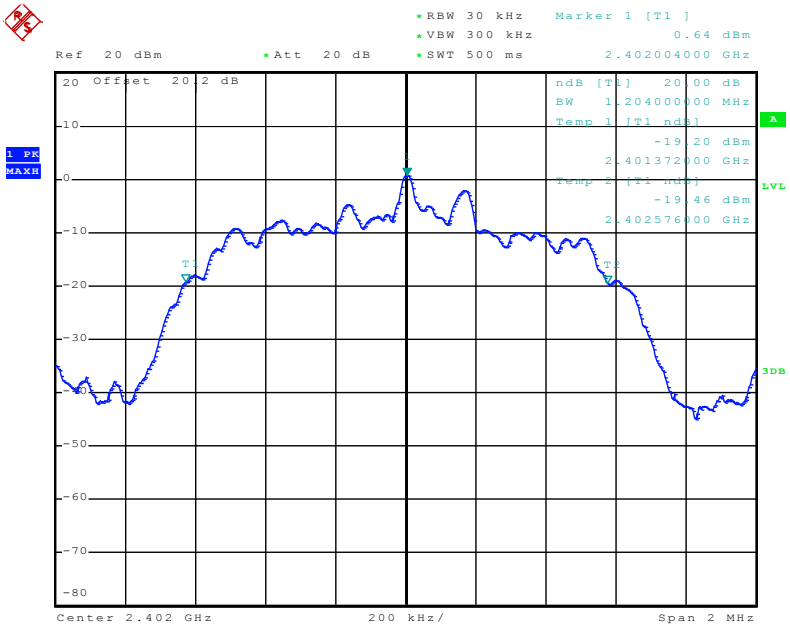
3.3.7 Test Result of Hopping Channel Separation

Final Test Date	Apr. 13, 2009	**Test Site No.**	TH02-HY
Temperature	23~24℃	**Humidity**	43~44%
Test Engineer	Eric Huang	**Configurations**	8DPSK

Frequency	Ch. Separation (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Result
2402 MHz	1.000	1.240	1.152	**Complies**
2441 MHz	1.000	1.220	1.152	**Complies**
2480 MHz	1.000	1.240	1.156	**Complies**

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

20 dB Bandwidth Plot on Channel 0 / 2402 MHz



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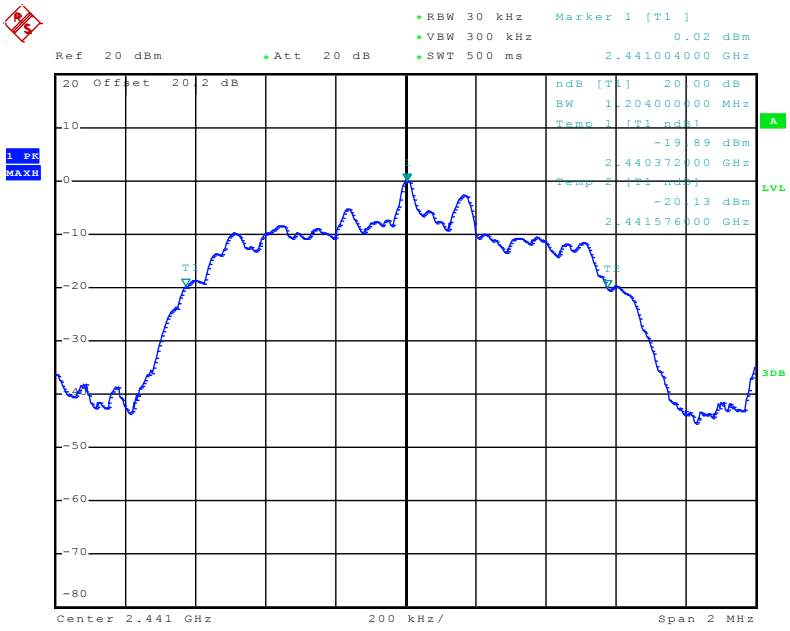
20 dB Bandwidth Plot on Channel 39 / 2441 MHz



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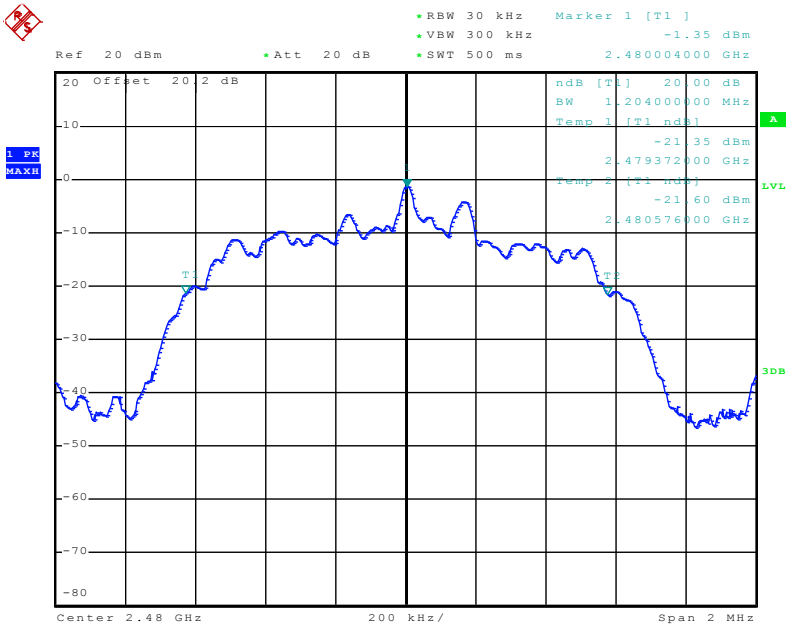
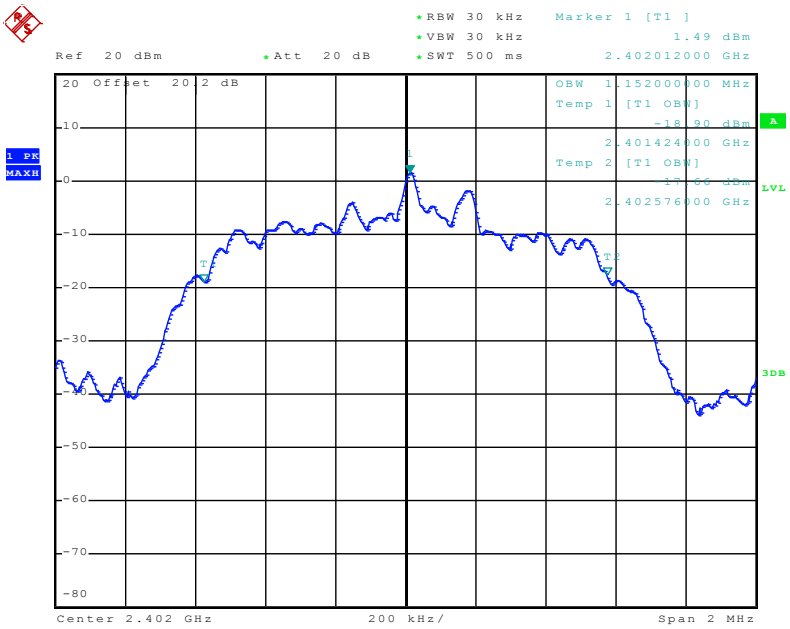
20 dB Bandwidth Plot on Channel 78 / 2480 MHz



