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Report No.: GLEMO051203069RF(I)

Page: 1 of 30

FCC ID: TWF-WL-286

FEDERAL COMMUNICATIONS COMMISSION

# TEST REPORT

**Application No. :** GLEMO051203069RF

**Applicant:** Cobalt Industrial Co.,Ltd.

**FCC ID:** TWF-WL-286

**Fundamental Carrier Frequency :**

2.40992GHz , 2.41902GHz , 2.42802GHz , 2.43702GHz

2.44602GHz , 2.45502GHz , 2.46402GHz, 2.47292GHz

**Equipment Under Test (EUT):**

Name: 2.4GHz Wireless Digital Headphone (Transmitter part)

Item No.: WL Series\*

\* Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.

**Standards:** FCC PART 15: 2005

**Date of Receipt:** 6 December 2005

**Date of Test:** 7 to 16 December 2005

**Date of Issue:** 16 December 2005

<b>Test Result :</b>	<b>PASS *</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Jerry Chen  
Manager

This report refers to the General Conditions for Inspection and Testing Services, printed overleaf

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.



## 2 Test Summary

Test	Test Requirement	Standard Paragraph	Result
Conducted Emission (150KHz to 30MHz)	FCC PART 15 :2005	Section 15. 207	PASS
Field Strength of Fundamental	FCC PART 15 :2005	Section 15.249 (a)	PASS
Field Strength of Harmonics or other Frequency	FCC PART 15 :2005	Section 15.249 (a) Section 15.209	PASS
Occupied Bandwidth	FCC PART 15 :2005	Section 15.249	PASS
Band Edges Measurement	FCC PART 15 :2005	Section 15.249 (d)	PASS

Item No.:

WL Series

Only the Item WL-286 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above items, with only difference being the item no.'s and outer decoration.

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## 4 General Information

### 4.1 Client Information

Applicant Name: Cobalt Industrial Co.,Ltd.  
Applicant Address: Flat M,7/F.,Yue Cheung Centre,1-3 Wong Chuk Yeung Street,Fo Tan,Shatin,N.T.,Hong Kong.

### 4.2 General Description of E.U.T.

Product Name: 2.4GHz Wireless Digital Headphone (Transmitter part)  
Item No.: WL Series  
Power Supply: Transmitter Part : 4.5V DC (3 x 'AAA' Size Batteries) or 6V DC  
Receiver Part: 4.5V DC (3 x 'AAA' Size Batteries).  
Power Cord: N/A-

### 4.3 Description of Support Units

The EUT was tested as an independent unit: a 2.4GHz Wireless Digital Headphone.  
The transmitter have 8 frequency channel between 2.4GHz and 2.4835GHz.FSK modulation and 44.1K sampling rate linear PCM.

### 4.4 Standards Applicable for Testing

The customer requested FCC tests for a 2.4GHz Wireless Digital Headphone.  
The standard used was FCC PART 15, SUBPART C (2005) section 15.249.

### 4.5 Test Location

All tests were performed at:-

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory, No.198 Kezhu Road, Science Town Economic& Technology Development District Guangzhou, China 510663

Tel: +86 20 82155555

Fax: +86 20 82075059

### 4.6 Other Information Requested by the Customer

None.

#### **4.7 Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP – Lab Code: 200611-0**  
SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is recognized under the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0. Effective through December 31, 2004.
- **ACA**  
SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.
- **VCCI**  
The 3m Semi-anechoic chamber and Shielded Room (11.5m x 4m x 4m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-1599 and C-1706 respectively.  
Date of Registration: June 01, 2005. Valid until February 22, 2008
- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**  
Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.
- **CNAL – LAB Code: L0141**  
SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAL/AC01: 2002 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of Testing Laboratories.
- **FCC – Registration No.: 282399**  
SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002. With the above and NVLAP's accreditation, SGS-CSTC is an authorised test laboratory for the DoC process.
- **Industry Canada (IC)**  
The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5169.

## 5 Test Results

### 5.1 Test Instruments

RE in Chamber						
No:	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	3m Semi- Anechoic Chamber	Frankonia	N/A	N/A	31-01-2005	30-01-2006
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	100249	05-12-2005	05-12-2006
3	EMI Test Software	Audix	E3	N/A	N/A	N/A
4	Coaxial cable	SGS	N/A	N/A	05-12-2004	04-12-2005
5	Bilog Type Antenna	Schaffner -Chase	CBL6143	5070	17-01-2005	16-01-2006
6	Horn Antenna	Rohde & Schwarz	HF906	100095	10-05-2005	09-05-2006
7	Spectrum Analyzer	Rohde & Schwarz	FSP30	100324	05-12-2005	05-12-2006
8	0.1-1300 MHz Pre-Amplifier	HP	8447D OPT 010	2944A0625 2	31-06-2005	30-06-2006
9	1-26.5 GHz Pre-Amplifier	Agilent	8449B	3008A0164 9	26-01-2005	25-01-2006
10	Active Loop Antenna	EMCO	6502	00042963	14-01-2005	14-01-2006

Conducted Emission						
No:	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	Shielding Room	Frankonia	8 x 3 x 3.8 m <sup>3</sup>	EMC0306	N/A	N/A
2	LISN	Schaffner Chase	MNZ050D11	1421	05-12-2005	05-12-2006
3	EMI Test Receiver	Rohde & Schwarz	ESCS30	100085	05-12-2005	05-12-2006
4	Coaxial Cable	SGS	2m	EMC0107	25/11/2005	25/11/2006

## 6 Test Procedure & Measurement Data

### 6.1 Conducted Emissions Mains Terminals, 150kHz to 30MHz

Test Requirement: FCC Part 15.207  
Test Method: ANSI C63.4  
Test Date: 19 December 2005  
Frequency Range: 150KHz to 30MHz  
Class / Severity: Class B  
Detector: Peak for pre-scan (9kHz Resolution Bandwidth)  
Quasi-Peak if maximised peak within 6dB of Quasi-Peak limit

