ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

BT 2.0 EDR USB Adapter

MODEL No.: ABD2020

BRAND NAME: Aluratek

FCC ID: UM4ABD20

REPORT NO: E0609053F

ISSUE DATE: September 29, 2006

Prepared for

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Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Sun Dynamic International Limited No.6, Lane 3, CangBei Road, Dongguan, Guangdong, China
Product Description:	BT 2.0 EDR USB Adapter
Brand Name:	Aluratek
Model Number:	ABD2020
Serial Number:	N/A
File Number:	E0609053F
Date of Test:	September 14,2006 to September 29, 2006

We hereby certify that:

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Approved By

David Lee / Q.A. Manager
SHENZHEN EMTEK CO., LTD.

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1. GENERAL INFORMATION

1.1 Product Description

The Sun Dynamic International Limited Model: ABD2020 (referred to as the EUT in this report) The EUT is an short range, lower power, BT 2.0 EDR USB Adapter designed as an " Input Device. It is designed by way of utilizing the GFSK, DQPSK and 8DPSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2402-2480MHz
B). Modulation: GFSK, DQPSK, 8DPSK
C). Number of Channel: 79
D). Channel space: 1MHz
E). Rated RF Output Power: 4dBm
F). BIT Rate of Transmission: 1Mbps, 2Mbps, 3Mbps
G). Antenna Type: PCB antenna
H). Antena GAIN: 2dBi
I). Duty cycle: 50%
J). Power Supply: 5VDC, 100A

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: UM4ABD20 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description

EMC Lab.	:	Accredited by CNAL, 2005.11.02 The certificate is valid until 2010.11 The Laboratory has been assessed and proved to be in compliance with CNAL/AC01:2003(identical to ISO/IEC17025:1999) The Certificate Registration Number is L2291 Accredited by TUV Rheinland Guangzhou, 2005.1 The certificate is valid until 2008.2 The Laboratory has been assessed according to the requirements ISO/IEC 17025:1999 Accredited by FCC, July 07, 2005 The Certificate Registration Number is 709623. Accredited by Industry Canada, August 30, 2005 The Certificate Registration Number is 46405-4480
Name of Firm	:	SHENZHEN EMTEK CO., LTD
Site Location	:	Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and average detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

2.4 Limitation

(1) Channel Separation test

FCC Part 15, Subpart C Section 12.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 Bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

(2) 20dB Bandwidth

Frequency Range(MHz)	Limit(kHz) Quantity of Hopping Channel	50	25	15	75
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

(3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 12.247

Frequency Range (MHz)	Limit(Quantity of Hopping Channel) 20dB bandwidth <250kHz	20dB bandwidth >250kHz	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	75	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 12.247

Frequency Range (MHz)	LIMIT(rms) 20dB bandwidth <250kHz(50Channel)	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20S)	400(10S)	NA
2400-2483.5	NA	NA	400(30S)
5725-5850	NA	NA	400(30S)

Note: The "()"is all channel's average time of occupancy.

(5) Maximum Peak Output Power

FCC Part 15, Subpart C Section 12.247

Frequency Range (MHz)	Quantity of Hopping Channel	LIMIT(W) 50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

(6) Band edge

FCC Part15, Subpart C Section 15.247, In any 100kHz bandwidth outside the frequency band in with the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Operating Frequency Range(MHz)	Spurious emission frequency	Limit	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

(8) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/m
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

FCC Part 15, Section 15.35(b) limit of radiated emission for frequency above 1000MHz

Frequency(MHz)	Class A(dBμV/m)(at 3m)		Class B(dBμV/m)(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency(MHz)	Filed Strength of Fundamental(at 3m)		Filed Strength of Harmonics(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
902-928	114	94	74.0	54.0
2400-2483.5	114	94	74.0	54.0
5725-5875	114	94	74.0	54.0
24000-24250	128	108	88.0	68.0

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

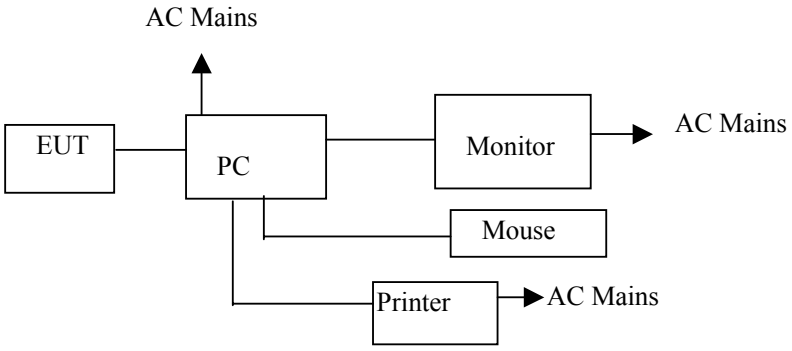


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	BT 2.0 EDR USB Adapter	Aluratek	ABD2020	UM4ABD20	N/A	***EUT***
2.	PC	HEWLETT PACKARD	Vectra VL420 MT	N/A	CN15100363	
3.	CRT Monitor	Sony	SDM-S53	N/A	0413350	
4.	Mouse	HEWLETT PACKARD	M-S48a	N/A	LZE14823966AW	
5.	Printer	HEWLETT PACKARD	C89520	N/A	CN25S182N6	

Note:

(1) Unless otherwise denoted as EUT in『Remark』column , device(s) used in tested system is a support equipment.

3. Summary Of Test Results

FCC Rules	Description Of Test	Result
§ 15.247(a)(1)	Channel Separation test	Compliant
§ 15.247(a)(1)	20dB Bandwidth	Compliant
§ 15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§ 15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§ 15.247(b)	Max Peak output Power test	Compliant
§ 15.247(d)	Band edge test	Compliant
§ 15.207	AC Power Conducted Emission	Compliant
§ 15.247(d), § 15.209	Radiated Emission	Compliant
§ 15.203	Antenna Requirement	Compliant
§ 1.1310	RF Exposure	Compliant

4. Description of test modes

The EUT (BT 2.0 EDR USB Adapter) has been tested under normal operating condition.
This EUT is a FHSS system, we use blue test to control the EUT with RS232, Let EUT hopping on and transmit at every channel with highest power, Only output power use conducted method, others are using radiated method. After sirfdemo330R1 send the command to EUT, it can be removed, and the EUT keep hopping. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for best.

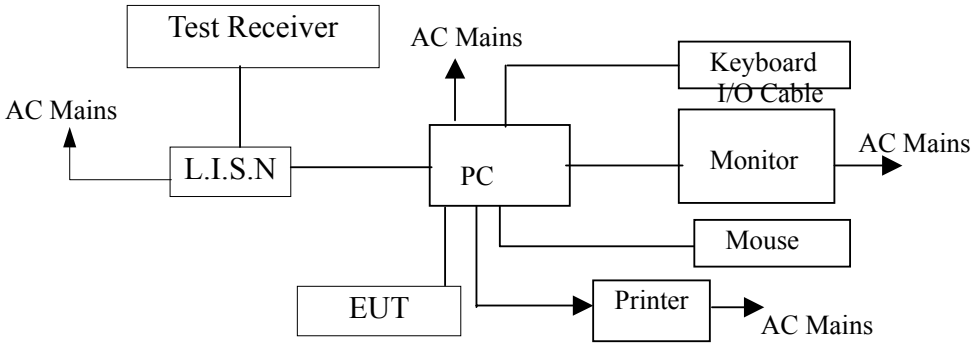
Channel	Frequency(MHz)
1	2402
40	2441
79	2480

5. Conducted Emissions Test

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)



5.3 Measurement Equipment Used:

Conducted Emission Test Site # 4					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2006	05/29/2007
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2006	05/29/2007
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2006	05/29/2007
50ΩCoaxial Switch	Anritsu	MP59B	M20531	005/29/2006	05/29/2007

5.4 Measurement Result:

Date of Test:	September 18, 2006	Temperature:	22℃
Frequency Detector:	0.15~30MHz	Humidity:	50%
Test Result:	PASS	Test Mode:	CH1(2402MHz)

Test Line	Frequency MHz	Emission Level QP dB(μV)	Emission Level AV dB(μV)	Limits QP dB(μV)	Limits AV dB(μV)	Margin QP dB(μV)	Margin AV dB(μV)
Neutral	0.220	39.70	36.20	62.82	52.82	-23.12	-16.62
	0.445	36.60	33.10	56.97	46.97	-20.37	-13.87
	13.150	41.20	31.90	60.00	50.00	-18.80	-18.10
Line	0.445	35.40	32.90	56.97	46.97	-21.57	-14.07
	0.870	36.70	32.80	56.00	46.00	-19.30	-13.20
	13.175	44.20	31.60	60.00	50.00	-15.80	-18.40

Date of Test:	September 18, 2006	Temperature:	22℃
Frequency Detector:	0.15~30MHz	Humidity:	50%
Test Result:	PASS	Test Mode:	CH40(2441MHz)