Date: 13.APR.2009 20:02:03

99% Occupied Bandwidth Plot on Channel 2402 MHz



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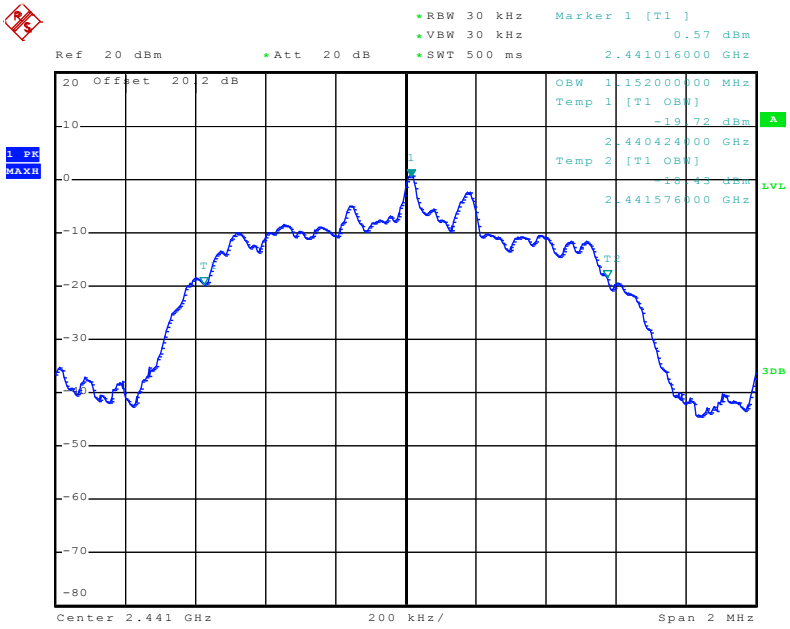
99% Occupied Bandwidth Plot on Channel 2441 MHz



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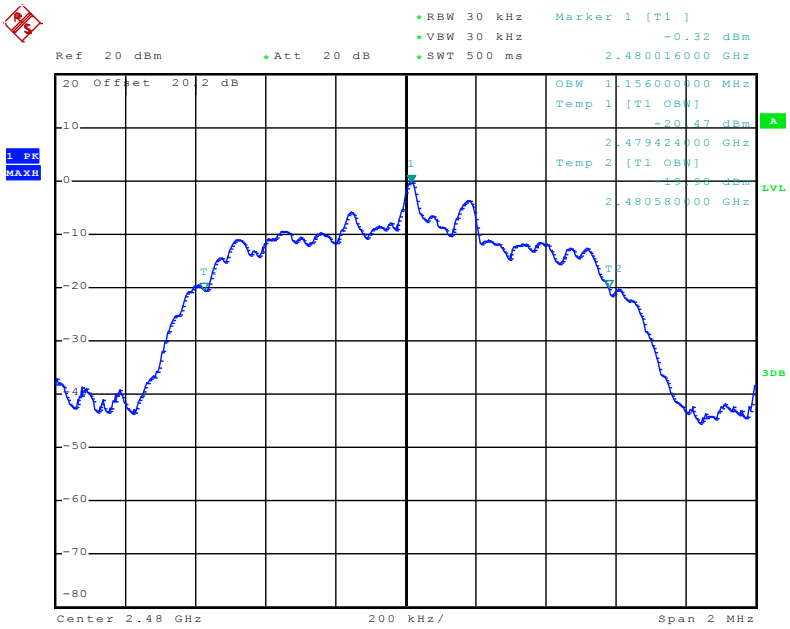
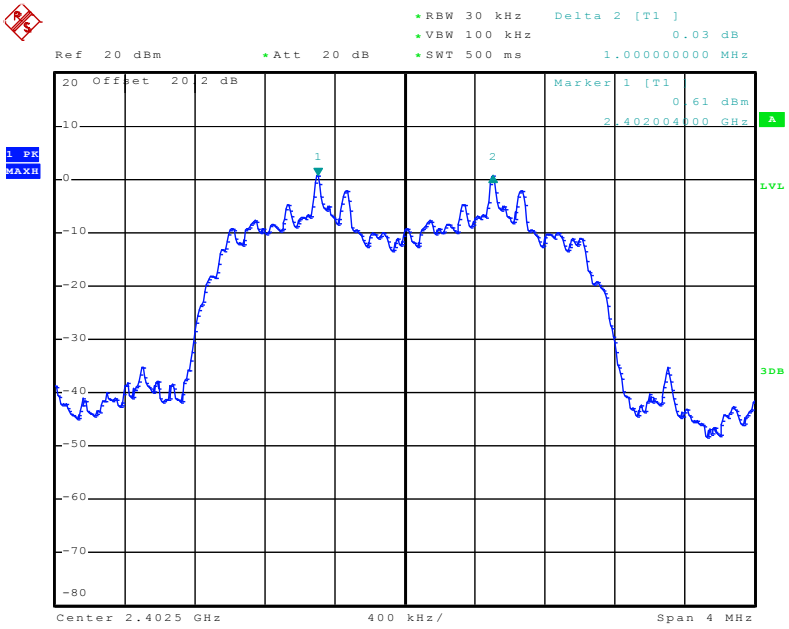
99% Occupied Bandwidth Plot on Channel 2480 MHz