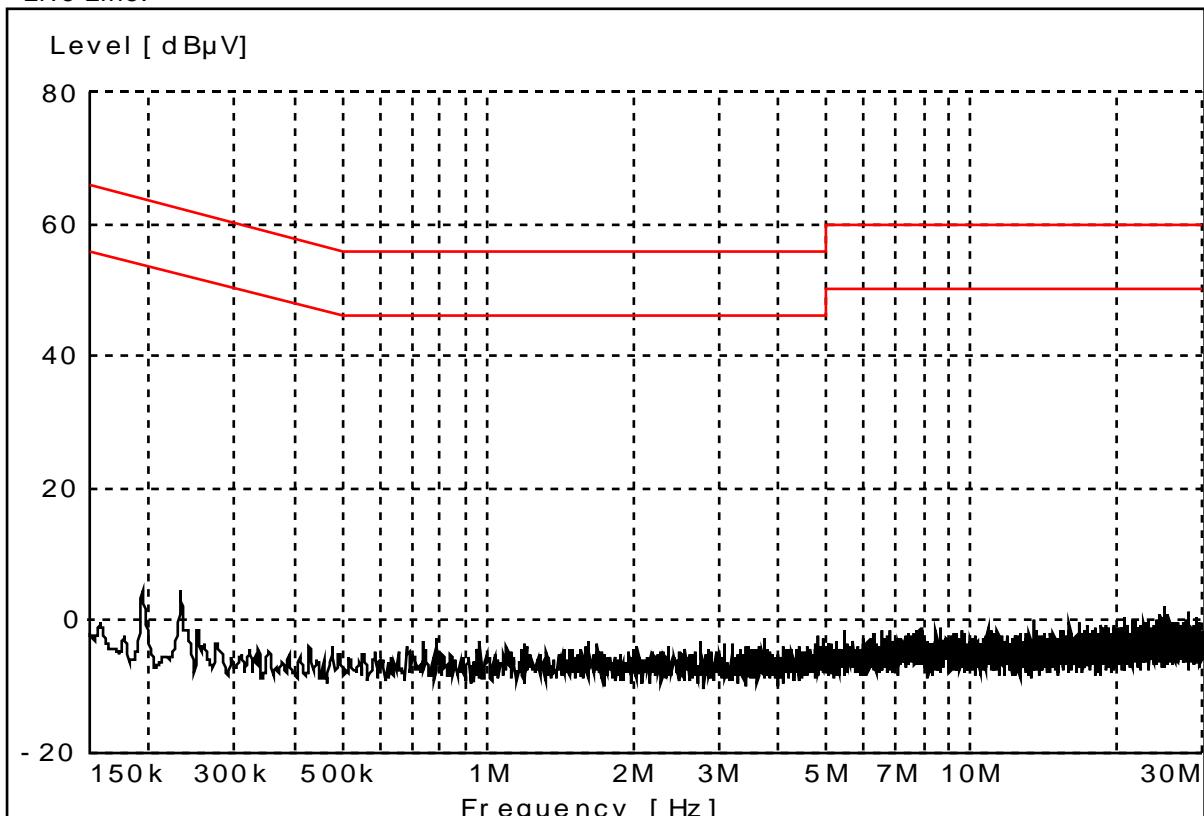
#### 6.1.1 E.U.T. Operation

Operating Environment:  
Temperature: 26.0 °C      Humidity: 73% RH      Atmospheric Pressure: 1005 mBar  
EUT Operation: Test the EUT in voice transmitting mode.

#### 6.1.2 Measurement Data

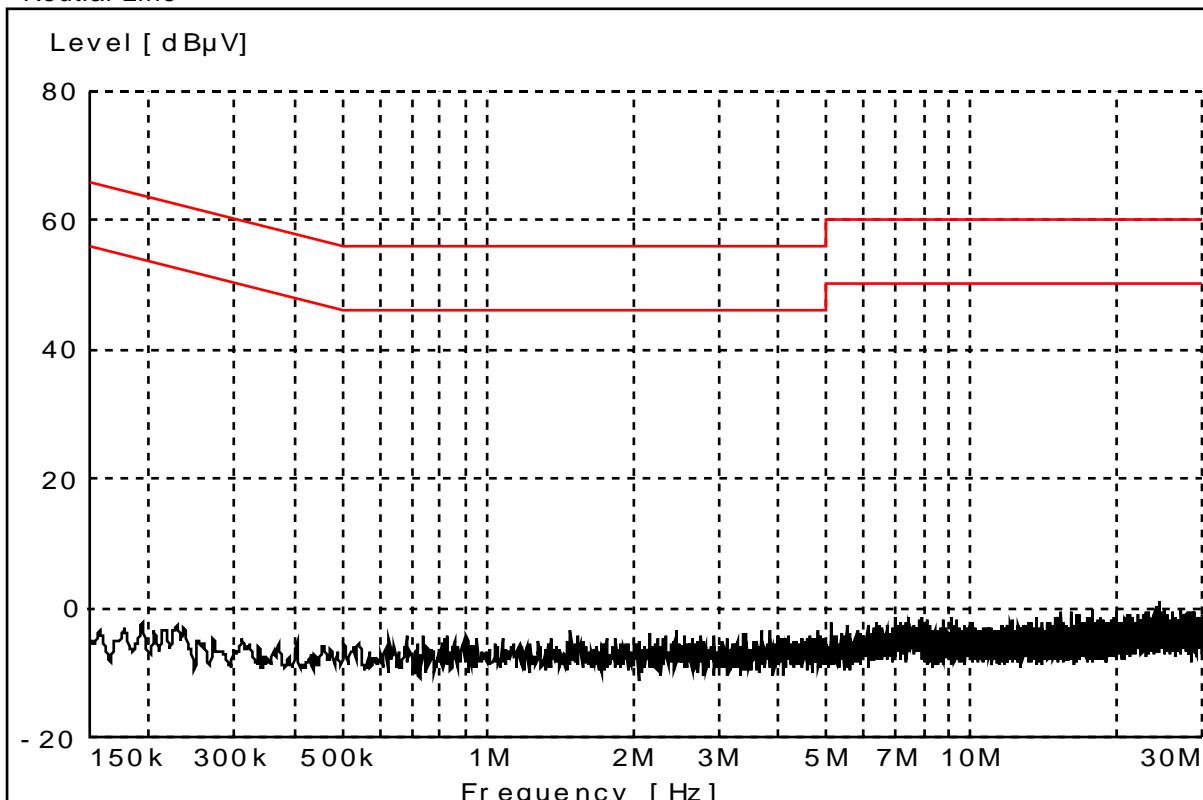
An initial pre-scan was performed on the live and neutral lines with peak detector.  
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.  
The following Quasi-Peak and Average measurements were performed on the EUT on 19 December 2005:

Live Line:



Frequency (MHz)	Transducer (dB)	Receiver QP Reading (dBuV)	Receiver QP Level (dBuV)	Limit (dBuV)	Margin (dB)	Receiver AV Reading (dBuV)	Receive AV Level (dBuV)	Limit (dBuV)	Margin (dB)
0.232	0.1	-2.2	-2.1	62.4	64.5	-4.3	-4.2	52.4	56.6
0.786	0.0	-4.2	-4.2	56.0	60.2	-5.1	-5.1	46.0	51.1
1.616	0.0	-4.3	-4.3	56.0	60.3	-5.0	-5.0	46.0	51.0
3.738	0.0	-4.1	-4.1	56.0	60.1	-5.0	-5.0	46.0	51.0
13.558	0.3	-3.8	-3.5	60.0	63.5	-4.8	-4.5	50.0	54.5
25.227	0.6	-0.4	0.2	60.0	59.8	-1.4	-0.8	50.0	50.8

## Neutral Line



Frequency (MHz)	Transducer (dB)	Receiver QP Reading (dBuV)	Receiver QP Level (dBuV)	Limit (dBuV)	Margin (dB)	Receiver AV Reading (dBuV)	Receive AV Level (dBuV)	Limit (dBuV)	Margin (dB)
0.193	0.1	-2.8	-2.7	63.9	66.6	-4.3	-4.2	53.9	58.1
0.735	0.0	-4.2	-4.2	56.0	60.2	-5.0	-5.0	46.0	51.0
1.488	0.0	-4.2	-4.2	56.0	60.2	-5.5	-5.5	46.0	51.5
3.828	0.0	-4.3	-4.3	56.0	60.3	-4.9	-4.9	46.0	50.9
6.932	0.2	-3.7	-3.5	60.0	63.5	-4.7	-4.5	50.0	54.5
24.552	0.6	-3.6	-3.0	60.0	63.0	-4.8	-4.2	50.0	54.2

