

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

*OF*

**INDUSTRIAL AUDIO KIT**

**MODEL No.: C2AK**

**Trademark: BlueVQL**

**FCC ID: WH8C2AK**

**REPORT No.: E0808678F**

**ISSUE DATE: September 10, 2008**

*Prepared for*  
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Rajajinagar IT Park, Rajajinagar Industrial Estate,  
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*Prepared by*  
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## VERIFICATION OF COMPLIANCE

Applicant:	KTwo Technology Solutions Pvt. Ltd. Rajajinagar IT Park, Rajajinagar Industrial Estate, Bangalore, India.
Product Description:	INDUSTRIAL AUDIO KIT
Trademark:	BlueVQL
Model Number:	C2AK
Serial Number:	N/A
File Number:	E0808678F
Date of Test:	August 20, 2008 to September 09, 2008

### We hereby certify that:

The above equipment was tested by DONGGUAN 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*  
**DONGGUAN EMTEK CO., LTD.**

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## 1. GENERAL INFORMATION

### 1.1 Product Description

The KTwo Technology Solutions Pvt. Ltd. Model: C2AK (referred to as the EUT in this report) The EUT is an short range, lower power, INDUSTRIAL AUDIO KIT designed as an "Input Device. It is designed by way of utilizing the GFSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 2402-2480MHz
- B). Modulation: GFSK
- C). Number of Channel: 79
- D). Channel space: 1MHz
- E). Rated RF Output Power: 4dBm
- F). BIT Rate of Transmission: 1Mbps
- G). Antenna Type: PCB antenna
- H). Antenna GAIN: 0.3dBi
- I). Power Supply: DC 3.7V

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: WH8C2AK 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 CNAS, 2007.07.27  
The certificate is valid until 2012.07.26  
The Laboratory has been assessed and proved to be in compliance  
with CNAS/CL01:2005  
The Certificate Registration Number is L3150

Accredited by TUV Rheinland Shenzhen, 2008.5  
The certificate is valid until 2009.12  
The Laboratory has been assessed according to the requirements  
ISO/IEC 17025

Accredited by FCC, July 07, 2005  
The Certificate Registration Number is 247565.

Accredited by Industry Canada, August 30, 2005  
The Certificate Registration Number is 46405-4480

Name of Firm : DONGGUAN EMTEK Co., Ltd.  
Site Location : No.281, Guantai Road, Nancheng District,  
Dongguan, 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 (Not apply in the report)

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)

Frequency Range(MHz)	Quantity of Hopping Channel	20dB Bandwidth Limit(kHz)			
		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	Peak power ration to emission(dBc)	Limit 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 (Not apply in the report)**

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 dB $\mu$ V/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(dB $\mu$ V/m)(at 3m)		Class B(dB $\mu$ V/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.	INDUSTRIAL AUDIO KIT	BlueVQL	C2AK	WH8C2AK	N/A	<b>EUT</b>

**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	N/A
§ 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 (INDUSTRIAL AUDIO KIT ) has been tested under normal operating condition.

This EUT is a FHSS system, we use blue test to control the EUT with LPT1, 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

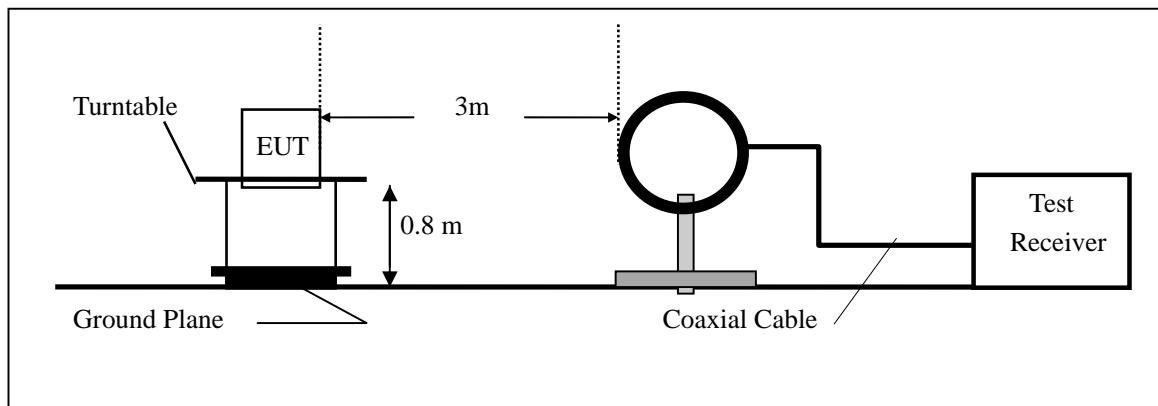
## **5. Radiated Emission Test**

### **5.1 Measurement Procedure**

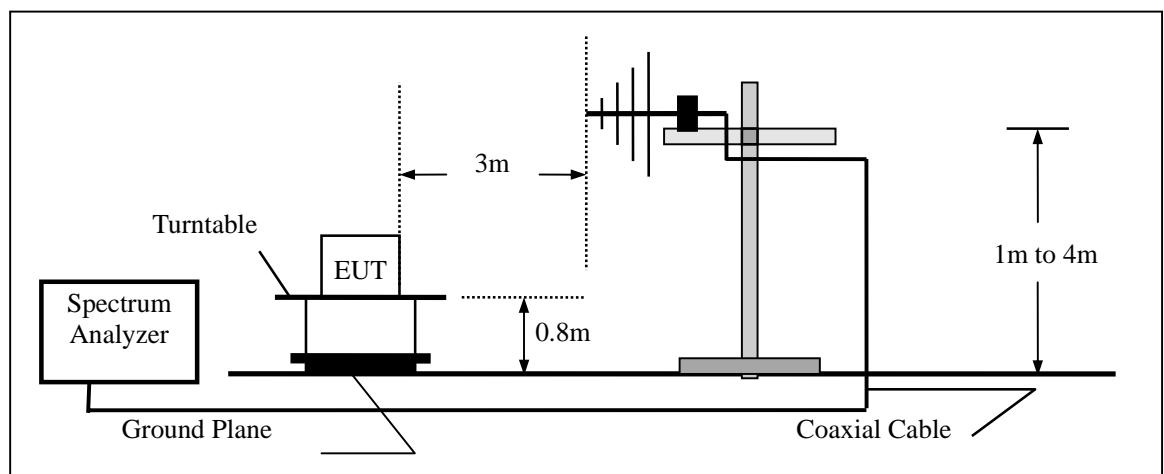
- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above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