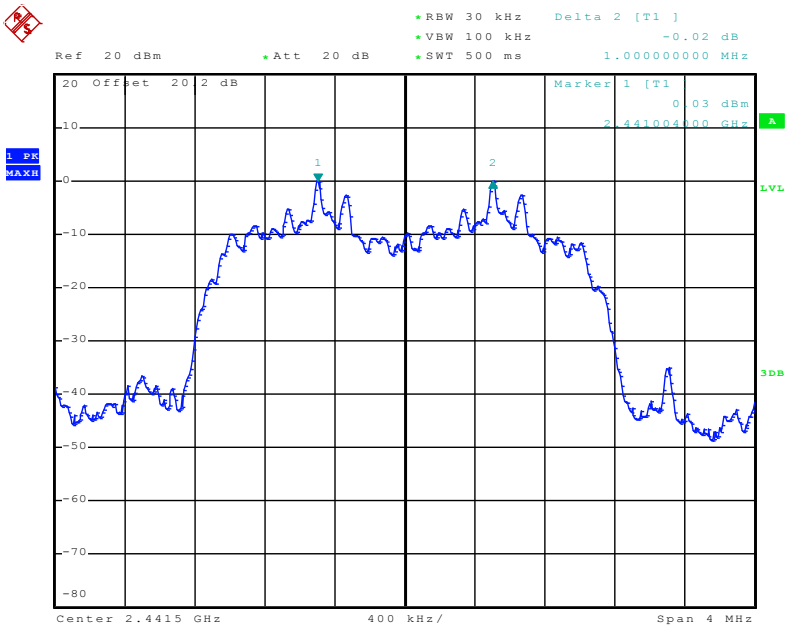
Date: 13.APR.2009 21:08:21

Channel Separation Plot on Channel 0~1 / 2402 MHz ~ 2403 MHz



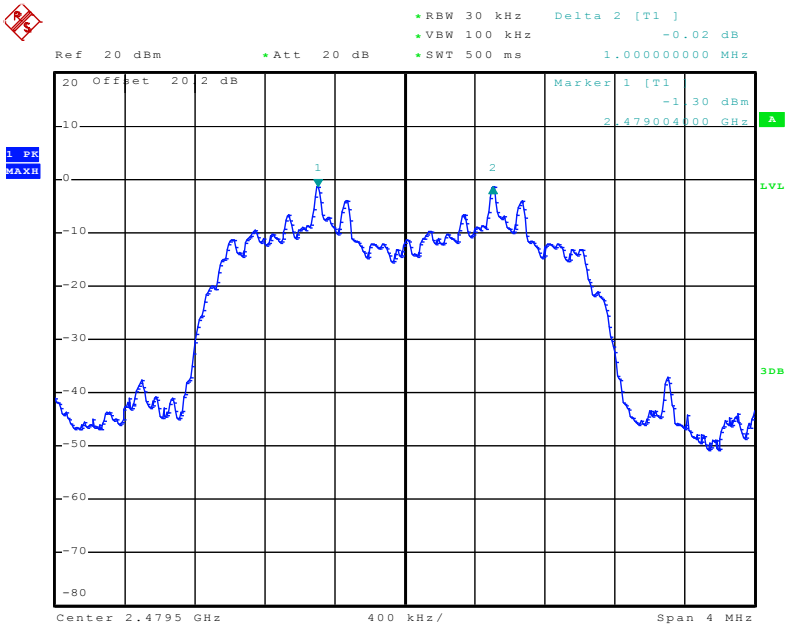
Date: 13.APR.2009 20:22:51

Channel Separation Plot on Channel 39~40 / 2441 MHz ~ 2442 MHz



Date: 13.APR.2009 20:23:23

Channel Separation Plot on Channel 77~78 / 2479 MHz ~ 2480 MHz



Date: 13.APR.2009 20:23:51

3.4 Number of Hopping Frequency Measurement

3.4.1 Limit

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

3.4.2 Measuring Instruments and Setting

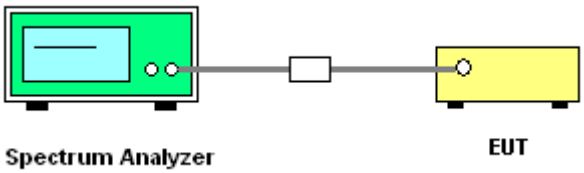
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.4.3 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.

3.4.4 Test Setup Layout



3.4.5 Test Deviation

There is no deviation with the original standard.

3.4.6 EUT Operation during Test

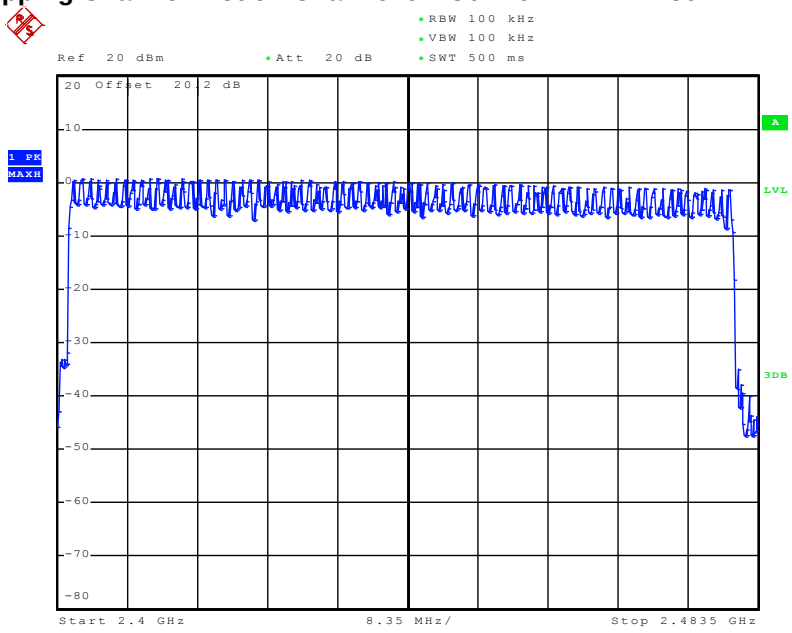
The EUT was programmed to be in continuously transmitting mode.

3.4.7 Test Result of Number of Hopping Frequency

Final Test Date	Apr. 13, 2009	**Test Site No.**	TH02-HY
Temperature	23~24℃	**Humidity**	43~44%
Test Engineer	Eric Huang	**Configurations**	8DPSK

Modulation Type	**Channel No.**	**Frequency (MHz)**	**Hopping Ch. (Channels)**	**Min. Limit (Channels)**	**Test Result**
8DPSK	0 ~ 78	2402 ~ 2480	79	15	**Complies**

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



Date: 13.APR.2009 20:40:40

3.5 Dwell Time Measurement

3.5.1 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.

3.5.2 Measuring Instruments and Setting

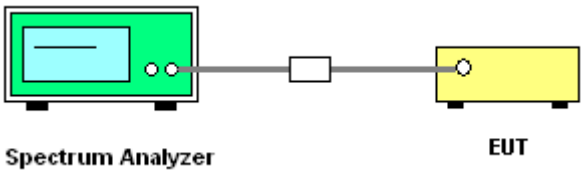
Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer.

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

3.5.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer
2. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
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 DH5, DH3 and DH1 packet transmitting.
8. Measure the maximum time duration of one single pulse.
9. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds
10. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
11. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.

3.5.4 Test Setup Layout



3.5.5 Test Deviation

There is no deviation with the original standard.

3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.5.7 Test Result of Dwell Time

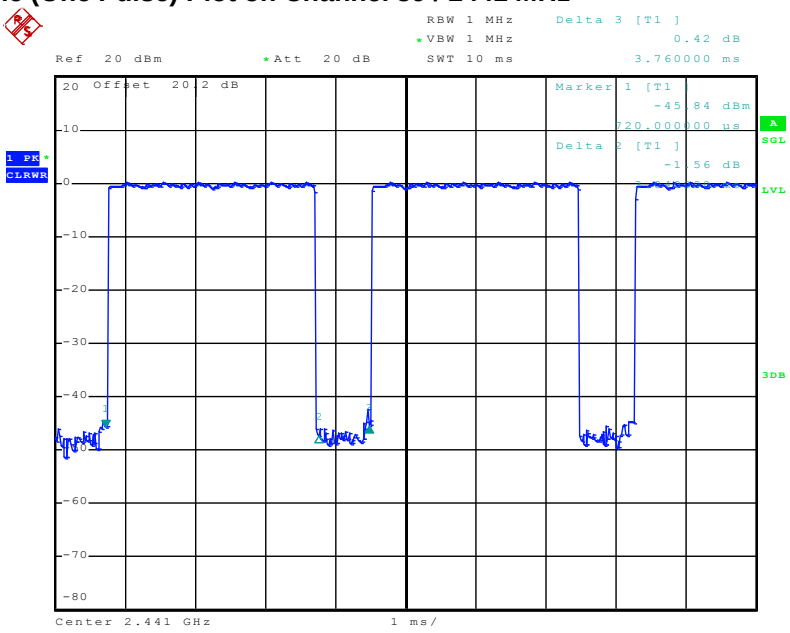
Final Test Date	Apr. 13, 2009	**Test Site No.**	TH02-HY
Temperature	23~24℃	**Humidity**	43~44%
Test Engineer	Eric Huang	**Configurations**	8DPSK Ch.39 3DH5