## 6.2 Radiated Emissions

### 6.2.1 Test in transmitting mode

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 C Section 15.249
Test Date:	14 December 2005
Measurement Distance:	3m (Semi-Anechoic Chamber)
Frequency range	30 MHz – 18GHz for transmitting mode.
Operation:	Test instrumentation resolution bandwidth 120 kHz (30 MHz - 1000 MHz), 1 MHz (1000 M – 18GHz) Receive antenna scan height 1 - 4 m, polarization Vertical/ Horizontal
Requirements:	

Fundamental Frequency (MHz)	Field Strength of Fundamental (dB $\mu$ V/m @ 3m)	Field Strength of Harmonics and Spurious Emissions (dB $\mu$ V/m @ 3m)
902 to 928	94.0	54.0
2400 to 2483.5	94.0	54.0
5725 to 5875	94.0	54.0
24000 to 24250	108.0	68.0

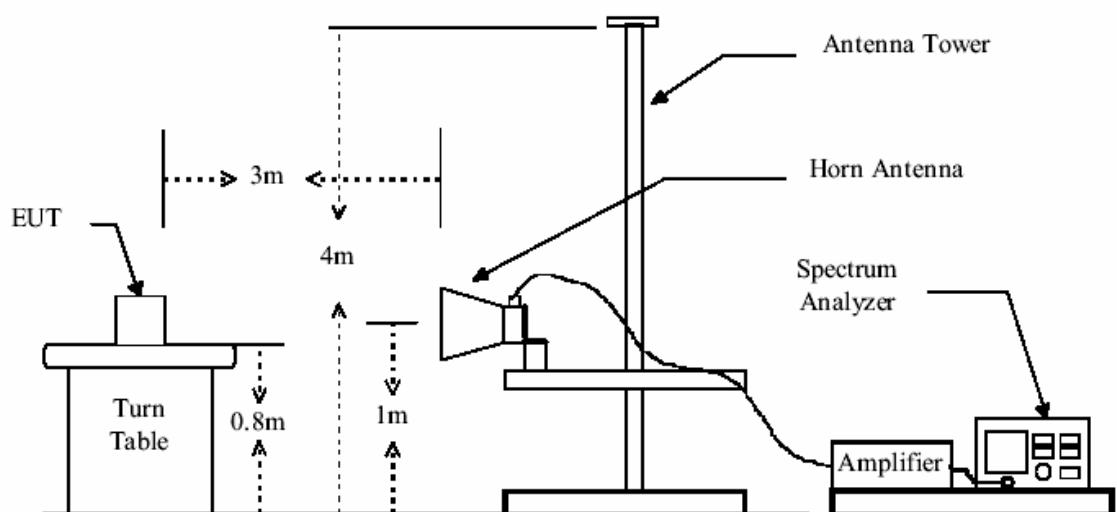
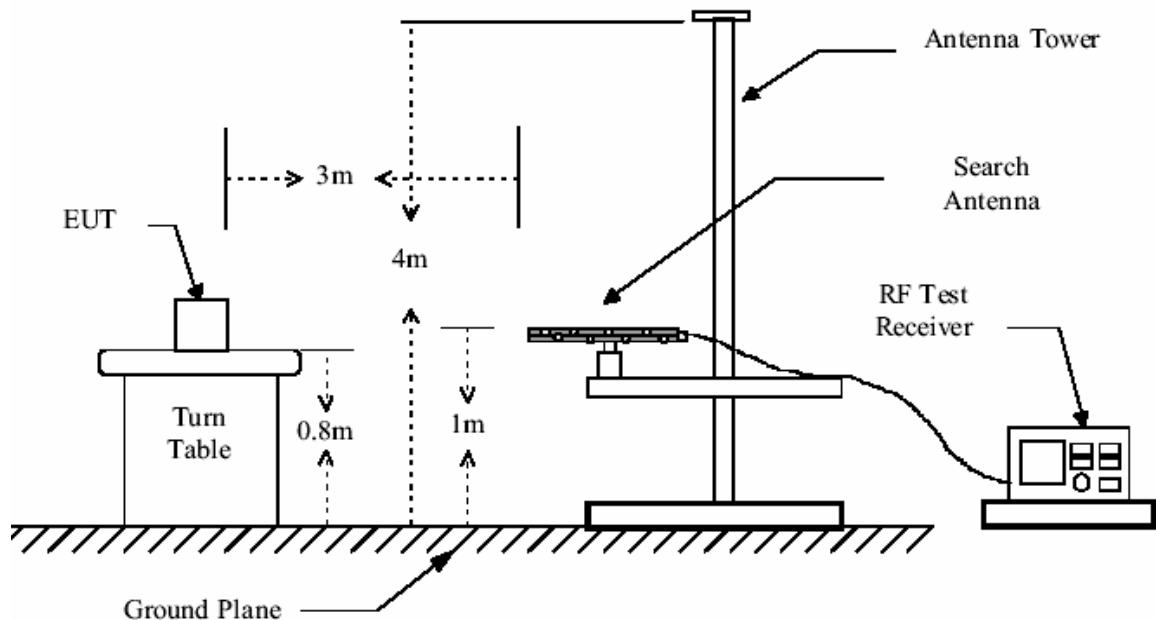
The fundamental frequency of the EUT is 2428MHz

The limit for average field strength dB $\mu$ V/m for the fundamental frequency = 94.0 dB $\mu$ V/m.

No fundamental is allowed in the restricted bands.

The limit for average field strength dB $\mu$ V/m for the harmonics and spurious frequencies = 54.0 dB $\mu$ V/m. Spurious in the restricted bands must be less than 54.0 dB $\mu$ V/m or 15.209.

**Test Procedure:** The procedure used was ANSI Standard C63.4-2003. The receive was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. The worst case emissions were reported.

**Test Configuration:**



The field strength is calculated by adding the Antenna Factor, Cable Factor & Peramplifier . The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Peramplifier Factor

The following test results were performed on the EUT:

For **Channel 1**: (1). Fundamental emission

Test Frequency (GHz)	Measuring Level (dBuV/m)		Limits (dBuV/m)	Margin (dB)	
	Vertical	Horizontal		Vertical	Horizontal
2.42802	97.9	98.4	114.0	16.1	15.6
Average Measurement					
2.42802	91.3	92.1	94.0	2.7	1.9

(2). Harmonics & Spurious Emissions

Test Frequency (GHz)	Measuring Level (dBuV/m)		Limits (dBuV/m)	Margin (dB)	
	Vertical	Horizontal		Vertical	Horizontal
2) 4.85604	51.9	52.6	74.0	23.1	22.4
3) 7.28406	N/A	N/A	74.0	N/A	N/A
4) 9.71208	N/A	N/A	74.0	N/A	N/A
5) 12.1401	N/A	N/A	74.0	N/A	N/A
6) 14.56812	N/A	N/A	74.0	N/A	N/A
7) 16.99614	N/A	N/A	74.0	N/A	N/A
8) 19.42416	N/A	N/A	74.0	N/A	N/A
9) 21.85218	N/A	N/A	74.0	N/A	N/A
10) 24.28020	N/A	N/A	74.0	N/A	N/A
Average Measurement					
2) 4.85604	50.1	50.3	54.0	4.9	4.7
3) 7.28406	N/A	N/A	54.0	N/A	N/A
4) 9.71208	N/A	N/A	54.0	N/A	N/A
5) 12.1401	N/A	N/A	54.0	N/A	N/A
6) 14.56812	N/A	N/A	54.0	N/A	N/A
7) 16.99614	N/A	N/A	54.0	N/A	N/A
8) 19.42416	N/A	N/A	54.0	N/A	N/A
9) 21.85218	N/A	N/A	54.0	N/A	N/A
10) 24.28020	N/A	N/A	54.0	N/A	N/A



N/A: refer to remark 1).