Test Line	Frequency MHz	Emission Level QP dB(μV)	Emission Level AV dB(μV)	Limits QP dB(μV)	Limits AV dB(μV)	Margin QP dB(μV)	Margin AV dB(μV)
Neutral	0.220	47.60	36.20	62.82	52.82	-15.22	-16.62
	0.445	35.50	33.20	56.97	46.97	-21.47	-13.77
	13.325	40.50	33.30	60.00	50.00	-19.50	-16.70
Line	0.445	35.30	32.60	56.97	46.97	-21.67	-14.37
	0.870	36.70	33.60	56.00	46.00	-19.30	-12.40
	13.175	40.20	32.10	60.00	50.00	-19.80	-17.90

Date of Test:	September 18, 2006	Temperature:	22℃
Frequency Detector:	0.15~30MHz	Humidity:	50%
Test Result:	PASS	Test Mode:	CH79(2480MHz)

Test Line	Frequency MHz	Emission Level QP dB(μV)	Emission Level AV dB(μV)	Limits QP dB(μV)	Limits AV dB(μV)	Margin QP dB(μV)	Margin AV dB(μV)
Neutral	0.220	39.70	36.20	62.82	52.82	-23.12	-16.62
	0.445	35.80	33.20	56.97	46.97	-21.17	-13.77
	13.325	41.20	33.10	60.00	50.00	-18.80	-16.90
Line	0.445	35.40	32.80	56.97	46.97	-21.57	-14.17
	0.540	35.60	32.30	56.00	46.00	-20.40	-13.70
	13.325	40.70	32.40	60.00	50.00	-19.30	-17.60

Remark: 1. The worst emission is detected at 1.200MHz with corrected AV signal level of 42.70dB(μV) (limit is 46.00dB(μV)), When the Line of the EUT is connected to LISN.

5.5 Conducted Measurement Photos:

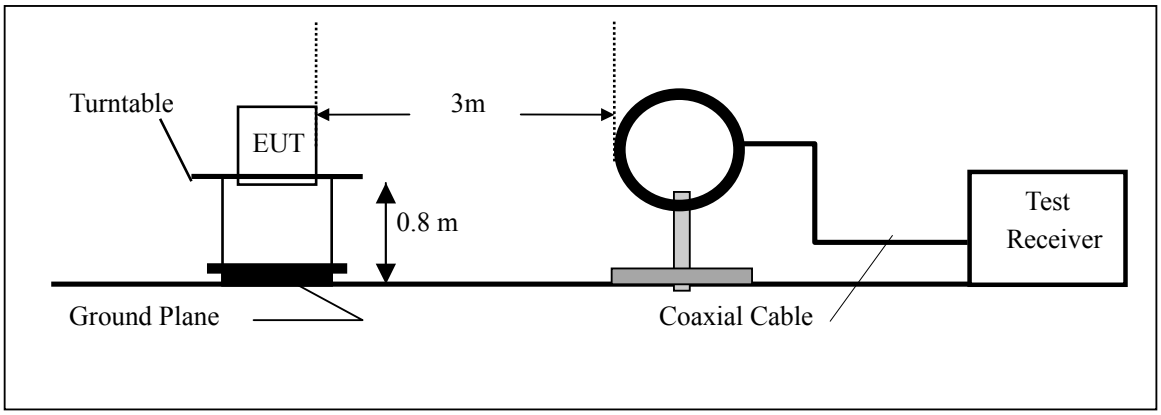
6. Radiated Emission Test

6.1 Measurement Procedure

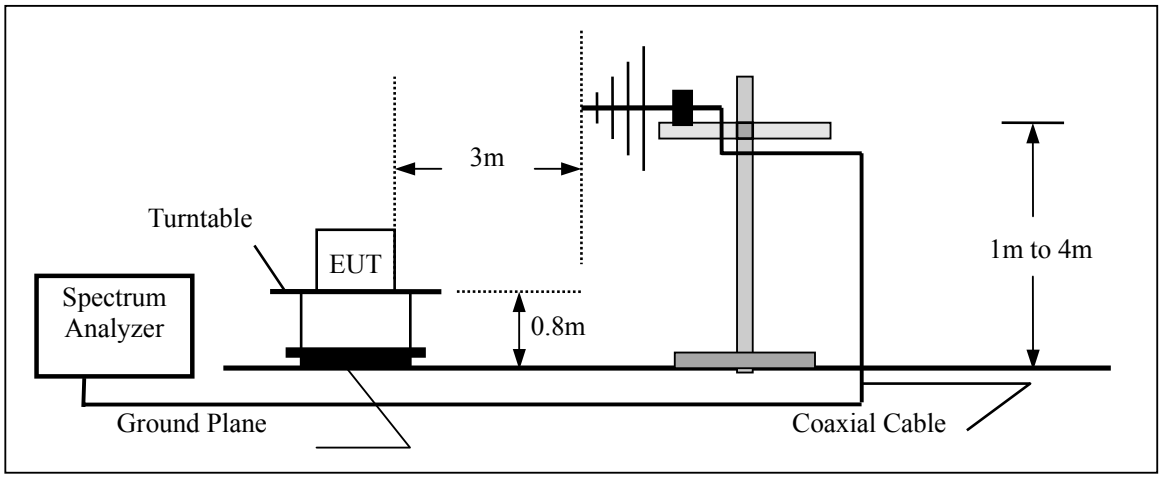
1 The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



6.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2006	05/29/2007
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2006	05/29/2007
Pre-Amplifier	HP	8447D	2944A07999	05/29/2006	05/29/2007
Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2006	05/29/2007
Loop Antenna	ARA	PLA-1030/B	1029	05/29/2006	05/29/2007

6.4 Measurement Result

Operation Mode:	RX Mode	Test Date :	September 16, 2006
Frequency Range:	30~1000MHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)	Note
144.040	V	38.50	43.50	-5.00	PK
165.992	V	37.50	43.50	-6.00	PK
194.200	V	38.20	43.50	-5.30	PK
302.020	V	38.60	46.00	-7.40	PK
401. 390	V	39.10	46.00	-6.90	PK
433.550	V	39.50	46.00	-6.50	PK
132.620	H	38.60	43.50	-4.90	PK
156.040	H	37.60	43.50	-5.90	PK
200.300	H	36.90	43.50	-6.60	PK
232.158	H	39.60	46.00	-6.40	PK
266.300	H	40.26	46.00	-5.74	PK
530.480	H	38.56	46.00	-7.44	PK

Note: (1) All Readings are Peak Value.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode:	CH1: 2402MHz	Test Date :	September 16, 2006
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2402.00(F)	V	95.60	80.70	114.00	94.00	-18.40	-13.30
2387.00	V	63.60	45.98	74.00	54.00	-10.40	-8.02
2394.30	V	62.30	43.10	74.00	54.00	-11.70	-10.90
2441.00	V	60.50	45.20	74.00	54.00	-13.50	-8.80
4804.00	V	61.20	42.20	74.00	54.00	-12.80	-11.80
7206.00	V	59.80	40.30	74.00	54.00	-14.20	-13.70
2402.00(F)	H	92.50	81.03	114.00	94.00	-21.50	-12.97
2394.00	H	62.30	45.36	74.00	54.00	-11.70	-8.64
2397.00	H	61.03	42.12	74.00	54.00	-12.97	-11.88
2441.02	H	60.23	42.20	74.00	54.00	-13.77	-11.80
2804.00	H	61.02	41.30	74.00	54.00	-12.98	-12.70
7206.00	H	60.23	40.20	74.00	54.00	-13.77	-13.80

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode:	CH40: 2441MHz	Test Date :	September 16, 2006
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV) PK	Emission Level(dBuV) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Margin(dB) PK	Margin(dB) AV
2441.00(F)	V	83.96	63.10	114.00	94.00	-30.04	-30.90
2387.00	V	50.23	41.36	74.00	54.00	-23.77	-12.64
2394.30	V	49.50	39.60	74.00	54.00	-24.50	-14.40
2441.00	V	51.20	38.60	74.00	54.00	-22.80	-15.40
4804.00	V	48.90	37.80	74.00	54.00	-25.10	-16.20
7206.00	V	46.80	38.50	74.00	54.00	-27.20	-15.50
2441.00(F)	H	94.36	82.56	114.00	94.00	-19.64	-11.44
2394.00	H	51.56	42.56	74.00	54.00	-22.44	-11.44
2397.00	H	50.50	40.20	74.00	54.00	-23.50	-13.80
2441.02	H	51.56	39.20	74.00	54.00	-22.44	-14.80
2804.00	H	50.90	39.58	74.00	54.00	-23.10	-14.42
7206.00	H	51.80	37.52	74.00	54.00	-22.20	-16.48

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode:	CH79: 2480MHz	Test Date :	September 16, 2006
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2480.00(F)	V	82.50	71.20	114.00	94.00	-31.50	-22.80
2387.00	V	50.12	43.20	74.00	54.00	-23.88	-10.80
2394.30	V	48.90	45.30	74.00	54.00	-25.10	-8.70
2441.00	V	48.60	44.50	74.00	54.00	-25.40	-9.50
4804.00	V	47.60	43.60	74.00	54.00	-26.40	-10.40
7206.00	V	46.50	43.20	74.00	54.00	-27.50	-10.80
2480.00(F)	H	93.30	82.10	114.00	94.00	-20.70	-11.90
2394.00	H	50.60	45.60	74.00	54.00	-23.40	-8.40
2397.00	H	51.90	46.30	74.00	54.00	-22.10	-7.70
2441.02	H	51.30	44.30	74.00	54.00	-22.70	-9.70
2804.00	H	49.80	43.50	74.00	54.00	-24.20	-10.50
7206.00	H	48.60	42.60	74.00	54.00	-25.40	-11.40