Package Mode	**Average Hopping Channel**	**Package Transfer Time (usec)**	**Dwell Time (sec)**	**Limits (sec)**	**Pass/Fail**
3DH5	3.400	3040.000	0.327	0.4	Pass

Remark:

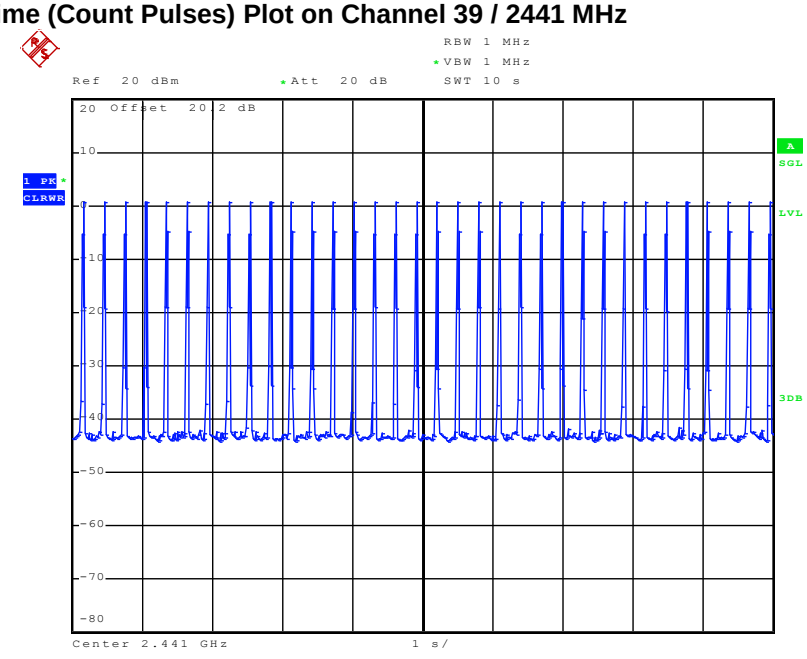
1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number.
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)

DH5 Dwell Time (One Pulse) Plot on Channel 39 / 2441 MHz



Date: 1.APR.2009 18:36:51

DH3 Dwell Time (Count Pulses) Plot on Channel 39 / 2441 MHz



Date: 13.APR.2009 20:27:32

3.6 Radiated Emissions Measurement

3.6.1 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

3.6.2 Measuring Instruments and Setting

Please refer to section 4 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

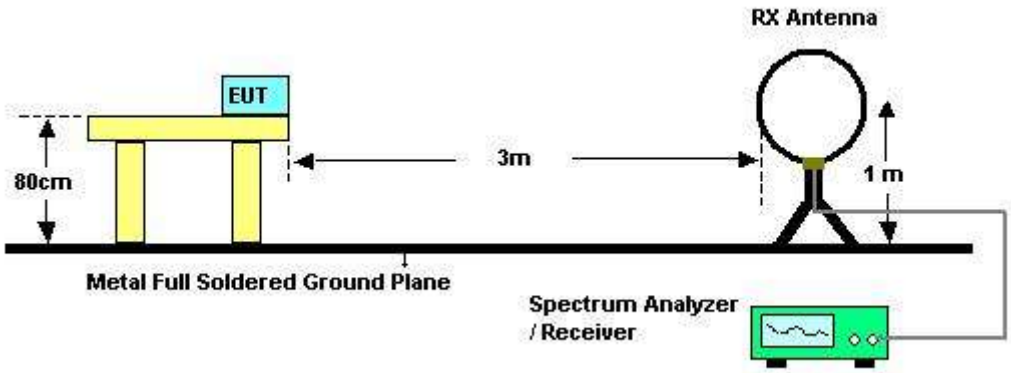
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.6.3 Test Procedures

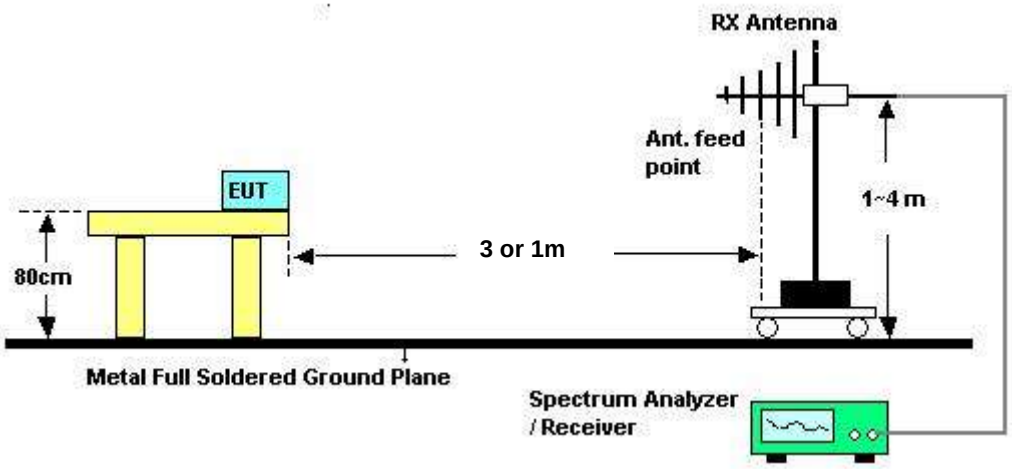
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

3.6.4 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 1m.
Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

3.6.5 Test Deviation

There is no deviation with the original standard.

3.6.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.6.7 Results of Radiated Emissions (9kHz~30MHz)

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang		

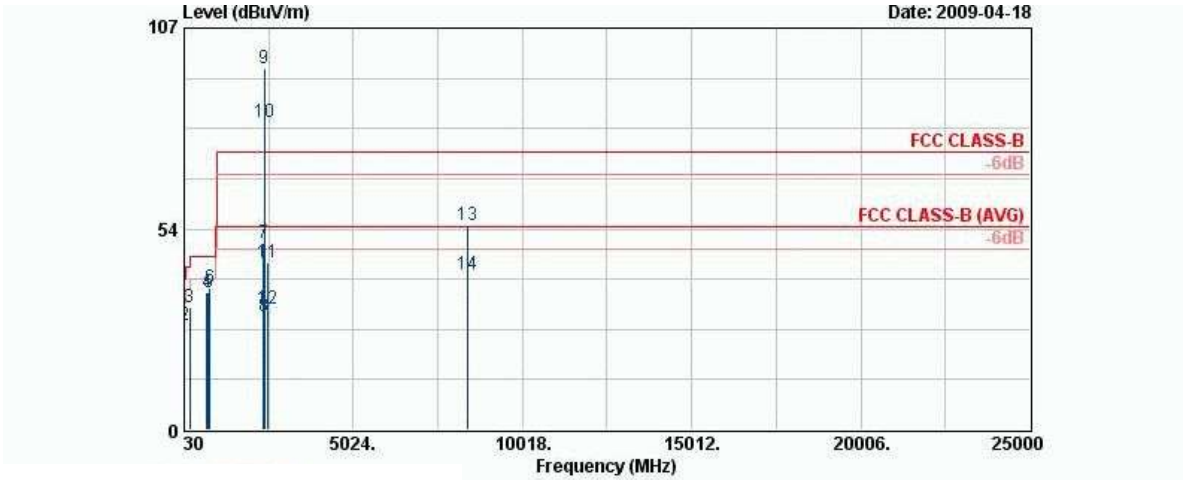
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