**Remark**

- 1). NA: Not applicable. For this intentional radiator operates below 10 GHz, the spectrum shall be investigated to the tenth harmonic of the highest fundamental frequency. And above the third harmonic of this intentional radiator, the disturbance was too weak to measure. So the test result only displays to 2<sup>th</sup> harmonic.
- 2). According to 15.249 (e) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

**TEST RESULTS:** The unit does meet the FCC requirements.

### **6.2.2 Occupied Bandwidth & Band Edge**

Test Requirement: FCC Part 15 C

Test Method: Based on FCC Part15 C Section 15.249:  
Operation within the band 2.4000 – 2.4835GHz

Test Date: 15 December 2005

Requirements: 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

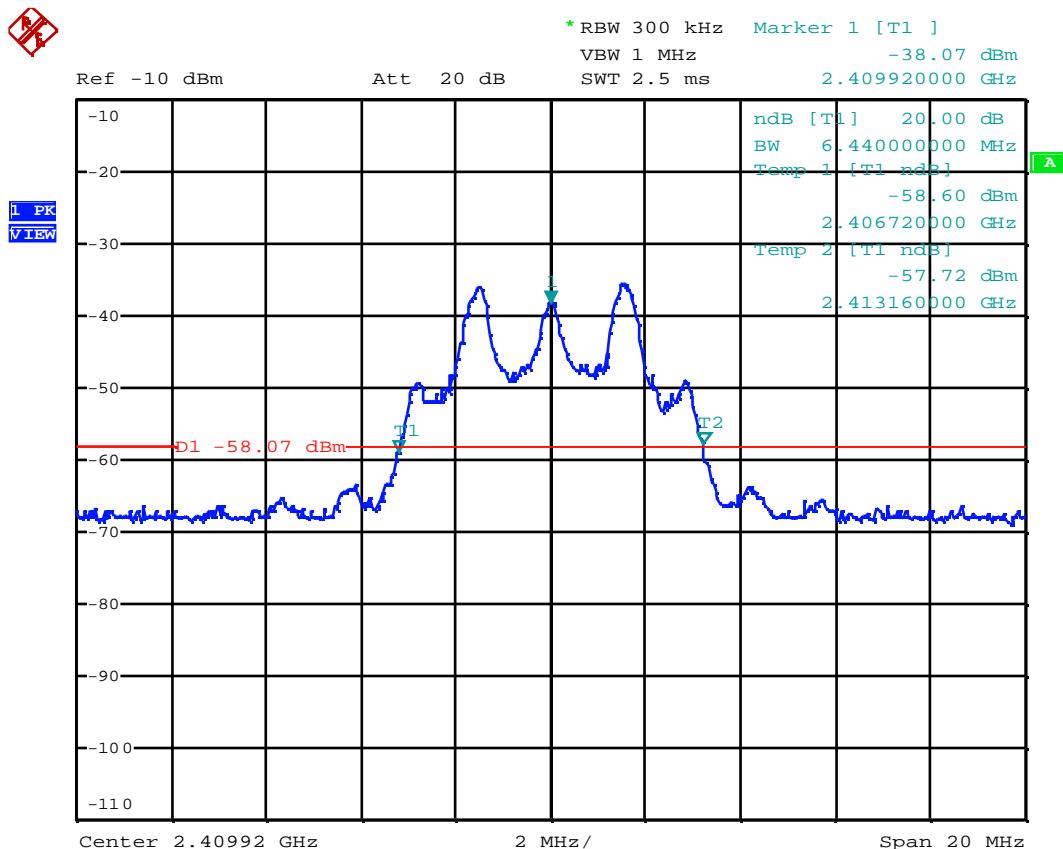
Method of measurement: A small sample of the transmitter output was fed into the Spectrum Analyzer and the attached plot was taken. The vertical is set to 10dB per division. The horizontal scale is set to 2MHz per division when do Occupied Bandwidth test, and the horizontal scale is set to 11MHz per division when do Band Edge test.

#### **(1). For Channel 1:**

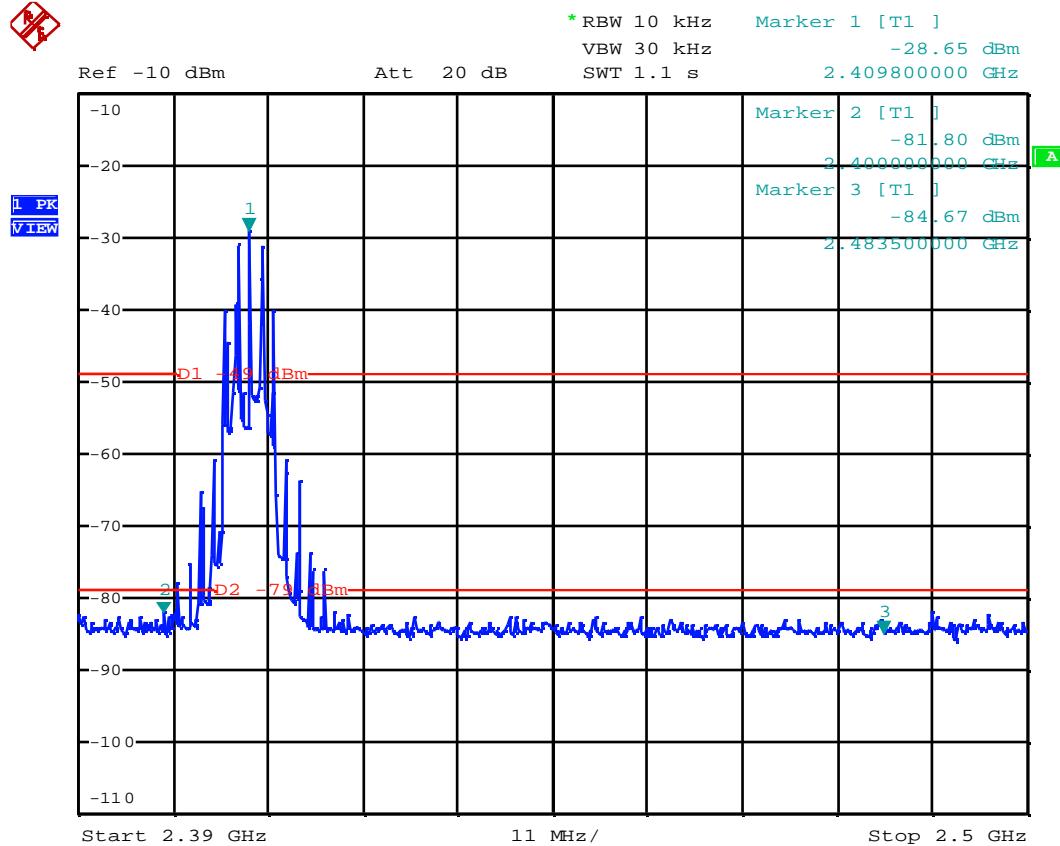
Report No.: GLEMO051203069RFF(I)