## 5.2 Test SET-UP (Block Diagram of Configuration)

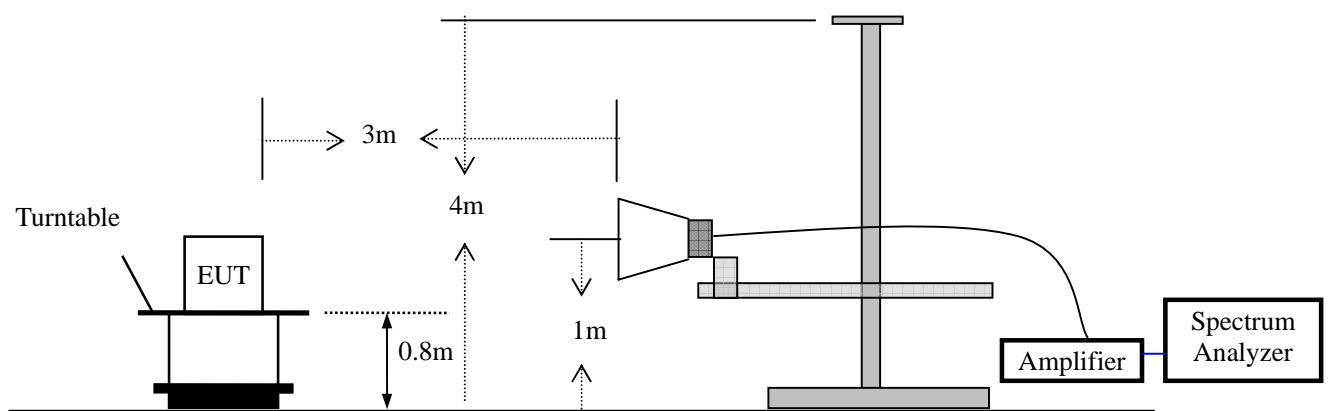
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



### 5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2008	05/29/2009
Spectrum Analyzer	HP	E4407B	839840481	05/29/2008	05/29/2009
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2008	05/29/2009
Pre-Amplifier	HP	8447D	2944A07999	05/29/2008	05/29/2009
Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2008	05/29/2009
Loop Antenna	ARA	PLA-1030/B	1029	05/29/2008	05/29/2009
Horn Antenna	Electro-Metrics	EM-6961	103314	05/29/2008	05/29/2009
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/29/2008	05/29/2009

### 5.4 Measurement Result

Operation Mode: RX Mode Test Date : August 29, 2008  
 Frequency Range: 30~1000MHz Temperature : 28 °C  
 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
36.320	V	32.46	40.00	-7.54	PK
73.540	V	31.12	40.00	-8.88	PK
184.325	V	35.46	43.50	-8.04	PK
254.450	V	33.43	46.00	-12.57	PK
534.560	V	38.54	46.00	-7.46	PK
683.541	V	35.56	46.00	-10.44	PK
43.450	H	32.43	40.00	-7.57	PK
72.610	H	34.57	40.00	-5.43	PK
156.339	H	35.44	43.50	-8.06	PK
342.340	H	33.54	46.00	-12.46	PK
582.120	H	38.88	46.00	-7.12	PK
761.350	H	35.48	46.00	-10.52	PK

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

**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 : August 29, 2008  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 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)	
		PK	AV	PK	AV	PK	AV
2402.00(F)	V	92.43	69.47	114.00	94.00	-21.57	-24.53
2256.12	V	58.31	45.34	74.00	54.00	-15.69	-8.66
2313.46	V	53.64	43.90	74.00	54.00	-20.36	-10.10
2954.65	V	51.33	42.77	74.00	54.00	-22.67	-11.23
4321.45	V	49.31	39.24	74.00	54.00	-24.69	-14.76
5231.52	V	51.91	43.22	74.00	54.00	-22.09	-10.78
2402.00(F)	H	91.45	70.66	114.00	94.00	-22.55	-23.34
2673.35	H	57.31	45.31	74.00	54.00	-16.69	-8.69
2948.43	H	54.33	42.67	74.00	54.00	-19.67	-11.33
3477.28	H	52.48	46.73	74.00	54.00	-21.52	-7.27
3878.42	H	52.61	44.11	74.00	54.00	-21.39	-9.89
4936.12	H	46.65	34.32	74.00	54.00	-27.35	-19.68

**No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.**

**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 : August 29, 2008  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 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)	
		PK	AV	PK	AV	PK	AV
2441.00(F)	V	91.56	71.32	114.00	94.00	-22.44	-22.68
2389.45	V	52.14	44.65	74.00	54.00	-21.86	-9.35
2432.76	V	54.54	44.88	74.00	54.00	-19.46	-9.12
2674.56	V	52.45	42.10	74.00	54.00	-21.55	-11.90
3762.22	V	53.54	44.63	74.00	54.00	-20.46	-9.37
4617.53	V	50.17	38.67	74.00	54.00	-23.83	-15.33
2441.00(F)	H	92.78	71.46	114.00	94.00	-21.22	-22.54
2547.67	H	53.11	44.22	74.00	54.00	-20.89	-9.78
3354.85	H	52.54	43.56	74.00	54.00	-21.46	-10.44
3937.66	H	50.21	42.54	74.00	54.00	-23.79	-11.46
4562.57	H	49.32	40.35	74.00	54.00	-24.68	-13.65
5137.35	H	54.37	45.43	74.00	54.00	-19.63	-8.57