3.6.8 Results of Radiated Emissions (30MHz ~ 10th Harmonic)

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang	**Configuration**	Ch. 0

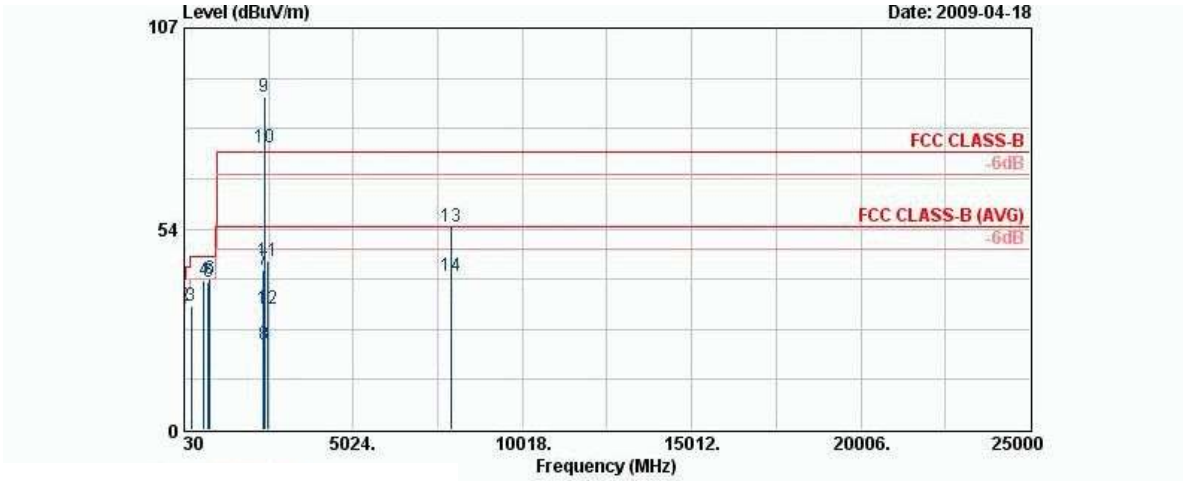
Horizontal



		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1		30.81	28.84	-11.16	40.00	40.53	19.36	0.65	31.70	---	---	Peak
2		50.25	27.87	-12.13	40.00	49.54	9.20	0.83	31.70	---	---	Peak
3		187.41	32.60	-10.90	43.50	53.17	9.40	1.65	31.61	---	---	Peak
4		701.80	36.57	-9.43	46.00	42.98	20.94	3.56	30.90	---	---	Peak
5		741.00	36.72	-9.28	46.00	42.22	21.64	3.67	30.82	---	---	Peak
6		780.20	37.88	-8.12	46.00	42.97	21.86	3.79	30.74	100	128	Peak
7		2375.93	49.89	-24.11	74.00	46.80	32.02	5.46	34.38	160	10	Peak
8		2375.93	30.18	-23.82	54.00	27.08	32.00	5.47	34.38	160	10	Average
9	@	2402.00	96.22	22.22	74.00	93.13	32.03	5.44	34.38	160	10	Peak
10	@	2402.00	81.92	27.92	54.00	78.83	32.02	5.46	34.38	160	10	Average
11		2500.00	44.55	-29.45	74.00	41.48	32.10	5.37	34.40	160	10	Peak
12		2500.00	32.08	-21.92	54.00	29.01	32.10	5.37	34.40	160	10	Average
13		8397.00	54.67	-19.33	74.00	44.18	35.68	10.11	35.30	100	106	Peak
14		8397.00	41.23	-12.77	54.00	30.74	35.68	10.11	35.30	100	106	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored

Vertical

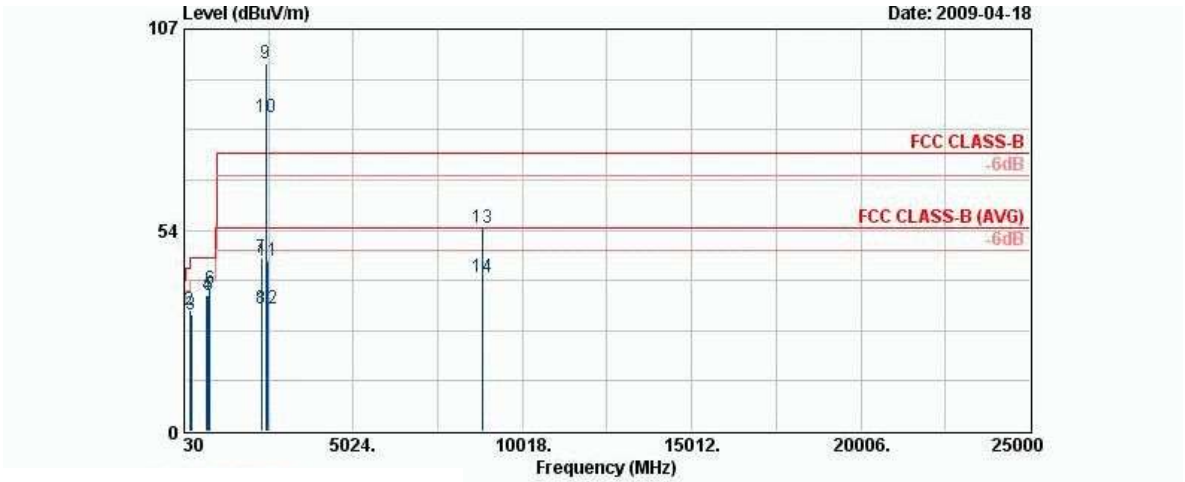


		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1		30.54	29.49	-10.51	40.00	41.18	19.36	0.65	31.70	---	---	Peak
2		50.25	33.14	-6.86	40.00	54.81	9.20	0.83	31.70	---	---	Peak
3		243.30	32.86	-13.14	46.00	50.26	12.23	1.89	31.51	---	---	Peak
4		623.40	39.77	-6.23	46.00	47.64	19.78	3.33	30.98	---	---	Peak
5		741.00	39.33	-6.67	46.00	44.84	21.64	3.67	30.82	---	---	Peak
6	!	780.20	40.29	-5.71	46.00	45.38	21.86	3.79	30.74	100	294	Peak
7		2372.13	42.54	-31.46	74.00	39.42	31.95	5.53	34.36	100	46	Peak
8		2372.13	22.83	-31.17	54.00	19.73	32.00	5.47	34.38	100	46	Average
9	X	2402.00	88.87	14.87	74.00	85.78	32.03	5.44	34.38	100	46	Peak
10	@	2402.00	75.33	21.33	54.00	72.24	32.02	5.46	34.38	100	46	Average
11		2494.00	44.83	-29.17	74.00	41.76	32.10	5.37	34.40	100	46	Peak
12		2494.00	32.10	-21.90	54.00	29.03	32.10	5.37	34.40	100	46	Average
13		7926.00	54.24	-19.76	74.00	44.14	35.58	9.81	35.28	100	215	Peak
14		7926.00	41.03	-12.97	54.00	30.93	35.58	9.81	35.28	100	215	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored.