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The occupied bandwidth as below:



Date: 15.DEC.2005 17:00:57

**(2). Band Edge:**


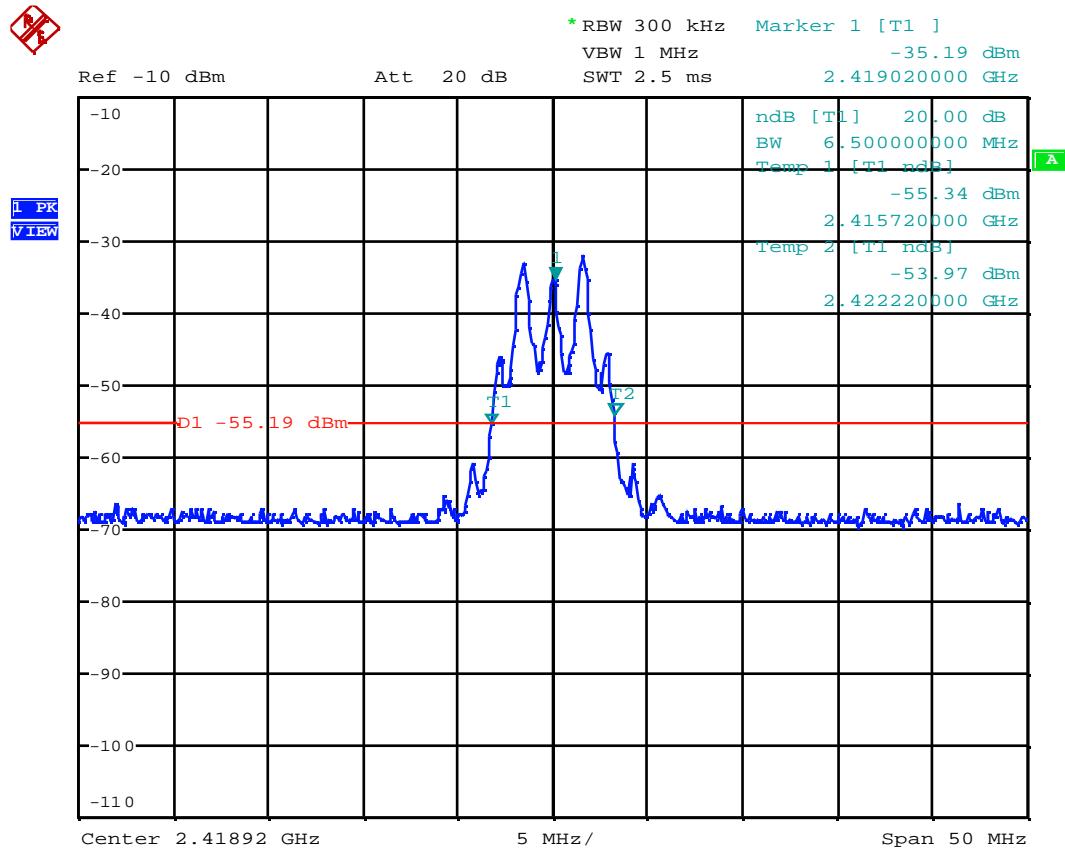
Date: 15.DEC.2005 15:20:17

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

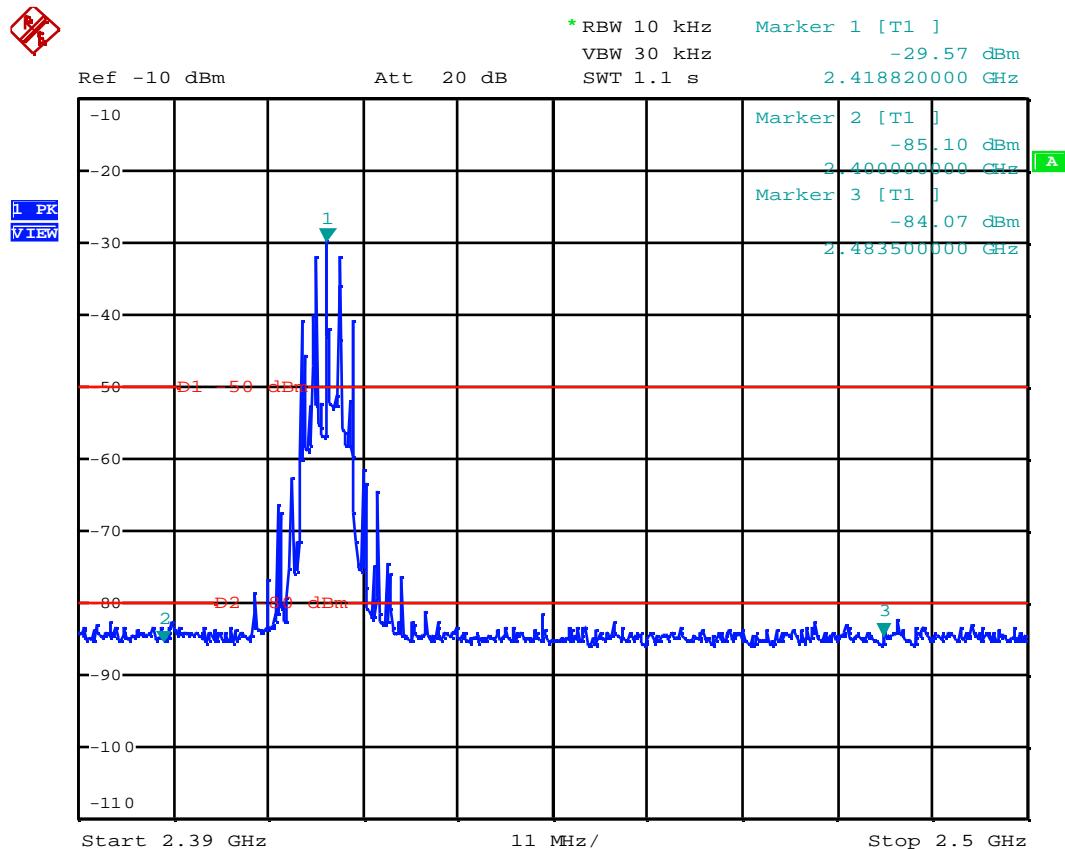
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