**No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.**

**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 : August 29, 2008  
 Frequency Range: 1-25GHz Temperature : 28 °C  
 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)	
		PK	AV	PK	AV	PK	AV
2480.00(F)	V	89.45	70.12	114.00	94.00	-24.55	-23.88
2572.34	V	52.14	43.64	74.00	54.00	-21.86	-10.36
2957.35	V	56.34	44.21	74.00	54.00	-17.66	-9.79
3126.64	V	50.67	42.14	74.00	54.00	-23.33	-11.86
4546.70	V	47.36	39.32	74.00	54.00	-26.64	-14.68
5231.65	V	49.34	39.34	74.00	54.00	-24.66	-14.66
2480.00(F)	H	91.46	73.65	114.00	94.00	-22.54	-20.35
2423.54	H	52.46	42.87	74.00	54.00	-21.54	-11.13
2984.36	H	54.64	41.24	74.00	54.00	-19.36	-12.76
3542.62	H	49.34	40.21	74.00	54.00	-24.66	-13.79
4387.33	H	48.36	39.24	74.00	54.00	-25.64	-14.76
5246.75	H	45.37	38.54	74.00	54.00	-28.63	-15.46

**No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.**

**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.

**5.5 Radiated Measurement Photos:**

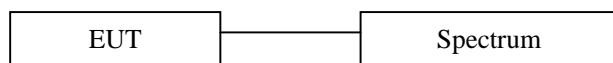


## 6. Channel Separation test

### 6.1 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.

### 6.2 Test SET-UP (Block Diagram of Configuration)



### 6.3 Measurement Equipment Used:

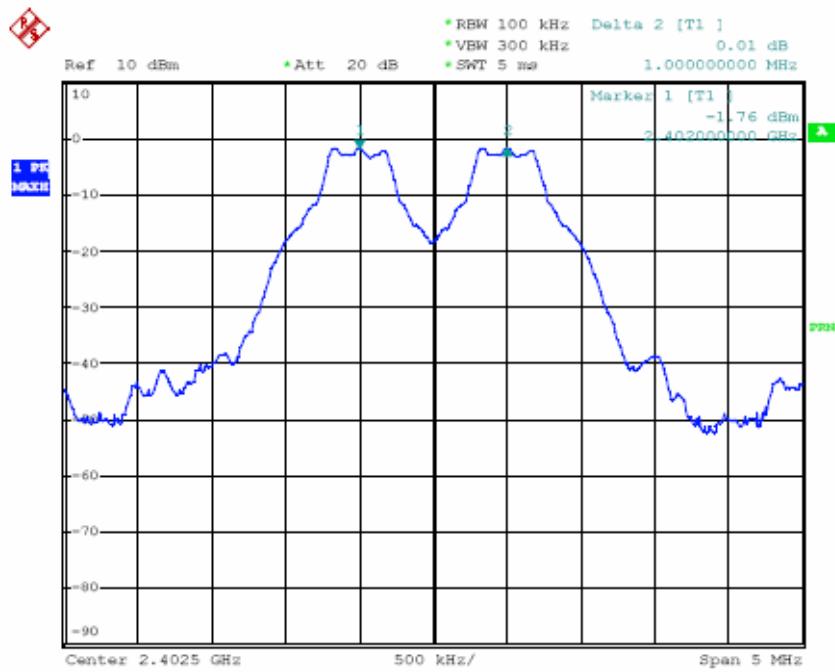
Same as 4.3 Radiated Emission Measurement.

### 6.4 Measurement Results:

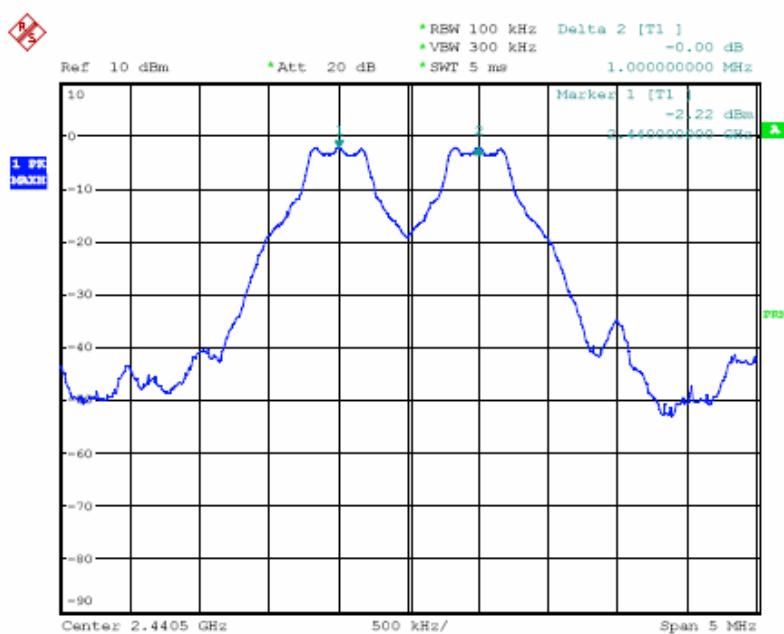
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 08, 2008
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

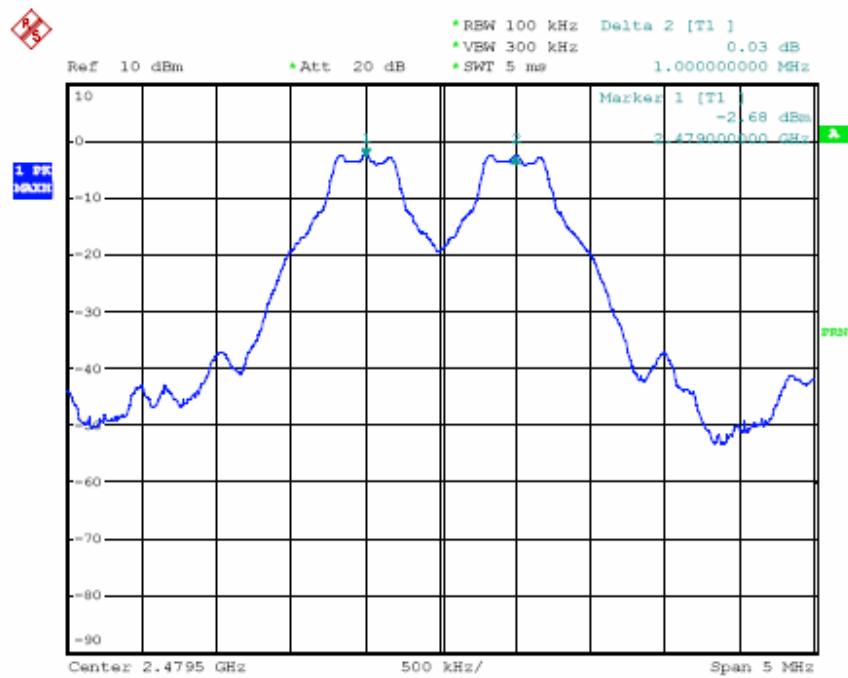
Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit (kHz)
1	2402	1000.00	>25 kHz
40	2441	1000.00	>25 kHz
79	2480	1000.00	>25 kHz