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang	**Configuration**	Ch. 39

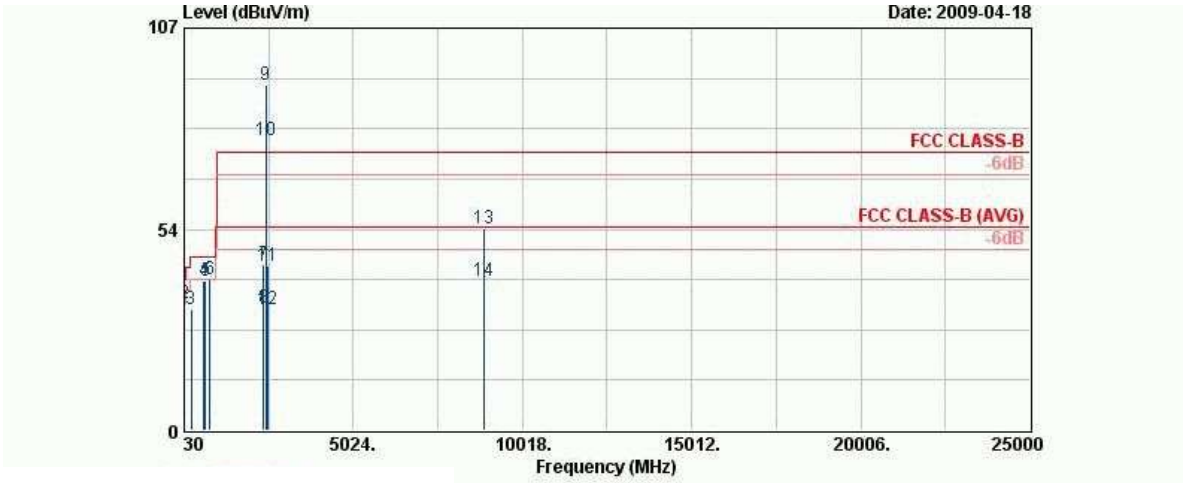
Horizontal



		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1		30.54	27.60	-12.40	40.00	39.29	19.36	0.65	31.70	---	---	Peak
2		189.30	32.42	-11.08	43.50	52.97	9.40	1.66	31.61	---	---	Peak
3		242.49	30.98	-15.02	46.00	48.46	12.15	1.89	31.51	---	---	Peak
4		701.80	36.25	-9.75	46.00	42.65	20.94	3.56	30.90	---	---	Peak
5		741.00	36.36	-9.64	46.00	41.86	21.64	3.67	30.82	---	---	Peak
6		780.20	37.97	-8.03	46.00	43.06	21.86	3.79	30.74	100	281	Peak
7		2318.00	46.11	-27.89	74.00	43.00	31.96	5.51	34.37	100	339	Peak
8		2318.00	32.61	-21.39	54.00	29.50	31.96	5.51	34.37	100	339	Average
9	@	2441.00	97.88	23.88	74.00	94.80	32.06	5.41	34.39	100	339	Peak
10	@	2441.00	83.69	29.69	54.00	80.61	32.06	5.41	34.39	100	339	Average
11		2484.00	45.28	-28.72	74.00	42.21	32.09	5.38	34.40	100	339	Peak
12		2484.00	32.59	-21.41	54.00	29.52	32.09	5.38	34.40	100	339	Average
13		8853.00	54.19	-19.81	74.00	43.29	35.98	10.29	35.37	100	239	Peak
14		8853.00	41.06	-12.94	54.00	30.16	35.98	10.29	35.37	100	239	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored.

Vertical

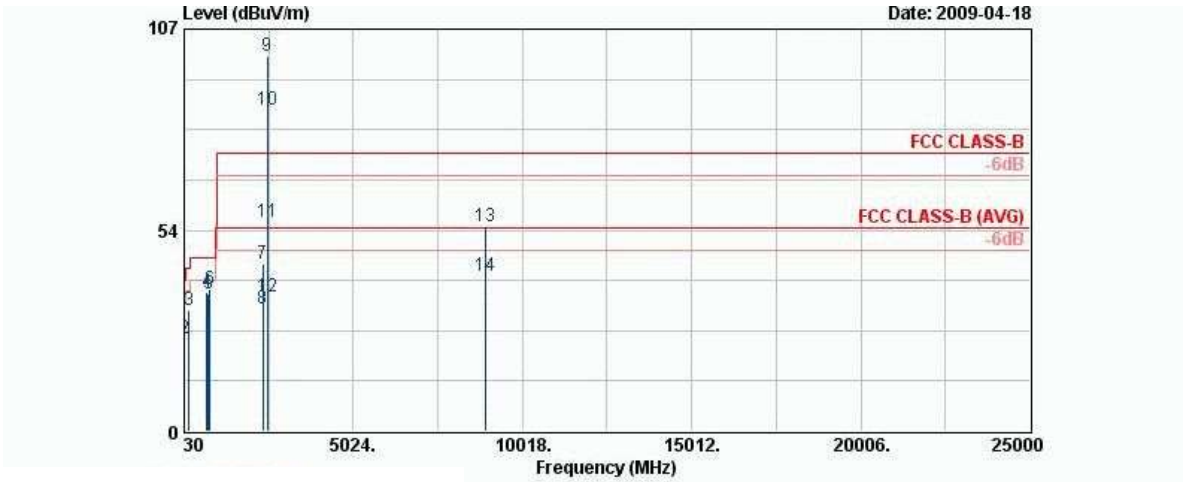


		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1		31.62	26.41	-13.59	40.00	38.63	18.82	0.66	31.70	---	---	Peak
2	!	50.25	34.00	-6.00	40.00	55.67	9.20	0.83	31.70	---	---	Peak
3		242.49	32.24	-13.76	46.00	49.72	12.15	1.89	31.51	---	---	Peak
4		623.40	39.66	-6.34	46.00	47.53	19.78	3.33	30.98	---	---	Peak
5		662.60	39.73	-6.27	46.00	46.92	20.30	3.45	30.94	---	---	Peak
6	!	780.20	40.13	-5.87	46.00	45.22	21.86	3.79	30.74	100	108	Peak
7		2372.00	44.35	-29.65	74.00	41.25	32.00	5.47	34.38	117	312	Peak
8		2372.00	32.42	-21.58	54.00	29.32	32.00	5.47	34.38	117	312	Average
9	X	2441.00	91.87	17.87	74.00	88.79	32.06	5.41	34.39	117	312	Peak
10	@	2441.00	77.12	23.12	54.00	74.04	32.06	5.41	34.39	117	312	Average
11		2484.00	43.76	-30.24	74.00	40.69	32.09	5.38	34.40	117	312	Peak
12		2484.00	32.22	-21.78	54.00	29.15	32.09	5.38	34.40	117	312	Average
13		8877.00	53.87	-20.13	74.00	42.95	35.99	10.30	35.37	100	145	Peak
14		8877.00	39.78	-14.22	54.00	28.86	35.99	10.30	35.37	100	145	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored.