**The results: The unit does meet the FCC requirements.**

**2. For Channel 2:****(1).The occupied bandwidth as below:**

Date: 15.DEC.2005 17:03:42

**(2). Band Edge:**


Date: 15.DEC.2005 15:44:35

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

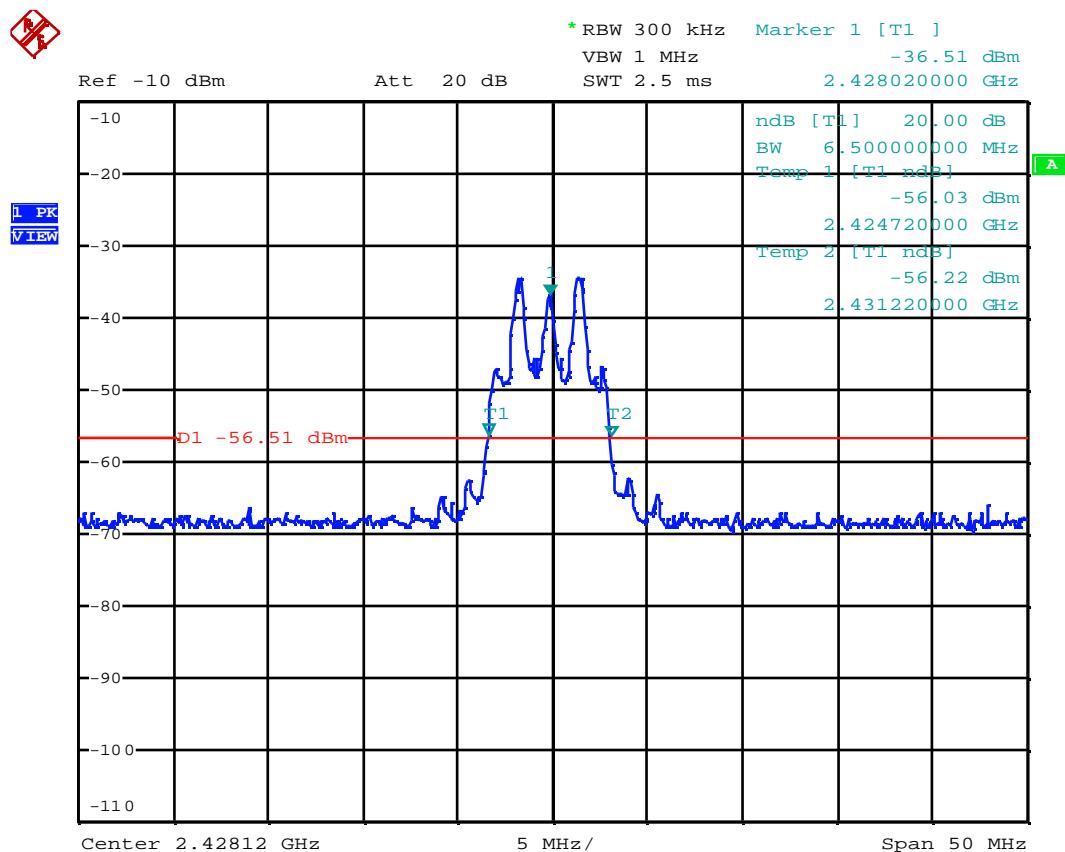
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

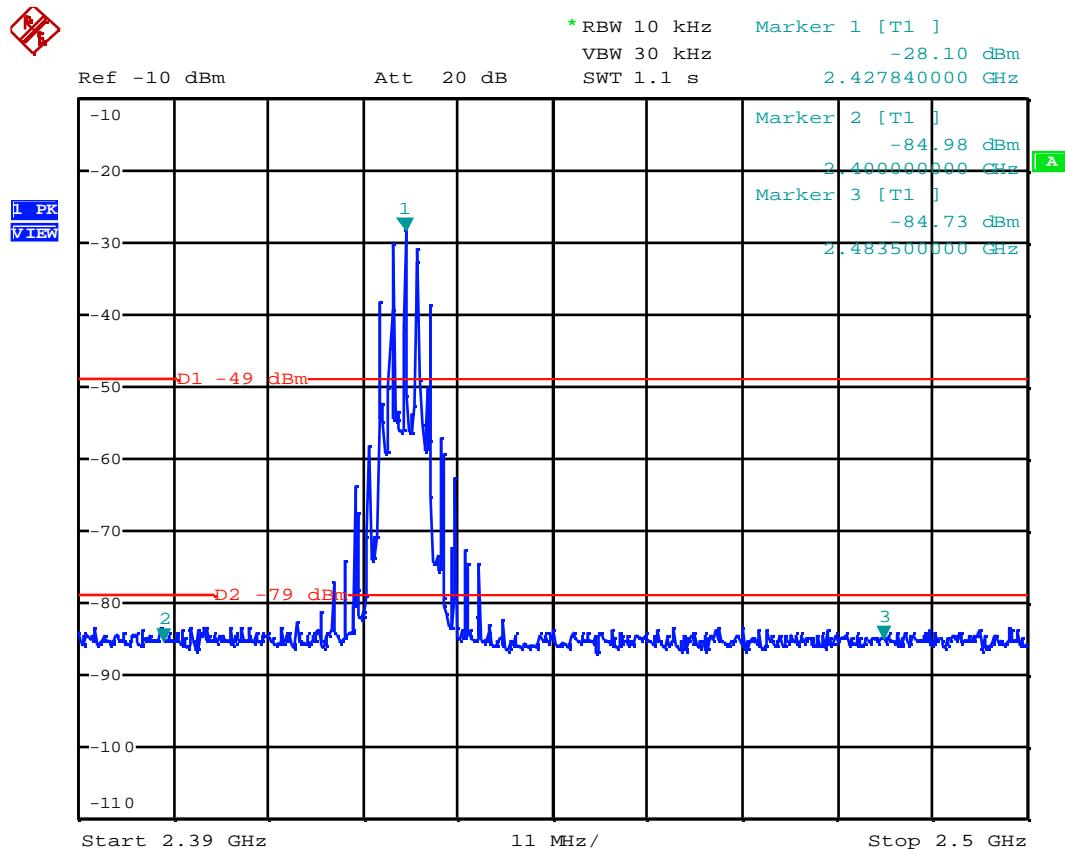
**The results: The unit does meet the FCC requirements.**