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

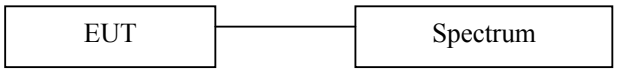
6.5 Radiated Measurement Photos:

7. Channel Separation test

7.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

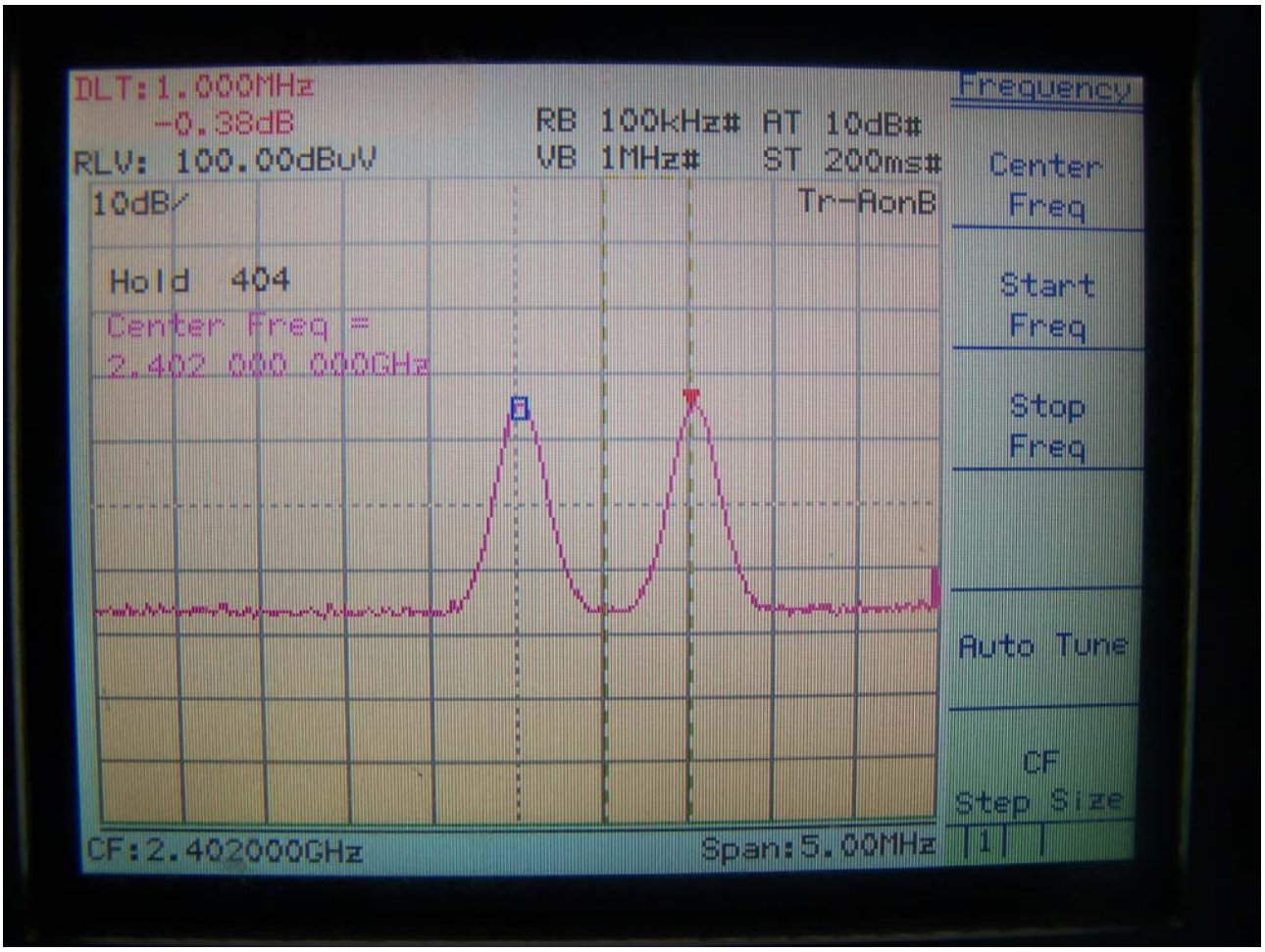
Same as 4.3 Radiated Emission Measurement.

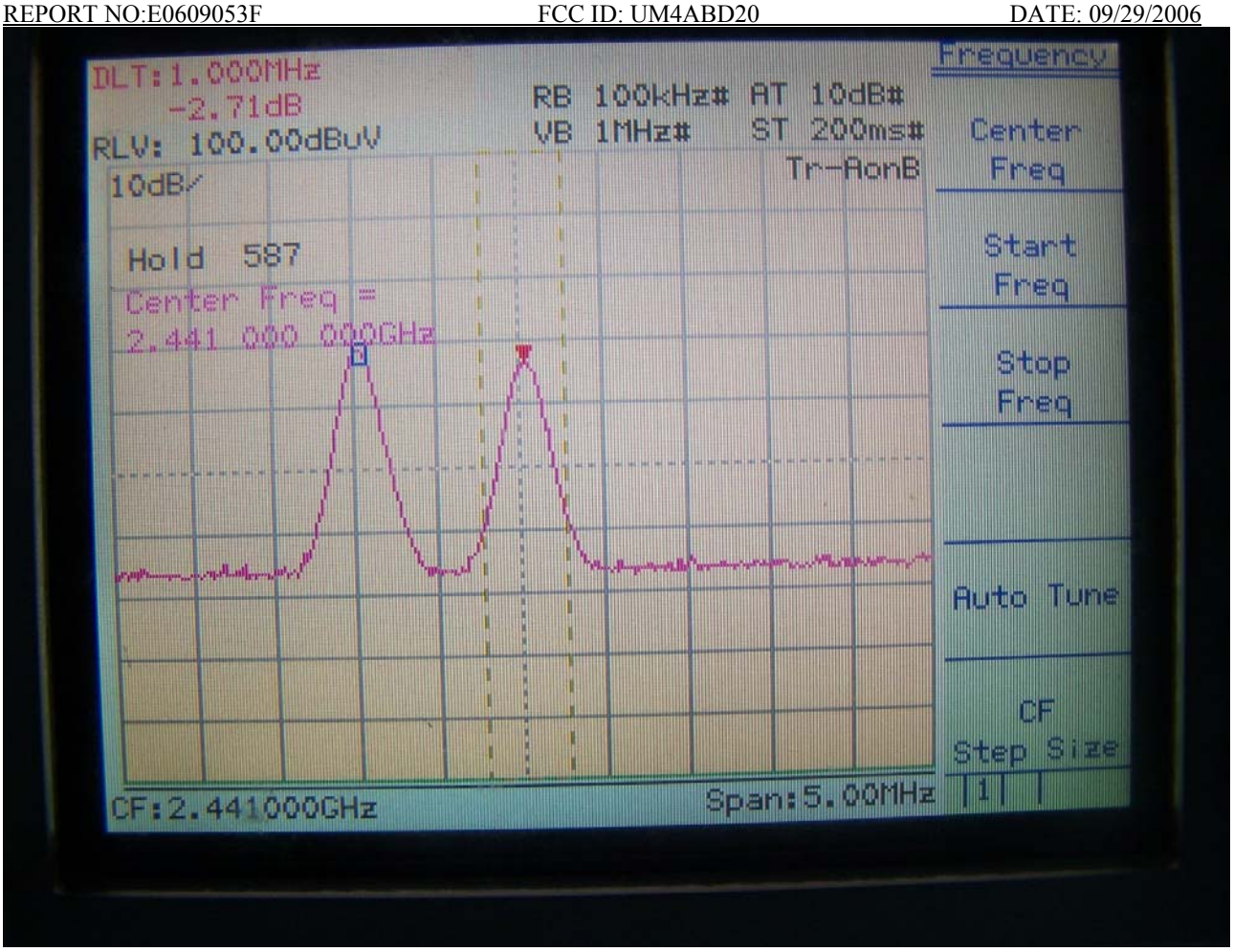
7.4 Measurement Results:

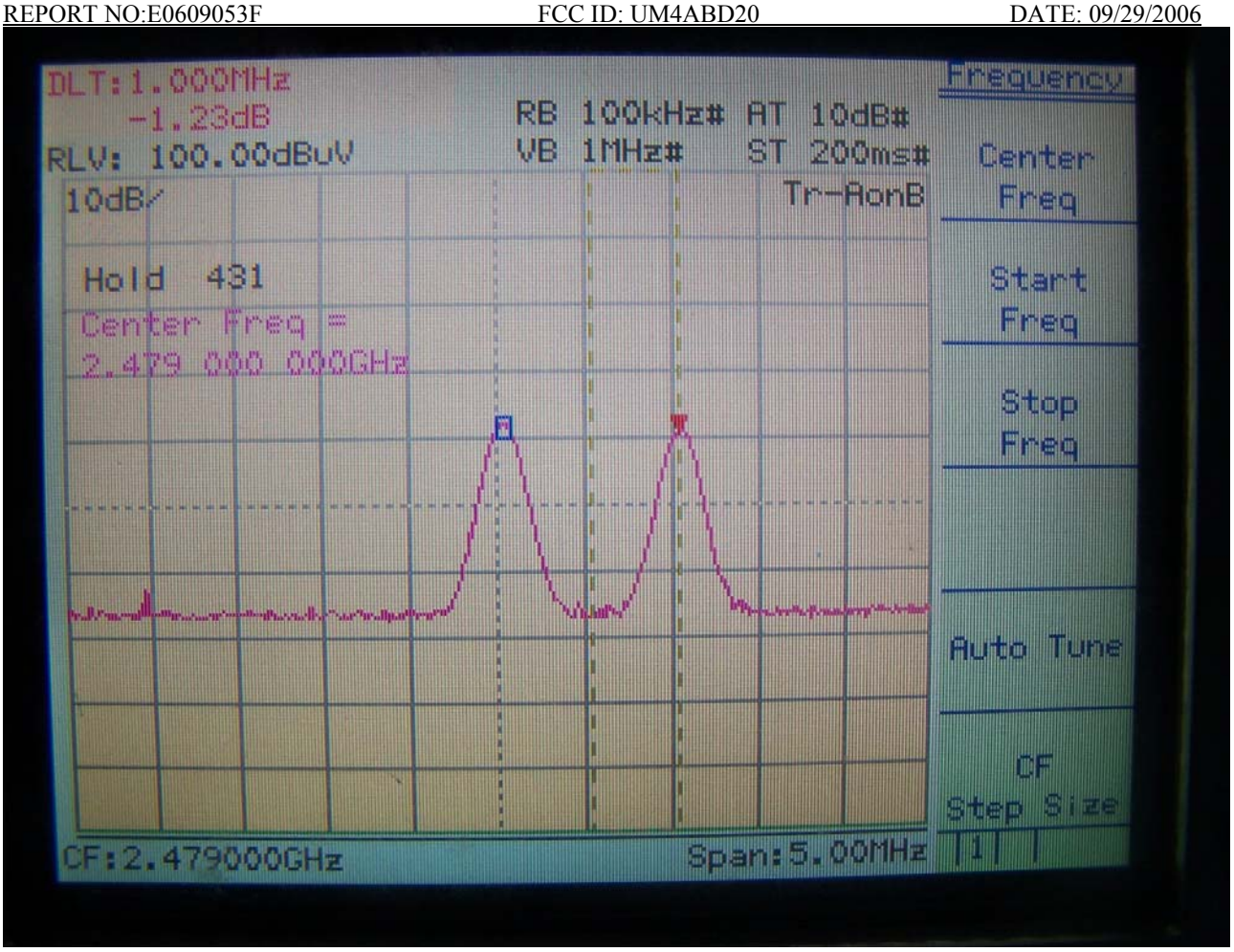
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit (kHz)
1	2402	1000.00	>25 kHz
40	2441	1000.00	>25 kHz
79	2480	1000.00	>25 kHz


DLT:1.000MHz
-0.38dB
RLV: 100.00dBuV
RB 100kHz# AT 10dB#
VB 1MHz# ST 200ms#
10dB/
Tr-AonB
Hold 404
Center Freq =
2.402 000 000GHz
CF:2.402000GHz
Span:5.00MHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size


DLT:1.000MHz
-2.71dB
RLV: 100.00dBuV
10dB/
RB 100kHz# AT 10dB#
VB 1MHz# ST 200ms#
Tr-AonB
Hold 587
Center Freq =
2.441 000 000GHz
CF:2.441000GHz
Span:5.00MHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size

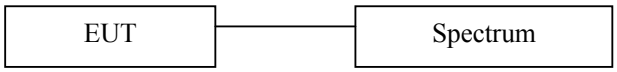

DLT:1.000MHz
-1.23dB
RLV: 100.00dBuV
RB 100kHz# AT 10dB#
VB 1MHz# ST 200ms#
10dB/
Tr-AonB
Hold 431
Center Freq =
2.479 000 000GHz
CF:2.479000GHz
Span:5.00MHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size

8. 20dB Bandwidth test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

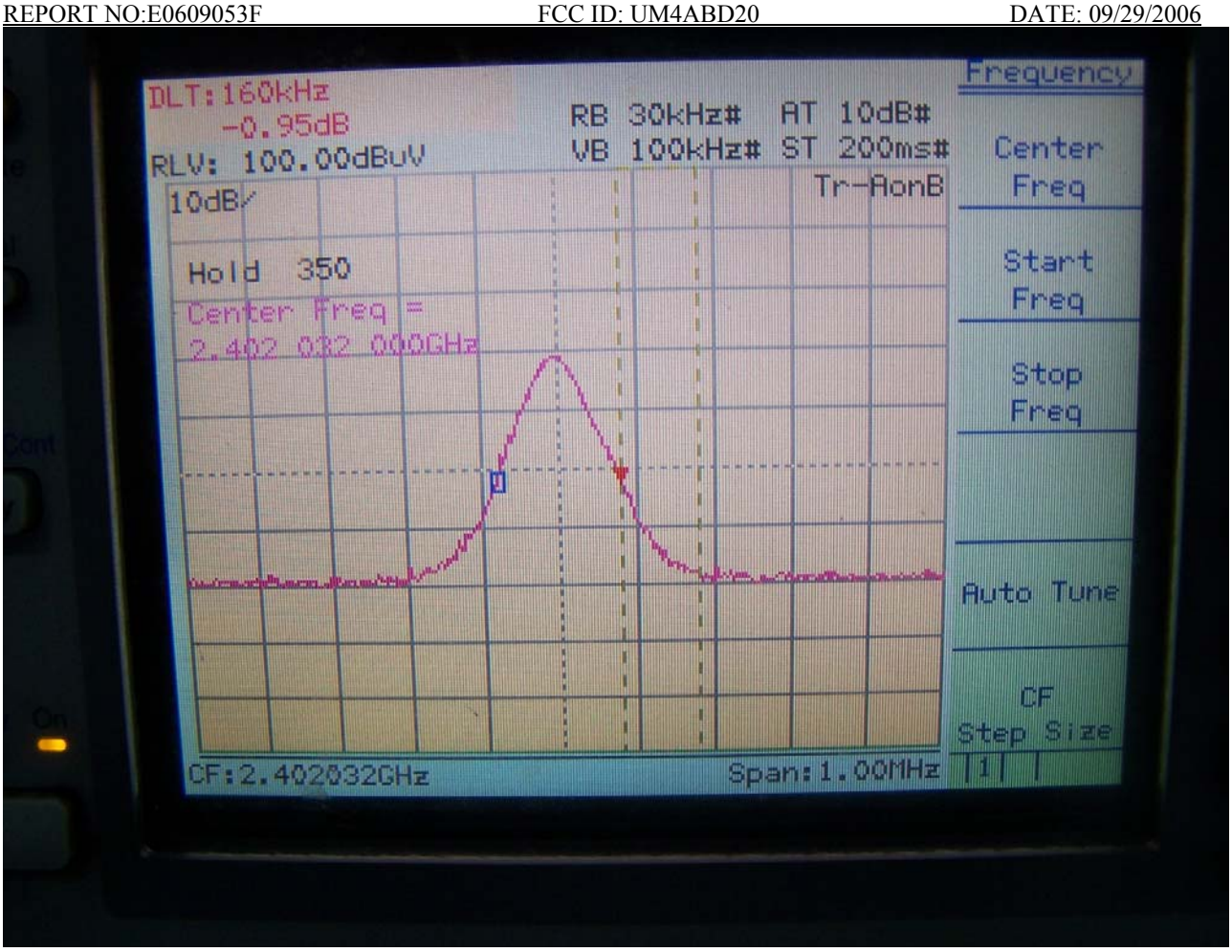
Same as 4.3 Radiated Emission Measurement.