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang	**Configuration**	Ch. 78

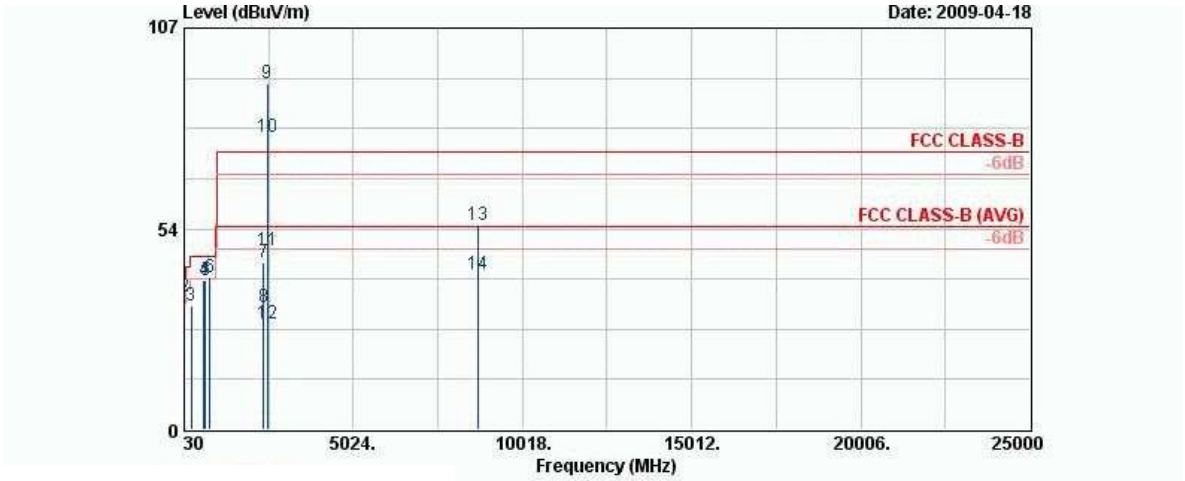
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	30.81	26.60	-13.40	40.00	38.29	19.36	0.65	31.70	---	---	Peak
2 @	50.25	24.63	-15.37	40.00	46.30	9.20	0.83	31.70	---	---	Peak
3 @	182.82	32.15	-11.35	43.50	52.74	9.40	1.63	31.62	---	---	Peak
4 @	701.80	36.81	-9.19	46.00	43.22	20.94	3.56	30.90	---	---	Peak
5 @	741.00	36.43	-9.57	46.00	41.93	21.64	3.67	30.82	---	---	Peak
6 @	780.20	37.86	-8.14	46.00	42.95	21.86	3.79	30.74	100	215	Peak
7 @	2356.00	44.67	-29.33	74.00	41.57	31.99	5.49	34.37	100	331	Peak
8 @	2356.00	32.43	-21.57	54.00	29.33	31.99	5.49	34.37	100	331	Average
9 @	2480.00	99.98	25.98	74.00	96.90	32.09	5.38	34.40	100	331	Peak
10 @	2480.00	85.54	31.54	54.00	82.47	32.09	5.38	34.40	100	331	Average
11 @	2483.50	55.63	-18.37	74.00	52.56	32.09	5.38	34.40	100	331	Peak
12 @	2483.50	35.92	-18.08	54.00	32.85	32.09	5.38	34.40	100	331	Average
13 @	8946.00	54.61	-19.39	74.00	43.63	36.05	10.32	35.39	100	217	Peak
14 @	8946.00	41.32	-12.68	54.00	30.34	36.05	10.32	35.39	100	217	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored.

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	30.81	27.38	-12.62	40.00	39.07	19.36	0.65	31.70	---	---	Peak
2 @	49.17	35.31	-4.69	40.00	56.60	9.60	0.81	31.70	---	---	Peak
3 @	242.49	32.94	-13.06	46.00	50.42	12.15	1.89	31.51	---	---	Peak
4 @	623.40	39.89	-6.11	46.00	47.76	19.78	3.33	30.98	---	---	Peak
5 @	662.60	39.70	-6.30	46.00	46.90	20.30	3.45	30.94	---	---	Peak
6 @	780.20	40.55	-5.45	46.00	45.64	21.86	3.79	30.74	100	281	Peak
7 @	2380.00	44.46	-29.54	74.00	41.36	32.00	5.47	34.38	161	234	Peak
8 @	2380.00	32.45	-21.55	54.00	29.35	32.00	5.47	34.38	161	234	Average
9 @	2480.00	92.11	18.11	74.00	89.03	32.09	5.38	34.40	161	234	Peak
10 @	2480.00	77.92	23.92	54.00	74.85	32.09	5.38	34.40	161	234	Average
11 @	2483.50	47.76	-26.24	74.00	44.69	32.09	5.38	34.40	161	234	Peak
12 @	2483.50	28.05	-25.95	54.00	24.98	32.09	5.38	34.40	161	234	Average
13 @	8718.00	54.65	-19.35	74.00	43.87	35.87	10.25	35.34	100	281	Peak
14 @	8718.00	41.32	-12.68	54.00	30.54	35.87	10.25	35.34	100	281	Average

Remark : #9 and #10 are Fundamental Signals which can be ignored.

3.7 Band Edge Emissions Measurement

3.7.1 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

3.7.2 Measuring Instruments and Setting

Please refer to section 4 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)	1MHz /1MHz for Peak

3.7.3 Test Procedures

1. The test procedure is the same as section 3.6.3, only the frequency range investigated is limited to 100MHz around band edges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

3.7.4 Test Setup Layout

This test setup layout is the same as that shown in section 3.6.4.

3.7.5 Test Deviation

There is no deviation with the original standard.

3.7.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.7.7 Test Result of Band Edge Emissions

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang	**Configuration**	Ch. 00

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2375.93	49.89	-24.11	74.00	46.80	32.02	5.46	34.38	160	10	Peak
2375.93	30.18	-23.82	54.00	27.08	32.00	5.47	34.38	160	10	Average

<Delta Marker>
Delta marker at 1% RBW of span = 45.67 + 0.66 = 46.33 dB (can be referred to section 3.6.6)
Peak band edge at 2375.93 MHz (RBW = VBW = 1MHz) = 96.22 dBuV/m – 46.33 dB = 49.89 dBuV/m
Duty factor = 20 x log ((Package Transfer Times(ms) x Avg Hopping Channel) / 100 ms)
= 20 x log ((3.04 x 3.4) / 100) = -19.71
Average band edge = Peak band edge + Duty factor = 49.89 dBuV/m + (-19.71) = 30.18 dBuV/m

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2372.13	42.54	-31.46	74.00	39.42	31.95	5.53	34.36	100	46	Peak
2372.13	22.83	-31.17	54.00	19.73	32.00	5.47	34.38	100	46	Average

<Delta Marker>
Delta marker at 1% RBW of span = 45.67 + 0.66 = 46.33 dB (can be referred to section 3.6.6)
Peak band edge at 2372.13 MHz (RBW = VBW = 1MHz) = 88.87 dBuV/m – 46.33 dB = 42.54 dBuV/m
Duty factor = 20 x log ((Package Transfer Times(ms) x Avg Hopping Channel) / 100 ms)
= 20 x log ((3.04 x 3.4) / 100) = -19.71
Average band edge = Peak band edge + Duty factor = 42.54 dBuV/m + (-19.71) = 22.83 dBuV/m

Final Test Date	Apr. 18, 2009	**Test Site No.**	03CH05-HY
Temperature	23~26°C	**Humidity**	43~46%
Test Engineer	Kai Wang	**Configuration**	Ch. 78

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2483.50	55.63	-18.37	74.00	52.56	32.09	5.38	34.40	100	331	Peak
2483.50	35.92	-18.08	54.00	32.85	32.09	5.38	34.40	100	331	Average