Date: 08.Sep.2008 16:45:34



Date: 08.Sep.2008 16:46:32



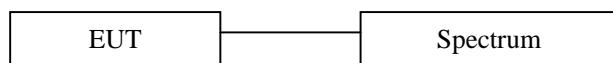
Date: 08.Sep.2008 16:47:34

## 7. 20dB Bandwidth 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:

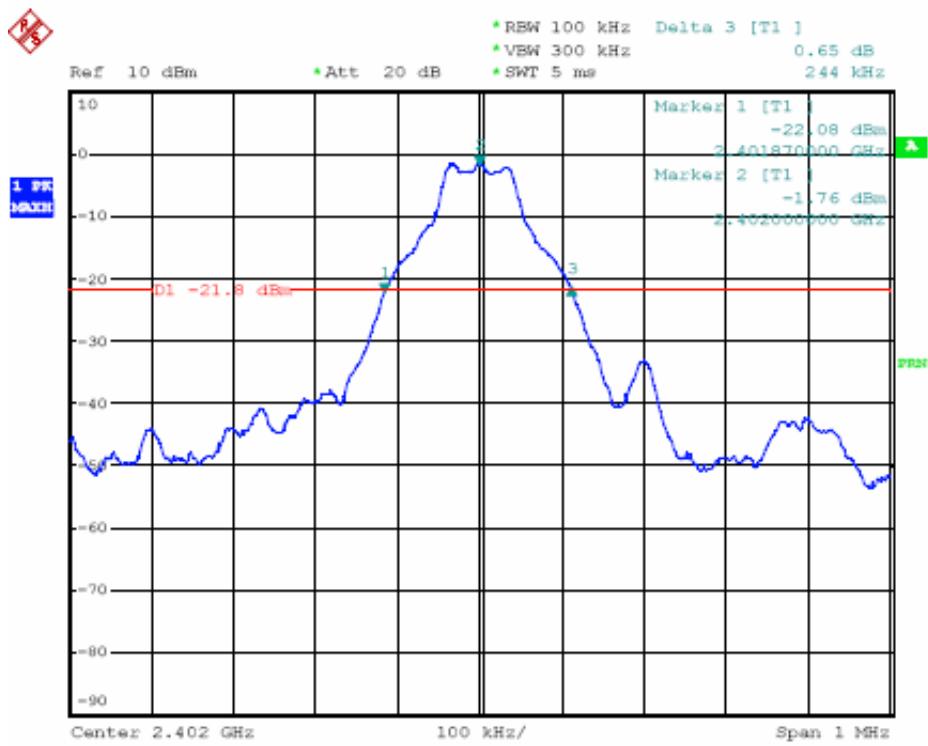
Same as 4.3 Radiated Emission Measurement.

### 7.4 Measurement Results:

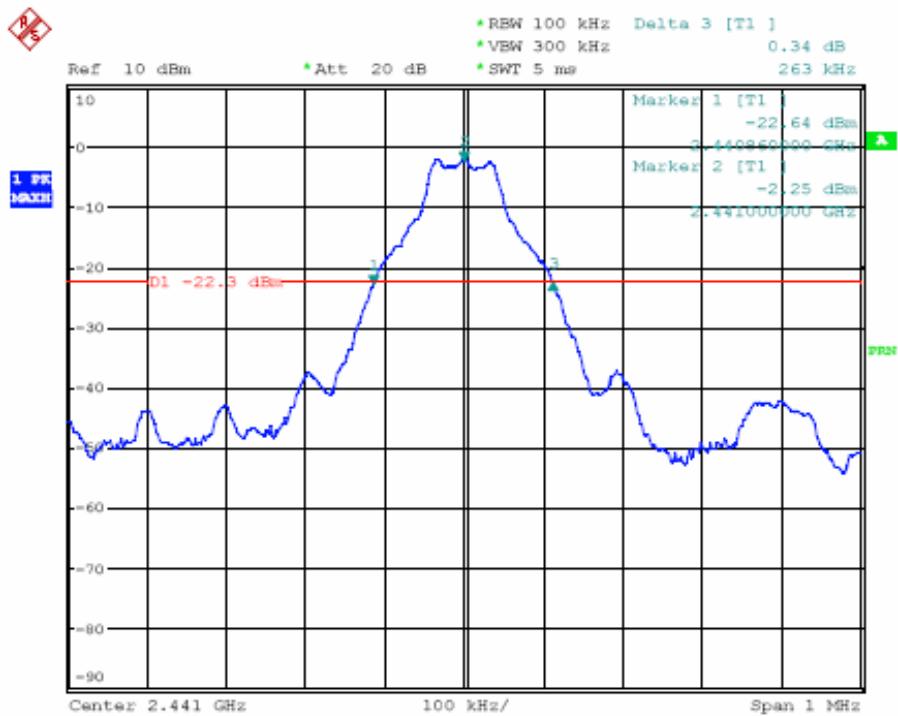
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 08, 2008
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