**2. For Channel 3:**

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:05:31

**(2). Band Edge:**


Date: 15.DEC.2005 15:27:21

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

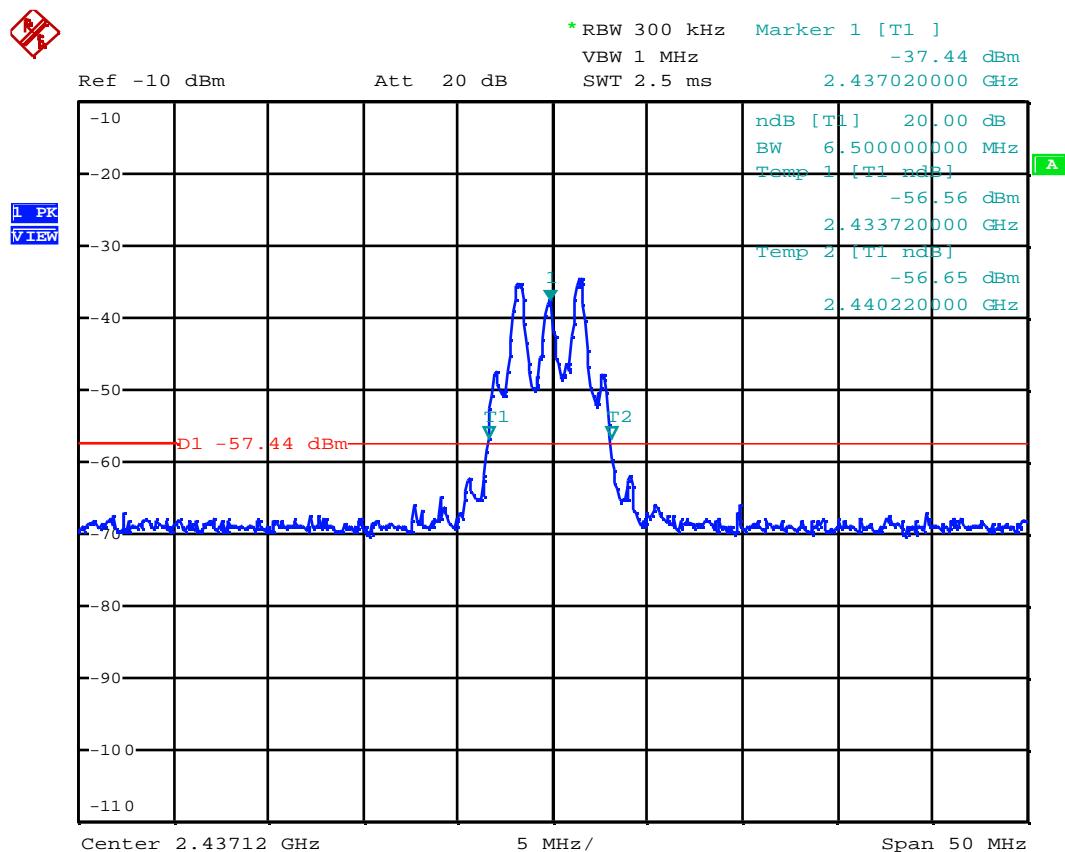
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

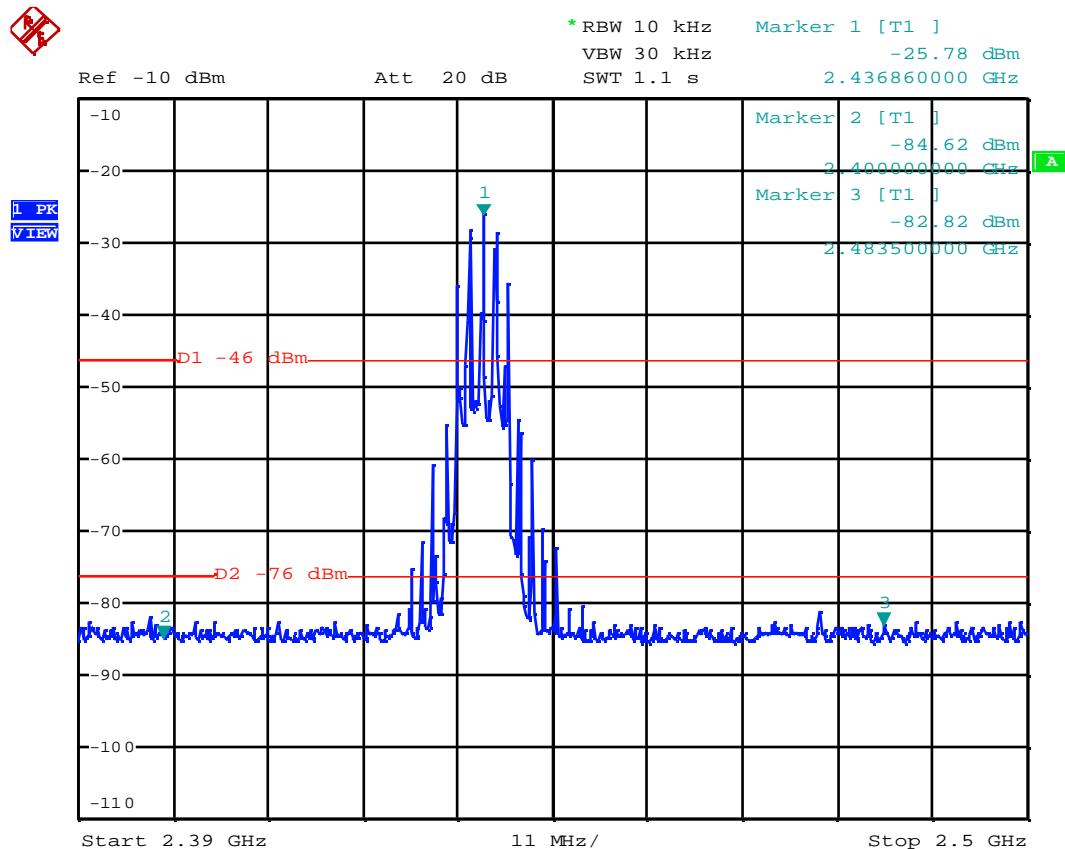
**The results: The unit does meet the FCC requirements.**

**2. For Channel 4:**

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:07:04

**(2). Band Edge:**


Date: 15.DEC.2005 15:29:08

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

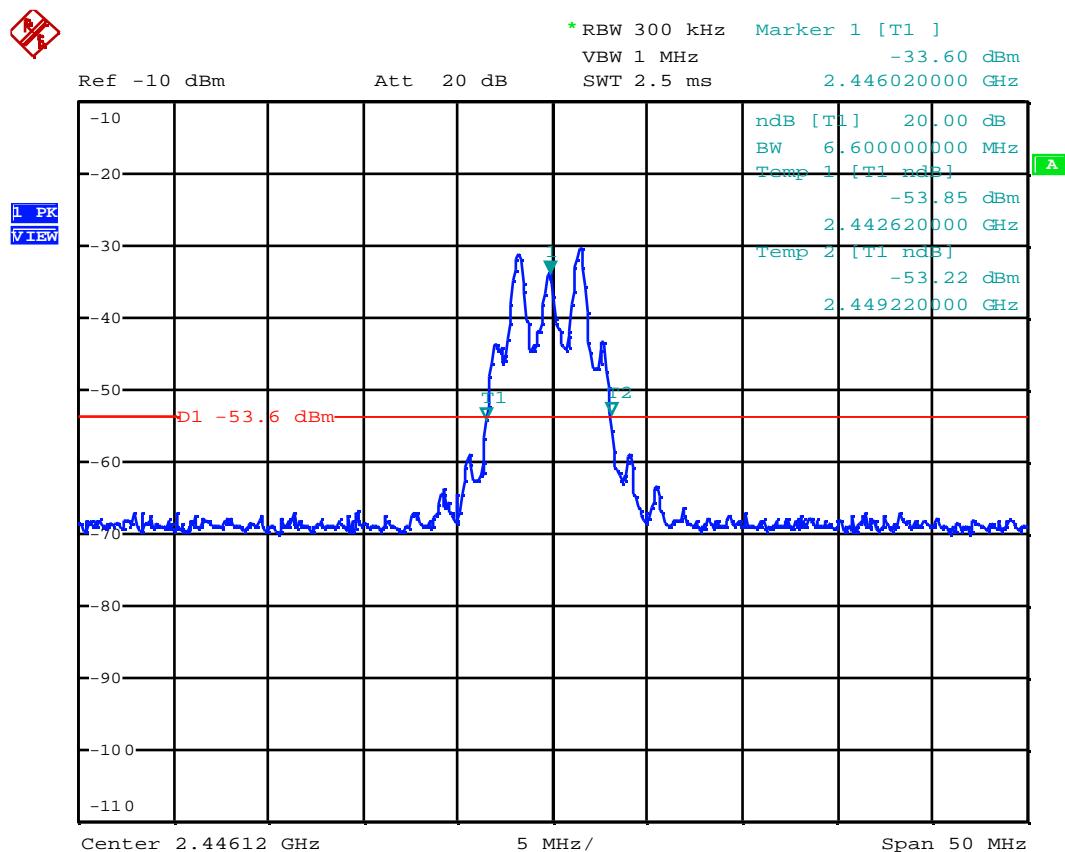
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