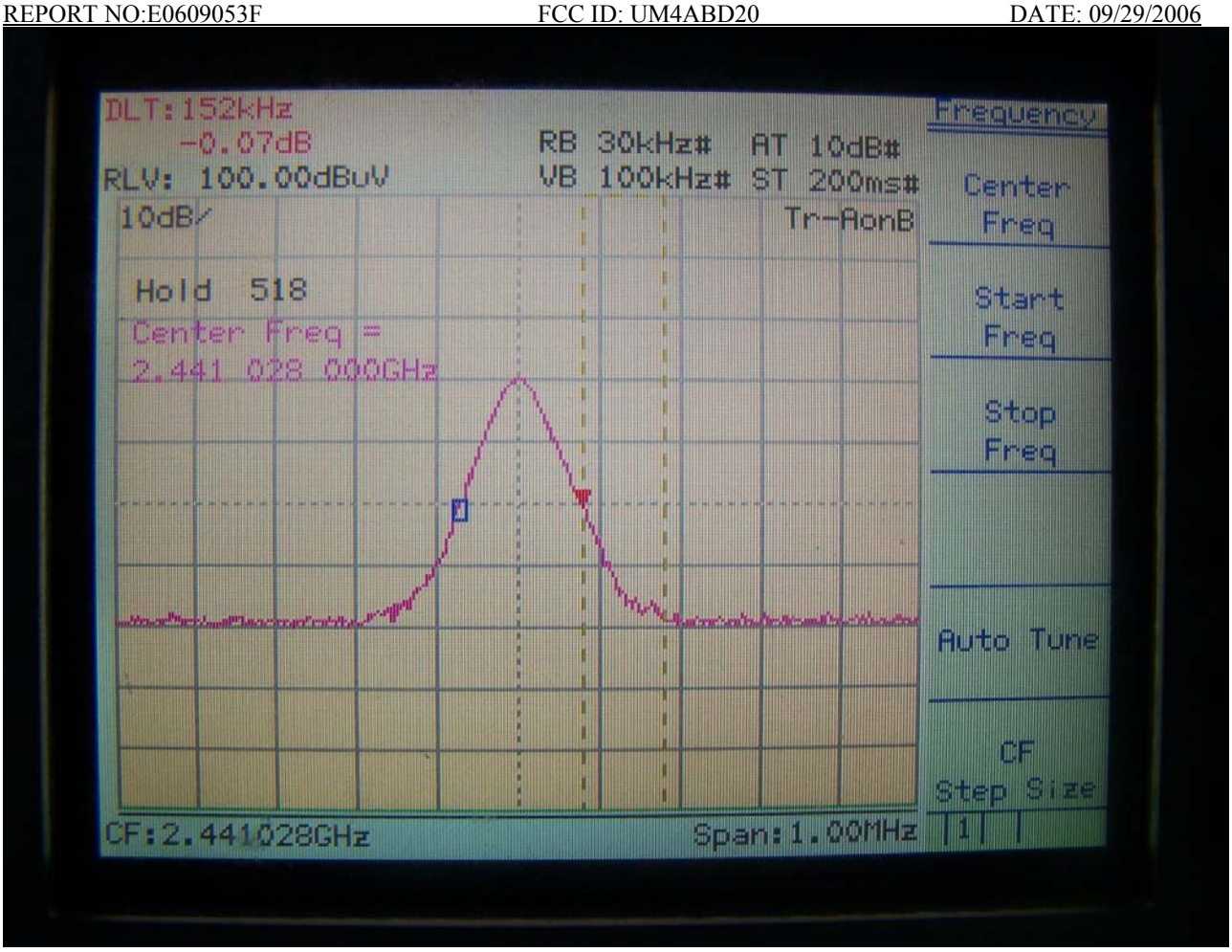
8.4 Measurement Results:

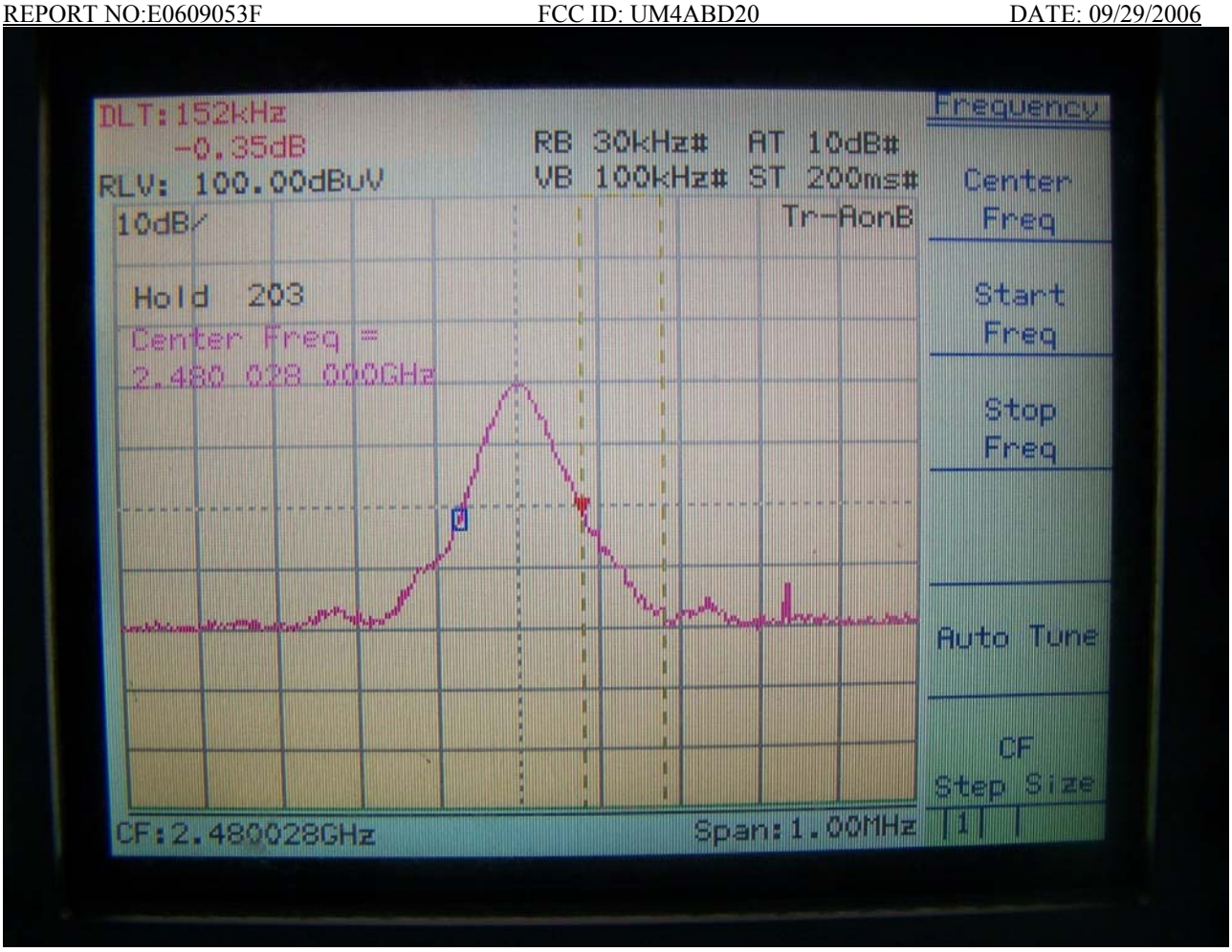
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	160
40	2441	152
79	2480	152


DLT:160kHz
-0.95dB
RLV: 100.00dBuV
RB 30kHz# AT 10dB#
VB 100kHz# ST 200ms#
Tr-AonB
10dB/
Hold 350
Center Freq =
2.402 032 000GHz
CF:2.402032GHz
Span:1.00MHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size


DLT:152kHz
-0.07dB
RLV: 100.00dBuV
RB 30kHz# AT 10dB#
VB 100kHz# ST 200ms#
10dB/
Tr-AonB
Hold 518
Center Freq =
2.441 028 000GHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size
CF:2.441028GHz
Span:1.00MHz

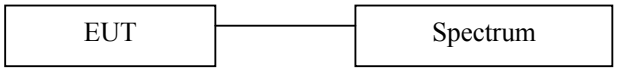

DLT:152kHz
-0.35dB
RLV: 100.00dBuV
RB 30kHz# AT 10dB#
VB 100kHz# ST 200ms#
Tr-AonB
10dB/
Hold 203
Center Freq =
2.480 028 000GHz
CF:2.480028GHz
Span:1.00MHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size

9. Quantity of Hopping Channel Test

9.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

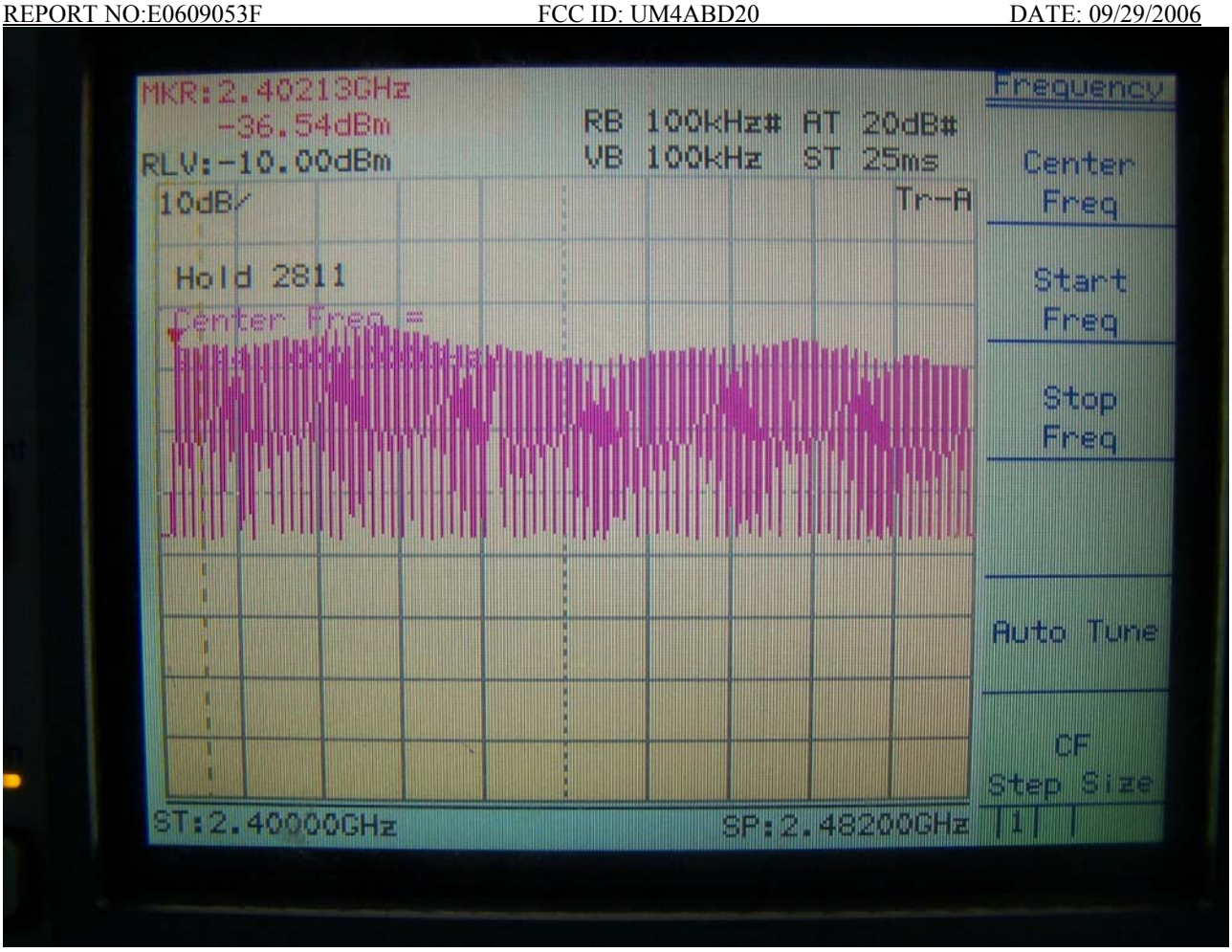
Same as 4.3 Radiated Emission Measurement.