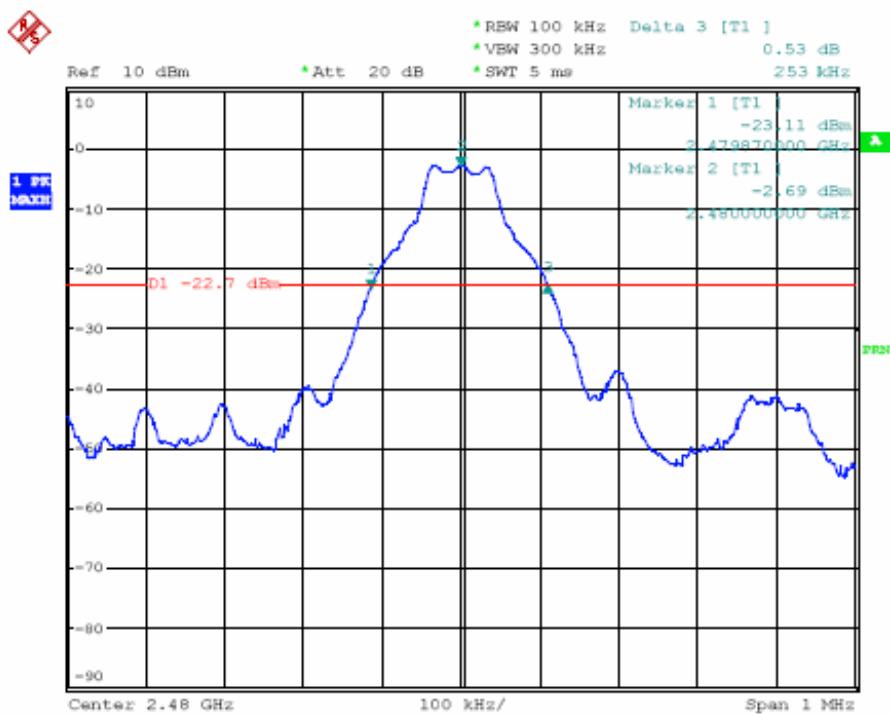
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	244
40	2441	263
79	2480	253



Date: 08.Sep.2008 16:59:05



Date: 08.Sep.2008 17:00:59



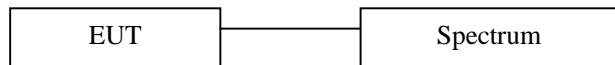
Date: 08.Sep.2008 17:02:52

## 8. Quantity of Hopping Channel 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:

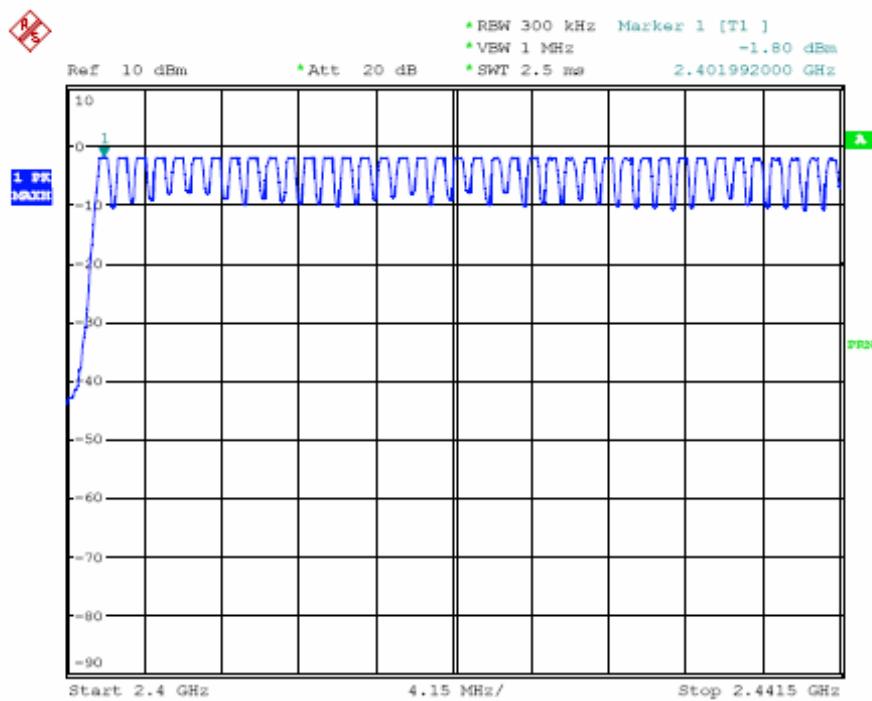
Same as 4.3 Radiated Emission Measurement.

### 8.4 Measurement Results:

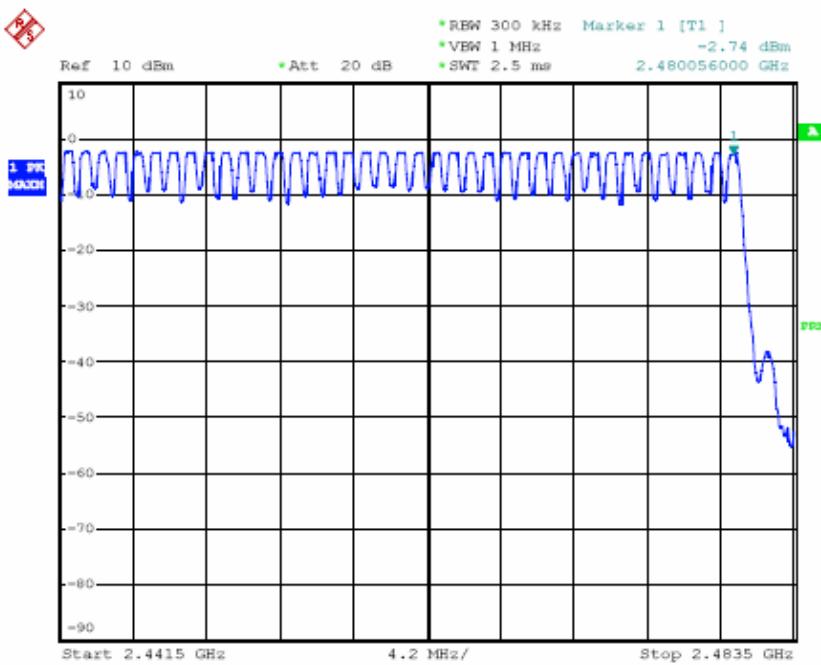
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 08, 2008
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

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



Date: 08.Sep.2008 17:08:28



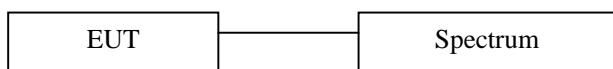
Date: 08.Sep.2008 17:11:14

## 9. Time of Occupancy (Dwell Time) test

### 9.1 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 to 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.

### 9.2 Test SET-UP (Block Diagram of Configuration)



### 9.3 Measurement Equipment Used:

Same as 4.3 Radiated Emission Measurement.