<Delta Marker>
Delta marker at 1% RBW of span = 45.66 - 1.31 = 44.35 dB (can be referred to section 3.6.6)
Peak band edge at 2483.50 MHz (RBW = VBW = 1MHz) = 99.98 dBuV/m – 44.35 dB = 55.63 dBuV/m
Duty factor = 20 x log ((Package Transfer Times(ms) x Avg Hopping Channel) / 100 ms)
= 20 x log ((3.04 x 3.4) / 100) = -19.71
Average band edge = Peak band edge + Duty factor = 55.63 dBuV/m + (-19.71) = 35.92 dBuV/m

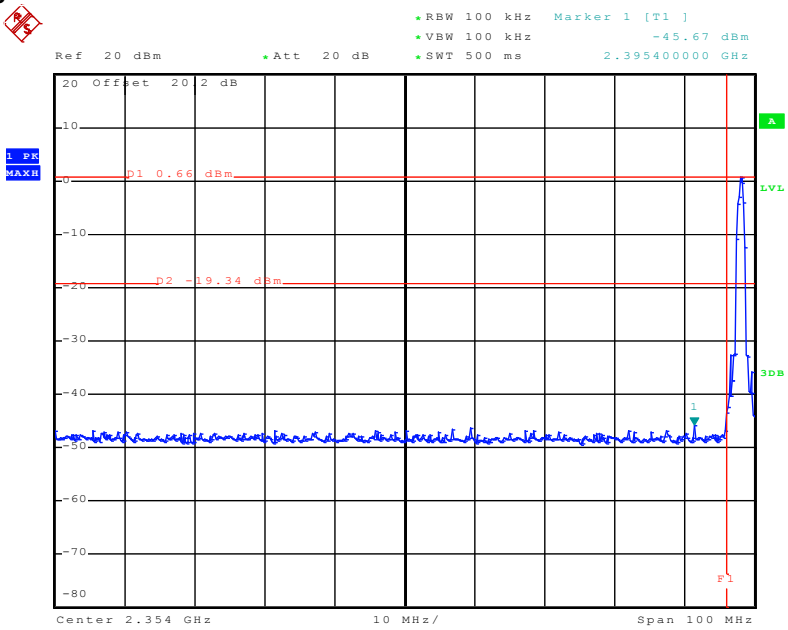
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2483.50	47.76	-26.24	74.00	44.69	32.09	5.38	34.40	161	234	Peak
2483.50	28.05	-25.95	54.00	24.98	32.09	5.38	34.40	161	234	Average

<Delta Marker>
Delta marker at 1% RBW of span = 45.66 - 1.31 = 44.35 dB (can be referred to section 3.6.6)
Peak band edge at 2483.50 MHz (RBW = VBW = 1MHz) = 92.11 dBuV/m – 44.35 dB = 47.76 dBuV/m
Duty factor = 20 x log ((Package Transfer Times(ms) x Avg Hopping Channel) / 100 ms)
= 20 x log ((3.04 x 3.4) / 100) = -19.71
Average band edge = Peak band edge + Duty factor = 47.76 dBuV/m + (-19.71) = 28.05 dBuV/m

Test Result of Conducted Band Edges

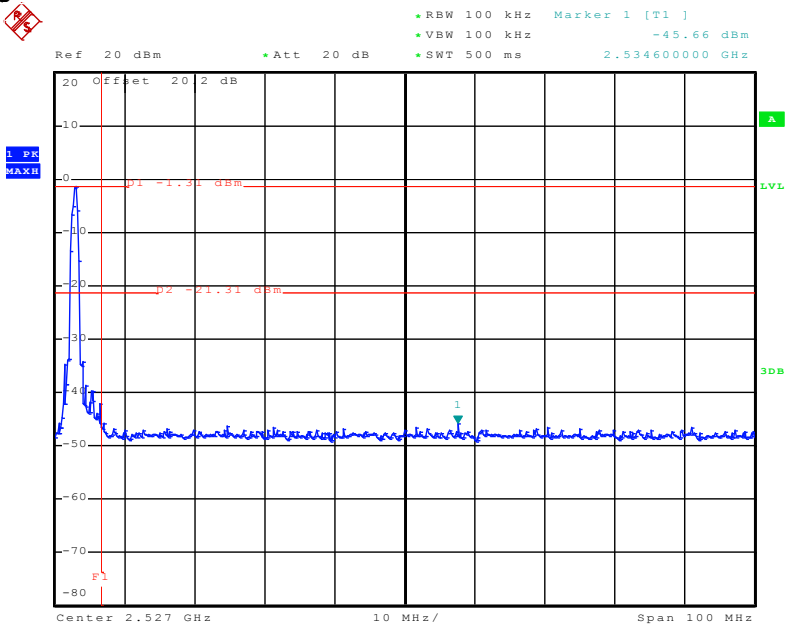
Final Test Date	Apr. 13, 2009	**Test Site No.**	TH01-HY
Temperature	23~24℃	**Humidity**	43~44%
Test Engineer	Eric Huang	**Configurations**	8DPSK

Low Band Edge Plot on Channel 0 / 2402 MHz



Date: 13.APR.2009 20:06:17

High Band Edge Plot on Channel 78 / 2480 MHz



Date: 13.APR.2009 20:08:06

3.8 Antenna Requirements

3.8.1 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.

3.8.2 Antenna Connector Construction

Please refer to section 2.1 in this test report; antenna connector complied with the requirements.

4 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Apr. 06, 2010	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	Mar. 23, 2010	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Apr. 29, 2010	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2010	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 26, 2008	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 19, 2009	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	N/A	Feb. 19, 2009	Conducted (TH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz~1GHz	Nov. 20, 2008	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP	101067	9kHz~30GHz	Dec. 02, 2008	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1G~18GHz	Aug. 13, 2008	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1G~26.5GHz	Dec. 17, 2008	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10~1000MHz. 32dB.GAIN	Mar. 27, 2009	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	66584	1G~18GHz	Aug. 06, 2008	Radiation (03CH07-HY)
SHF-EHF Horn	SCHWARZBECK	BBHA 9170	BBHA9170251	15G - 40GHz	Oct. 16, 2008	Radiation (03CH07-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	May 22, 2008	Radiation (03CH07-HY)

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

5 TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 728, 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. : L1190-110111

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 : January 11, 2011

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Annex

Declaration for Bluetooth Device acc to Part 15.247

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

Hereby we declare that the maximum frequency of this device is: 2402 – 2480 MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organised in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and behaviour for short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire
LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR- operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:
The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.
The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth and behaviour for repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.
Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.
Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *30s

Example for a DH1 packet (with a maximum length of one time slot) Dwell time = 625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multislot packet the hopping is reduced according to the length of the packet. Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period). This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefor all Bluetooth devices **comply** with the FCC dwell time requirement in data mode. This was checked during the Bluetooth Qualification tests. The Dwell time in hybrid mode is measured and stated in the test report.

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.
The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz).
Additionally an example for the channel separation is given in the test report

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see chapter 5), but this time with different input vectors:

- For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
- For the page hop sequence, the device address of the paged unit is used as input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.

So it is ensured that also in hybrid mode the frequency use equally averaged.

Example of a hopping sequence in inquiry mode:
48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode:
08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronisation in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code, the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, an special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection.
Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced considerable.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate
/ Data rate will be 68/1.

12 Spurious emission in hybrid mode

The dwell time in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.

13 Peak power spectral density measurement

Since the transmitter is only active for some milliseconds on one channel you would get a result with many interruptions if using a sweep time of e.g. 1s as stated in the FCC rules. Therefore a fast sweep in maxhold function is used instead and the EUT is activated several times until the measurement curve has stabilized.