9.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel
2402-2480	79	75

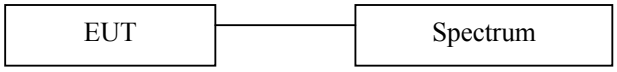

MKR:2.40213GHz
-36.54dBm
RLV:-10.00dBm
RB 100kHz# AT 20dB#
VB 100kHz ST 25ms
10dB/
Tr-A
Hold 2811
Center Freq =
ST:2.40000GHz
SP:2.48200GHz
Frequency
Center Freq
Start Freq
Stop Freq
Auto Tune
CF Step Size

10. Time of Occupancy (Dwell Time) test

10.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used:

Same as 4.3 Radiated Emission Measurement.

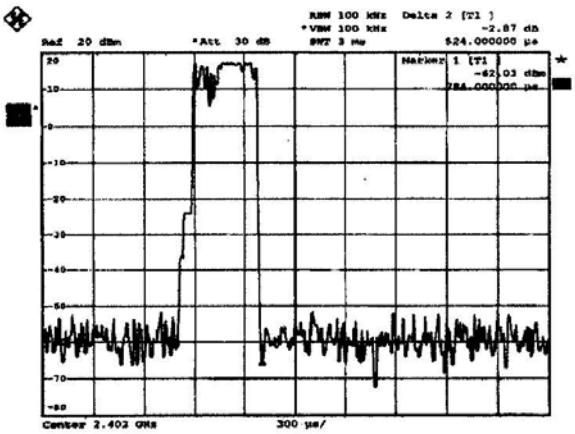
10.4 Measurement Results:

Refer to attached data chart.

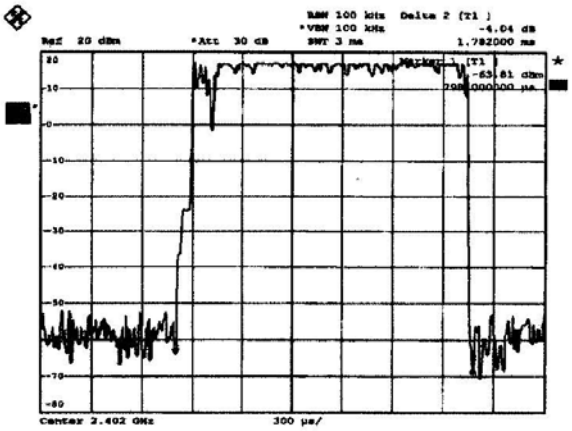
Spectrum Detector:	PK	Test Date :	September 20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Mode	Number of transmission in a 31.6(79 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
DH1	51(times/5 sec)*6.32=322.32 times	0.524	168.900	400
DH3	26(times/5 sec)*6.32=164.32 times	1.782	292.820	400
DH5	15(times/5 sec)*6.32=94.80 times	3.110	294.828	400

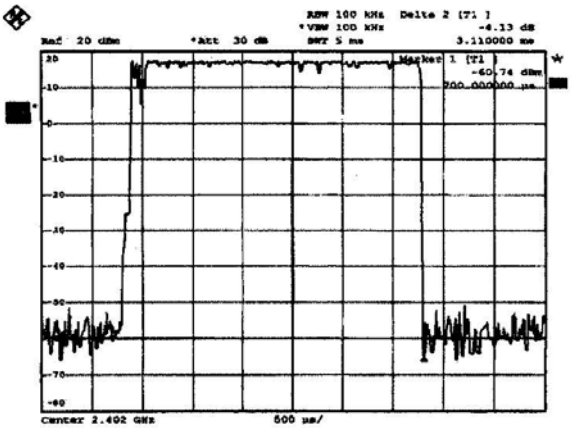
DH1


RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 3 ms
Delta 2 [T1]
-2.87 dB
524.000000 µs
Marker 1 [T1]
-42.03 dBm
Center 2.402 GHz
300 µs/

DH3


RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 3 ms
Delta 2 [T1]
-4.04 dB
1.782000 ms
Marker 1 [T1]
-63.81 dBm
Center 2.402 GHz
300 µs/

DH5

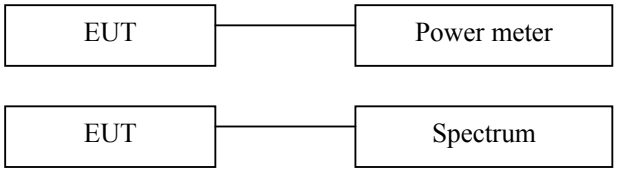

RBW 100 kHz
*VBW 100 kHz
Ref 20 dBm
*Att 30 dB
SWT 5 ms
Delta 2 [T1]
-4.13 dB
3.110000 ms
Marker 1 [T1]
-60.74 dBm
Center 2.402 GHz
500 µs/

11. M AX IMUM PEAK OUTPUT POWER TEST

11.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.
d. Measure the captured power within the band and recording the plot.
e. Repeat above procedures until all frequencies required were complete.

11.2 Test SET-UP (Block Diagram of Configuration)



11.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2006	05/29/2007
Power meter	Boonton	4232A	29001	05/29/2006	05/29/2007
Power sensor	Boonton	51011-EMC	31184	05/29/2006	05/29/2007

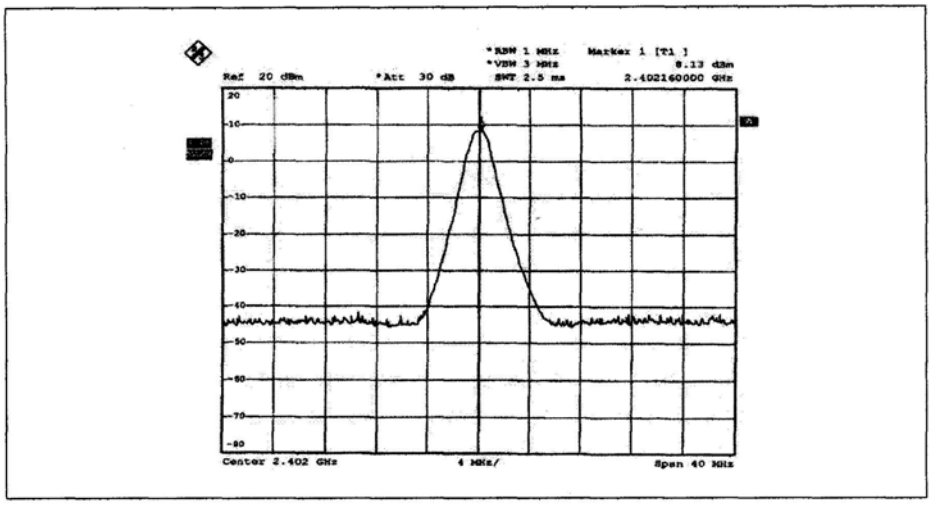
11.4 Measurement Results:

Refer to attached data chart.