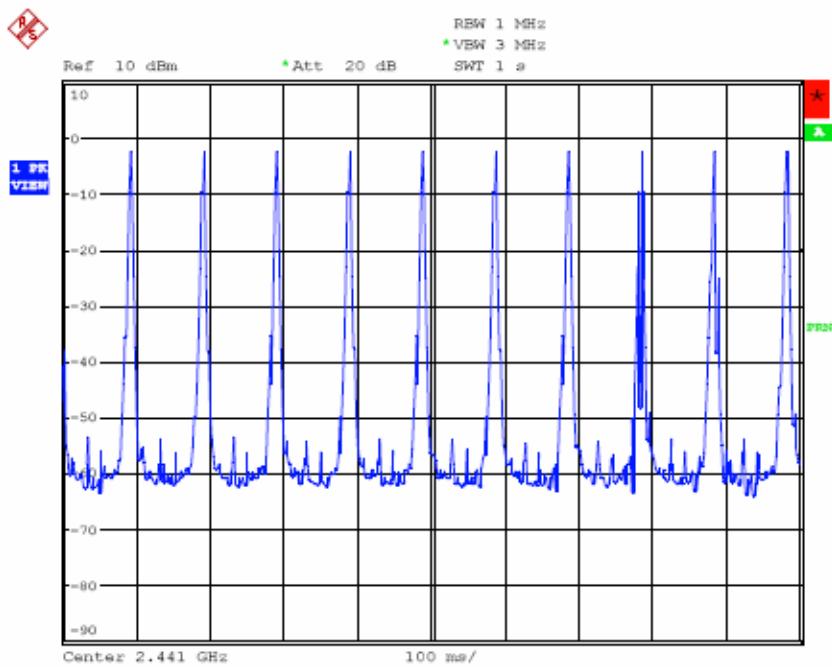
### 9.4 Measurement Results:

Refer to attached data chart.

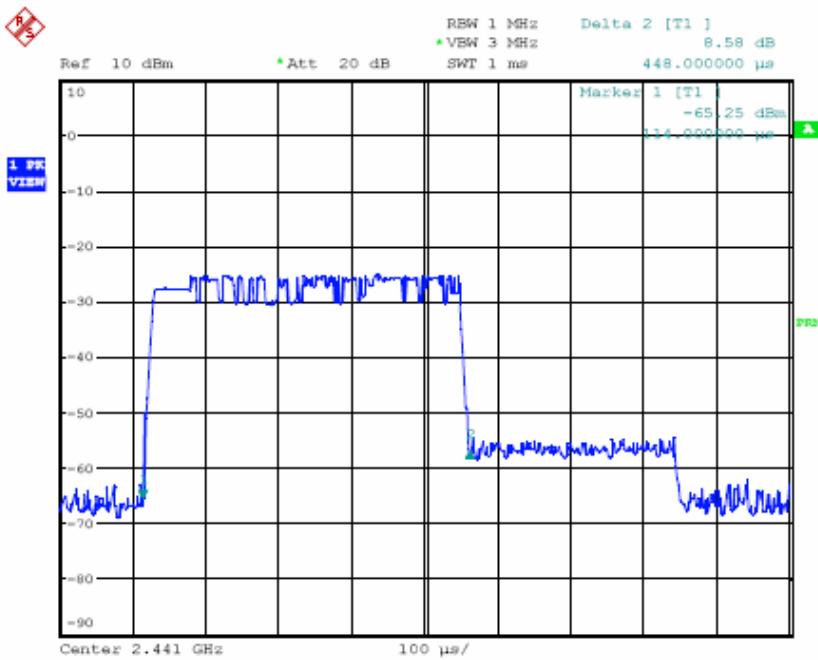
Spectrum Detector:	PK	Test Date :	September 08, 2008
Test By:	Andy	Temperature :	28 °C
Test Result:	PASS	Humidity :	65 %

Mode	Numbers of emission in 31.6s(79*0.4s)	Single transmission time(ms)	Result (msec)	Limit (msec)
DH1	10*31.6	0.448	141.568ms	400
DH3	10*31.6	0.462	145.992ms	400
DH5	10*31.6	0.460	145.360ms	400

DH1

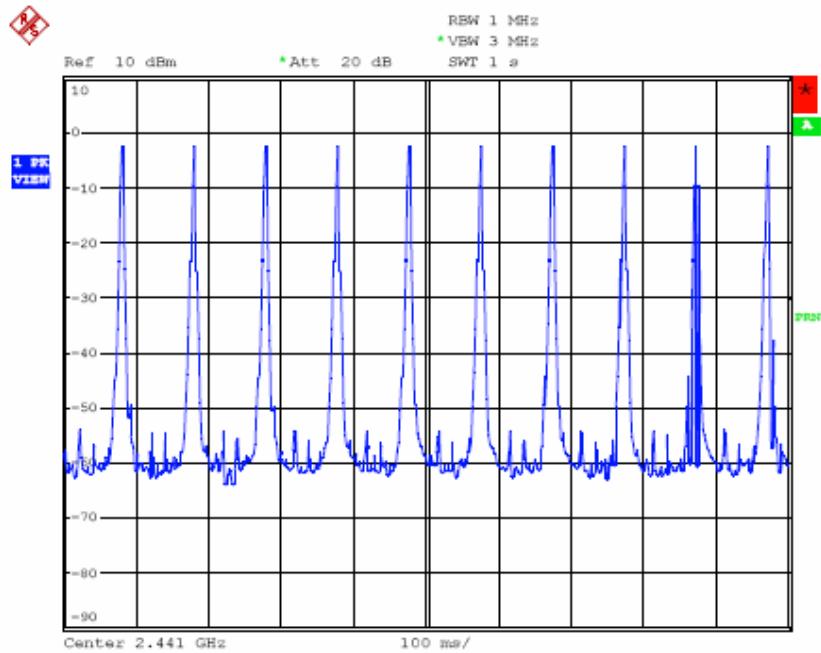


Date: 08.Sep.2008 19:03:25

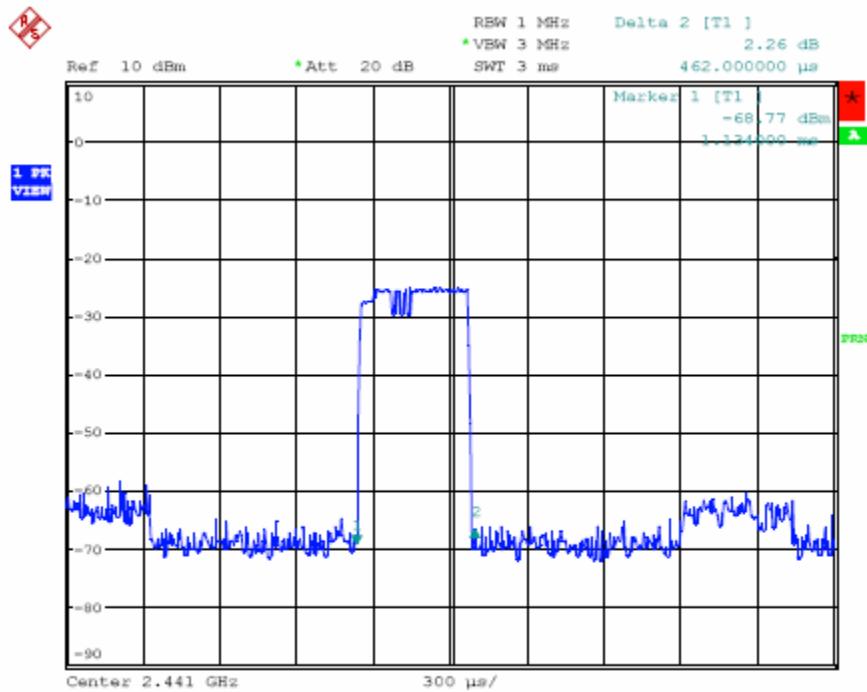


Date: 08.Sep.2008 19:04:37

DH3

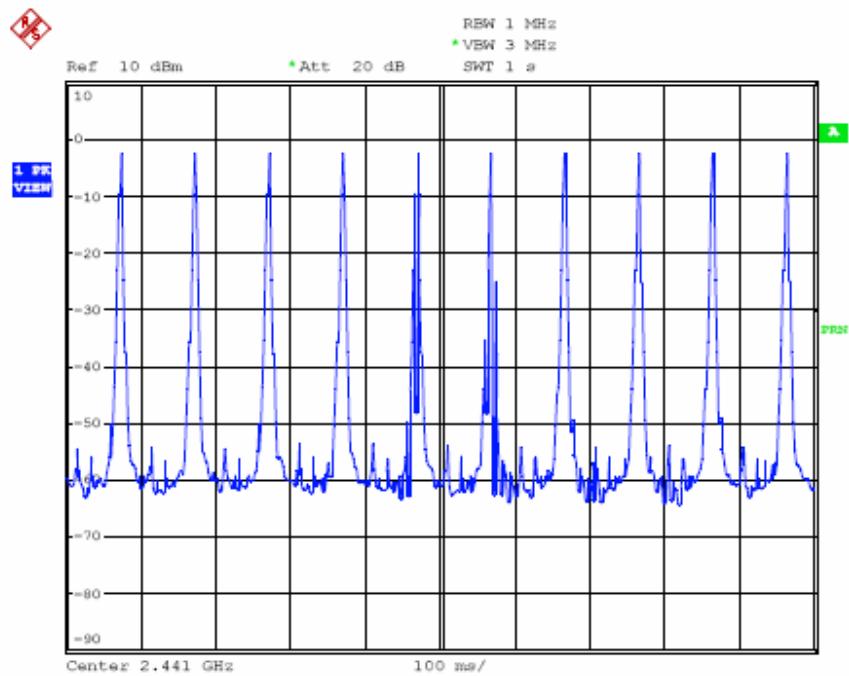


Date: 08.Sep.2008 19:07:22

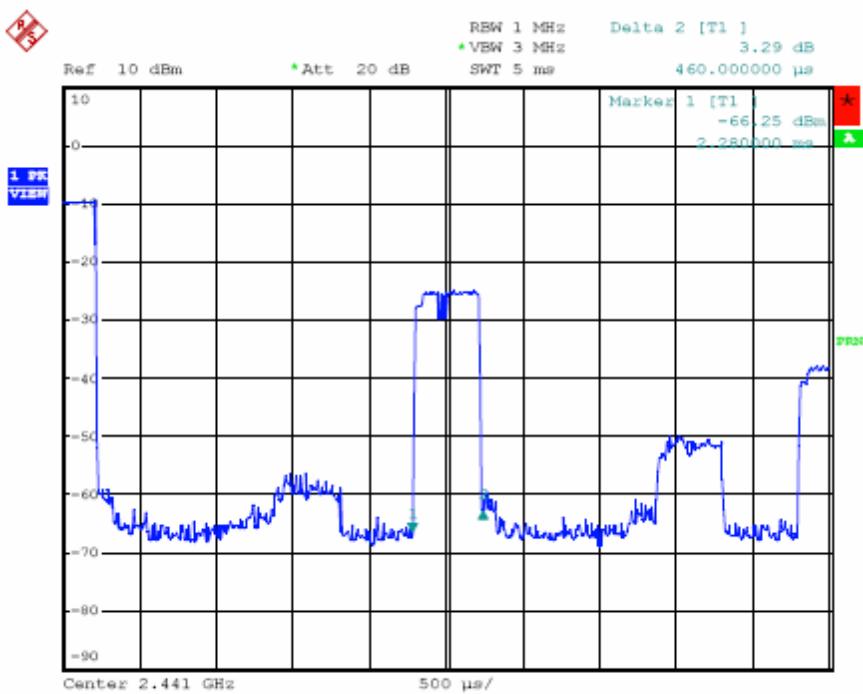


Date: 08.Sep.2008 19:08:36

DH5



Date: 08.Sep.2008 19:09:15



Date: 08.Sep.2008 19:10:15

## 10. MAXIMUM PEAK OUTPUT POWER 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 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.