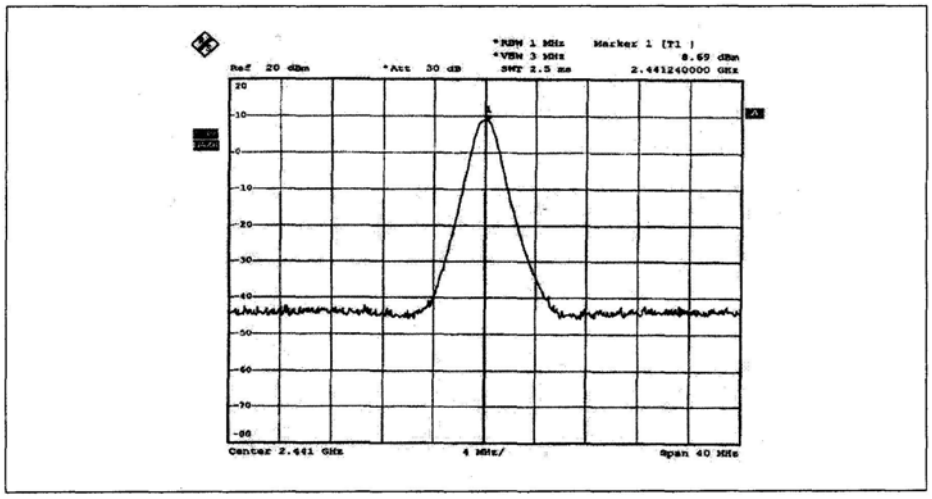
Spectrum Detector:	PK	Test Date :	September 20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Channel number	Channel Frequency (MHz)	Peak Power output(mW)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
1	2402.00	6.501	8.13	125	PASS
40	2441.00	7.396	8.69	125	PASS
79	2480.00	7.379	8.68	125	PASS

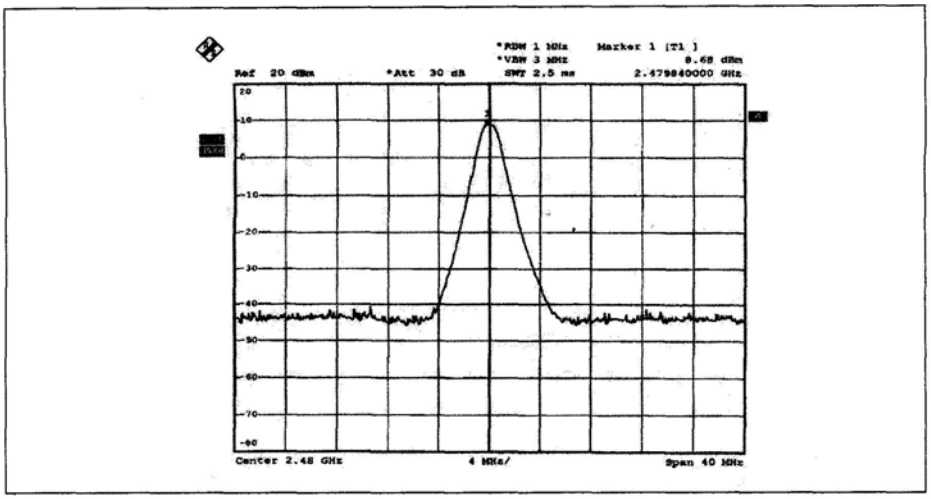
CH 1


*RBW 1 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
8.13 dBm
2.402160000 GHz
Ref 20 dBm
*Att 30 dB
Center 2.402 GHz
4 MHz/
Span 40 MHz

CH 40


*RBW 1 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
8.69 dBm
2.441240000 GHz
Ref 20 dBm
*Att 30 dB
Center 2.441 GHz
4 MHz/
Span 40 MHz

CH 79

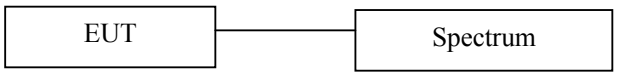

*RBW 1 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
8.68 dBm
2.479840000 GHz
Ref 20 dBm
*Att 30 dB
Center 2.48 GHz
4 MHz/
Span 40 MHz

12. Band EDGE test

12.1 Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

12.2 Test SET-UP (Block Diagram of Configuration)



12.3 Measurement Equipment Used:

Same as 4.3 Radiated Emission Measurement.

12.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 20, 2006
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

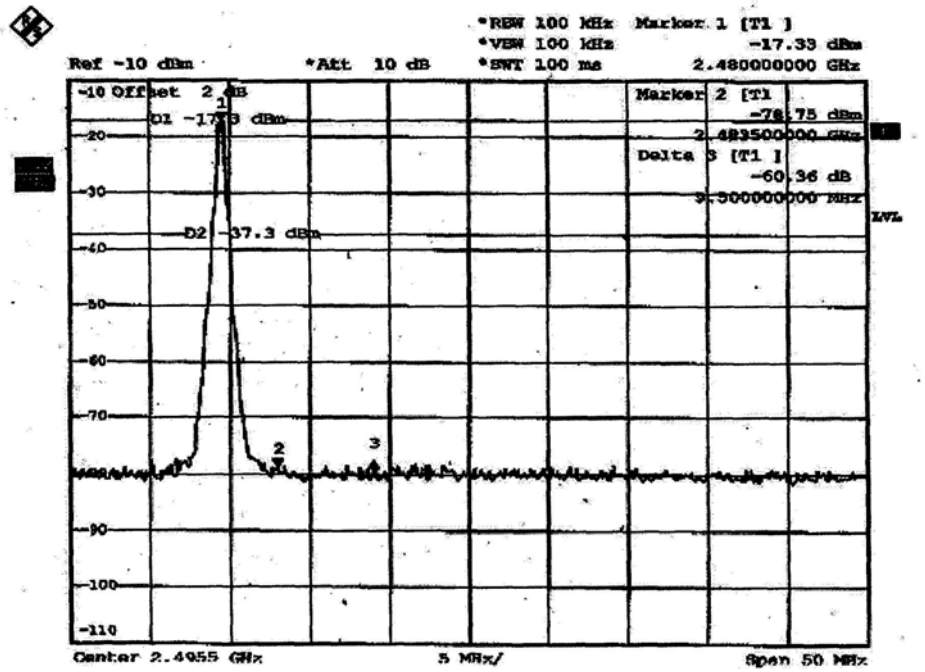
1.Conducted Test

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	-17.14	-76.00	58.86	>20dBc
>2483.5	-17.33	-78.75	61.42	>20dBc

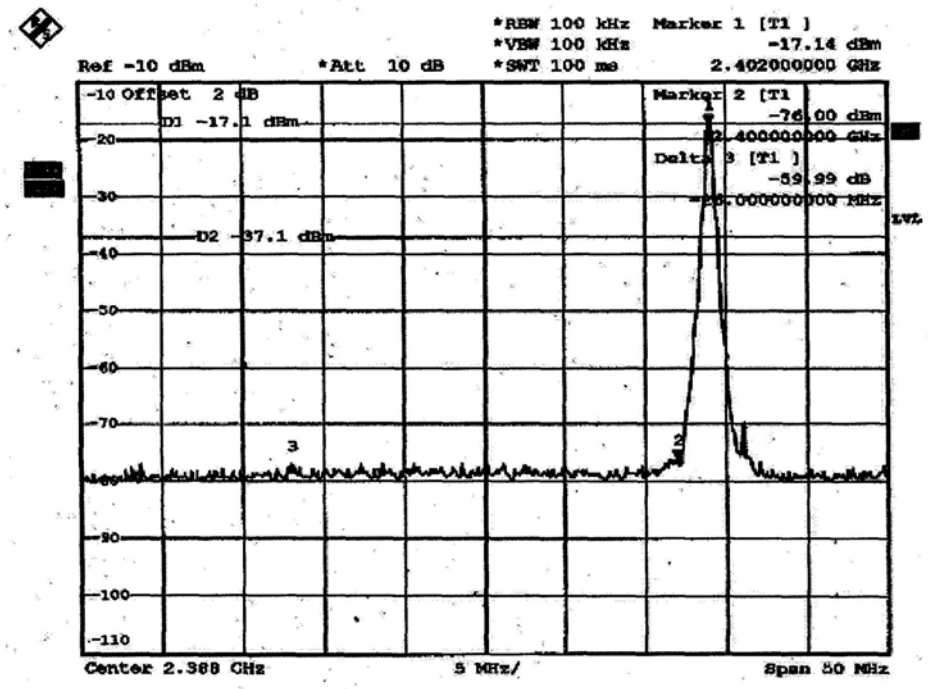
2.Radiated emission tes

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		QP	AV	QP	AV
<2400	V	50.50	32.50	74.00	54.00
>2483.5	V	51.60	32.20	74.00	54.00

>2483.5MHz


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-17.33 dBm
2.480000000 GHz
Ref -10 dBm
*Att 10 dB
-10 Offset 2 dB
D1 -17.3 dBm
D2 -37.3 dBm
Marker 2 [T1
-78.75 dBm
2.483500000 GHz
Delta 3 [T1]
-60.36 dB
3.500000000 MHz
-20
-30
-40
-50
-60
-70
-90
-100
-110
Center 2.4955 GHz
5 MHz/
Span 50 MHz

<2400MHz:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-17.14 dBm
2.402000000 GHz
Ref -10 dBm
*Att 10 dB
Offset 2 dB
D1 -17.1 dBm
D2 -37.1 dBm
Marker 2 [T1
-76.00 dBm
Delta 3 [T1]
-59.99 dB
LVL
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 2.368 GHz
5 MHz/
Span 50 MHz

13. Antenna Application

13.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.240.

FCC part 15C section 15.247 requirements:
Systems operating in the 2402-2484MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

13.2. Result

The EUT's antenna used a chip antenna and integrated on PCB, The antenna's gain is 2dBi and meets the requirement.

14. RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in § 1.1307(b)

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	**Electric Field Strength(V/m)**	**Magnetic Field Strength(A/m)**	**Power Density(mW/cm^2)**	**Average Time**
(A) Limits for Occupational/Control Exposures				
300-1500	**--**	**--**	**F/300**	**6**
1500-100000	**--**	**--**	**5**	**6**
(B) Limits for General Population/Uncontrol Exposures				
300-1500	**--**	**--**	**F/1500**	**6**
1500-100000	**--**	**--**	**1**	**30**

14.1 Friis transmission formula: Pd=(Pout*G)\(4*pi*R^2)

Where
Pd= Power density in mW/cm^2
Pout=output power to antenna in Mw
G= gain of antenna in linear scale
Pi=3.1416
R= distance between observation point and center of the radiator in cm
Pd the limit of MPE, 1mW/cm2. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

14.2 Measurement Result

Antenna gain: 2 dBi

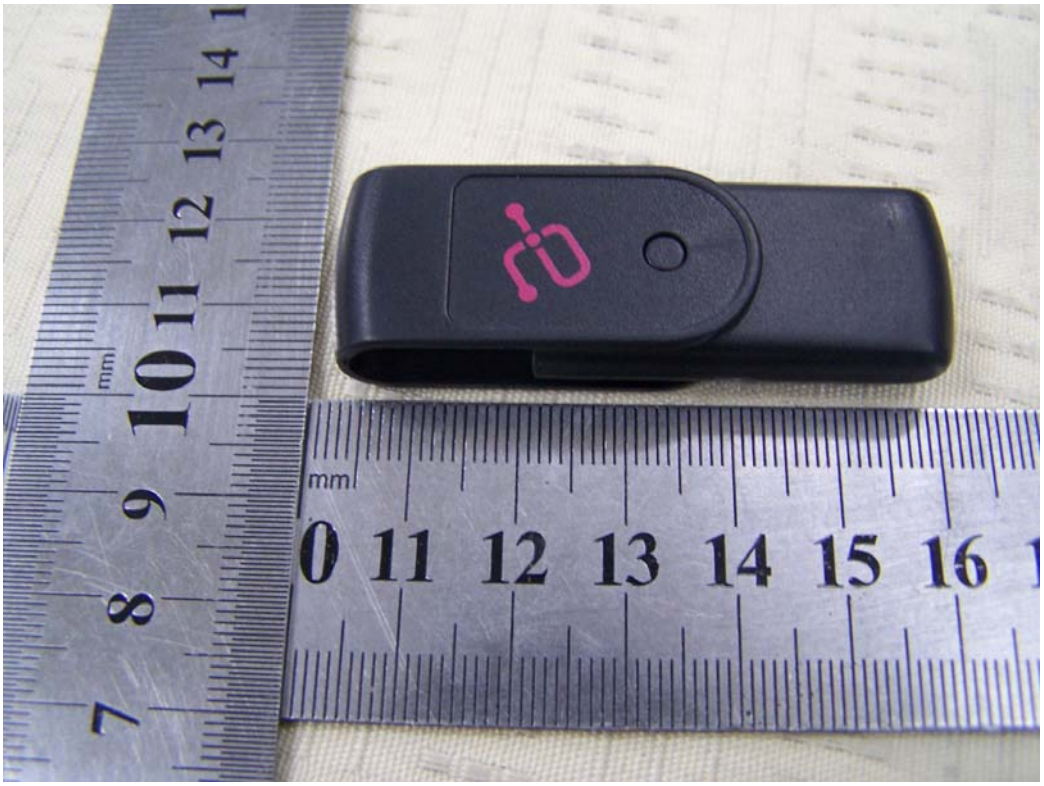
Channel	Channel Frequency (MHz)	Output Peak power (mW)	Antenna Gain (dBi)	Power density at 25cm (mW/ cm^2)	Power density Limits (mW/cm^2)
Low	2402	6.501	2	0.001655	1
Middle	2441	7.396	2	0.001883	1
High	2480	7.379	2	0.001833	1

APPENDIX 1

PHOTOGRAPHS OF EUT

UP View of TX

Bottom View of TX


mm
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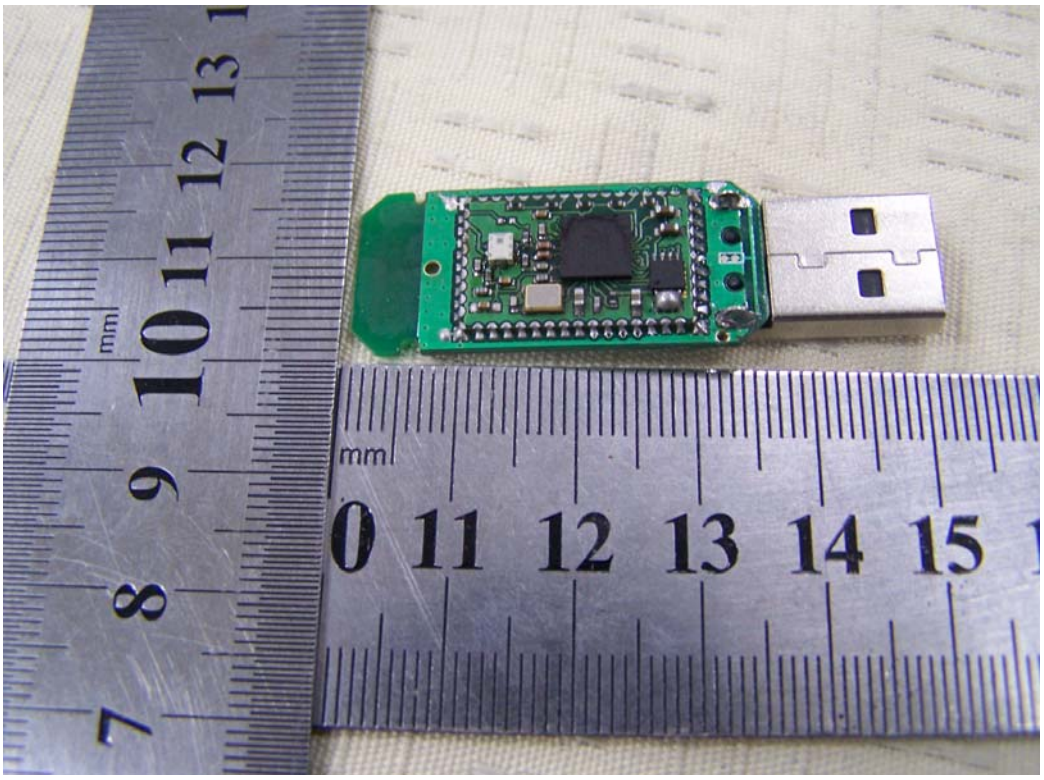
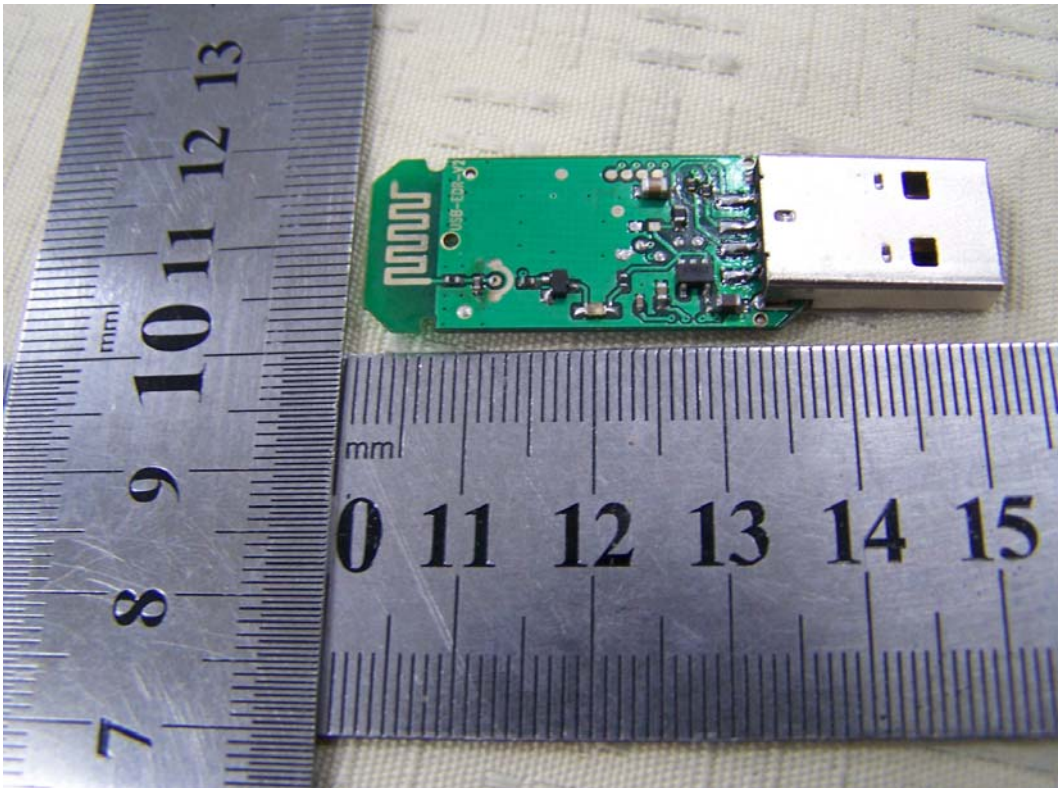
Internal of TX– Open

Internal of TX– 1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