### 10.2 Test SET-UP (Block Diagram of Configuration)



### 10.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power meter	Boonton	4232A	29001	05/29/2008	05/29/2009
Power sensor	Boonton	51011-EMC	31184	05/29/2008	05/29/2009

### 10.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector: PK Test Date : September 06, 2008  
Test By: Andy Temperature : 28 °C  
Test Result: PASS Humidity : 65 %

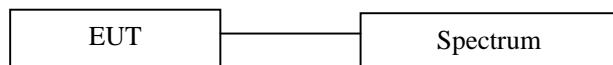
Channel number	Channel Frequency (MHz)	Reading dBm	Cable loss dB	Result (dBm)	Limit dBm	Pass/Fail
1	2402.00	1.99	0.63	2.62	20.97	PASS
40	2441.00	1.84	0.57	2.41	20.97	PASS
79	2480.00	1.27	0.68	1.95	20.97	PASS

## 11. Band EDGE test

### 11.1 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.

### 11.2 Test SET-UP (Block Diagram of Configuration)



### 11.3 Measurement Equipment Used:

Same as 4.3 Radiated Emission Measurement.

### 11.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 08, 2008
Test By:	Andy	Temperature :	28 °C
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	-1.71	-41.43	39.72	>20dBc
>2483.5	-2.64	-41.65	39.01	>20dBc

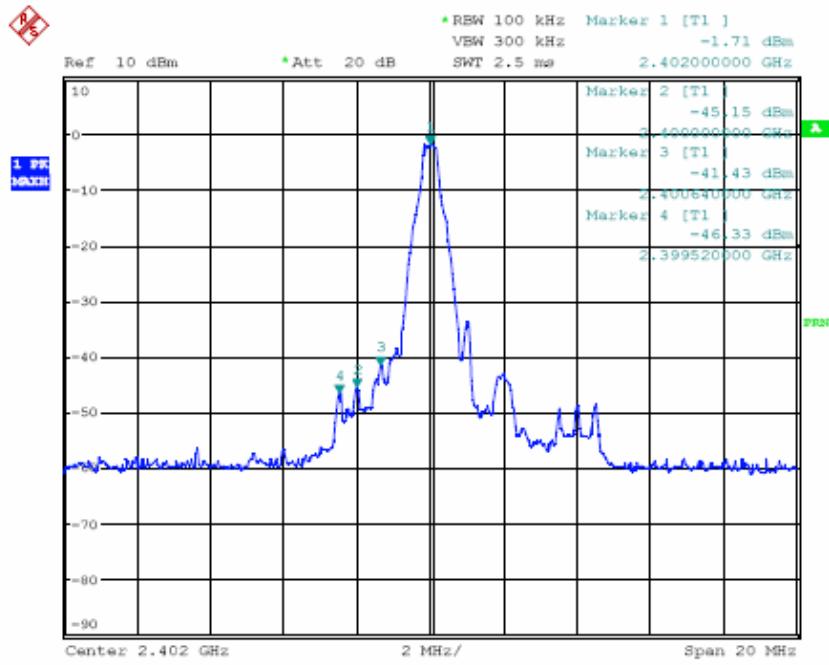
#### 2. Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		QP	AV	QP	AV
<2400	V	54.37	35.87	74.00	54.00
>2483.5	V	57.12	38.66	74.00	54.00

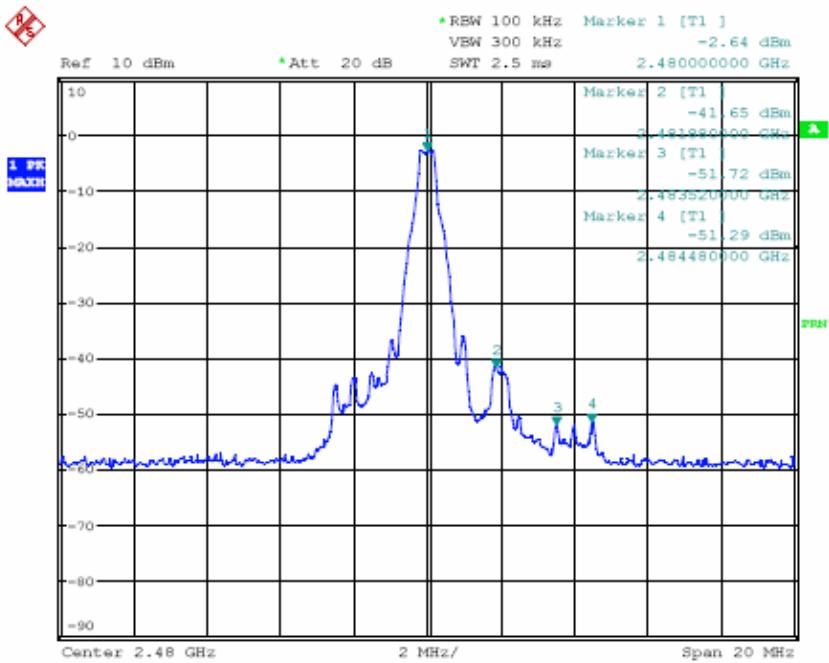
DONGGUAN EMTEK CO., LTD.  
REPORT NO:E0808678F

FCC ID:WH8C2AK

DATE: 09/10/2008



Date: 08.Sep.2008 17:56:55



Date: 08.Sep.2008 18:45:20

## **12. Antenna Application**

### **12.1 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 2402-2480MHz 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.

### **12.2. Result**

The EUT's antenna used a chip antenna and integrated on PCB, The antenna's gain is 0.3dBi and meets the requirement.

### 13. 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 <sup>2</sup> )	Average Time
<b>(A) Limits for Occupational/Control Exposures</b>				
<b>300-1500</b>	--	--	<b>F/300</b>	<b>6</b>
<b>1500-100000</b>	--	--	<b>5</b>	<b>6</b>
<b>(B) Limits for General Population/Uncontrol Exposures</b>				
<b>300-1500</b>	--	--	<b>F/1500</b>	<b>6</b>
<b>1500-100000</b>	--	--	<b>1</b>	<b>30</b>

**13.1 Friis transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * R^2)$**

Where

Pd= Power density in mW/cm<sup>2</sup>

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/cm<sup>2</sup>. 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.

### 13.2 Measurement Result

Antenna gain: 2 dBi

Channel	Channel Frequency (MHz)	Output Peak power (mW)	Antenna Gain (dBi)	Power density at 25cm (mW/ cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
Low	2402	1.828	0.3	7.758e-5	1
Middle	2441	1.742	0.3	7.393e-5	1
High	2480	1.567	0.3	6.651e-5	1