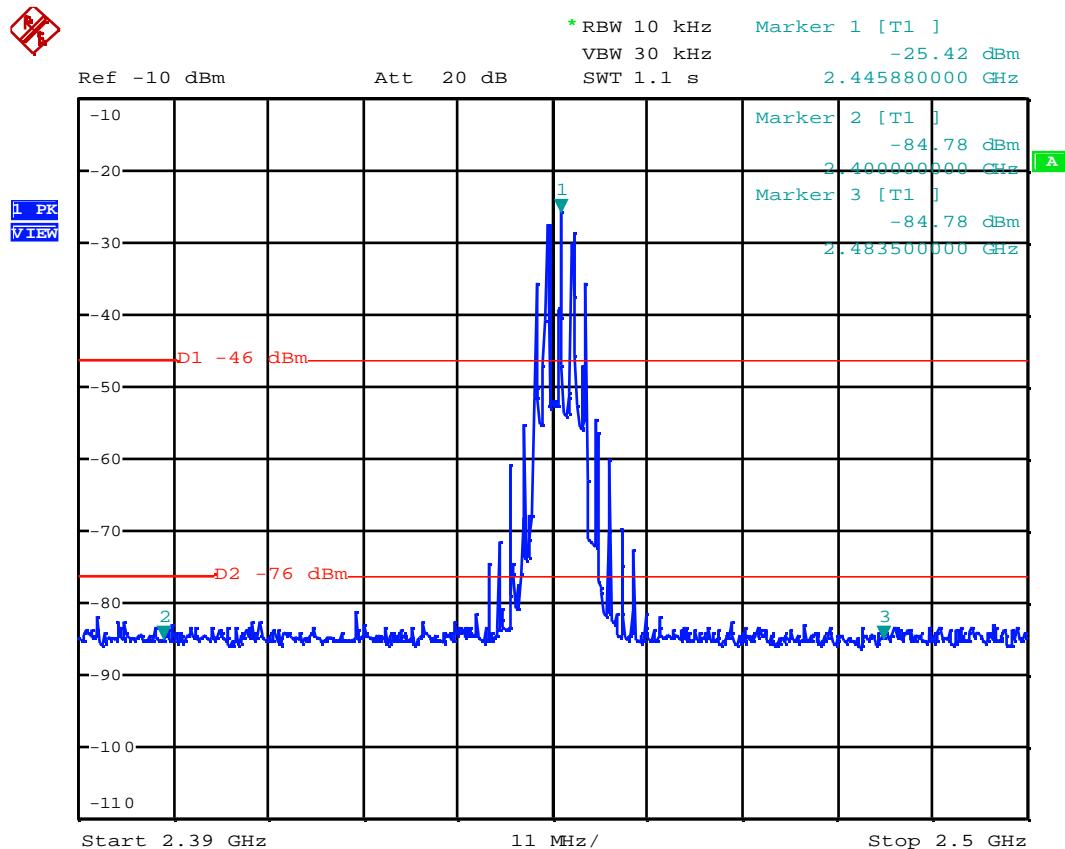
**The results: The unit does meet the FCC requirements.**

**2. For Channel 5:**

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:08:22

**(2). Band Edge:**


Date: 15.DEC.2005 15:30:10

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

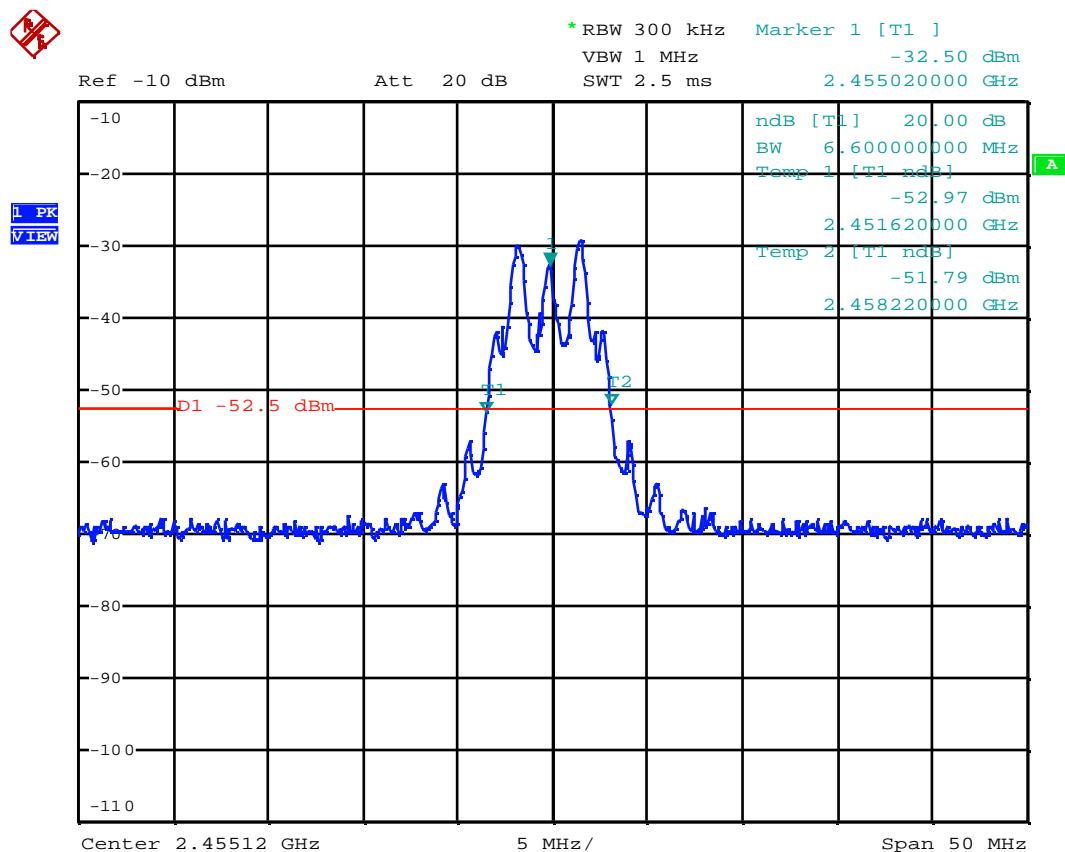
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

**The results: The unit does meet the FCC requirements.**

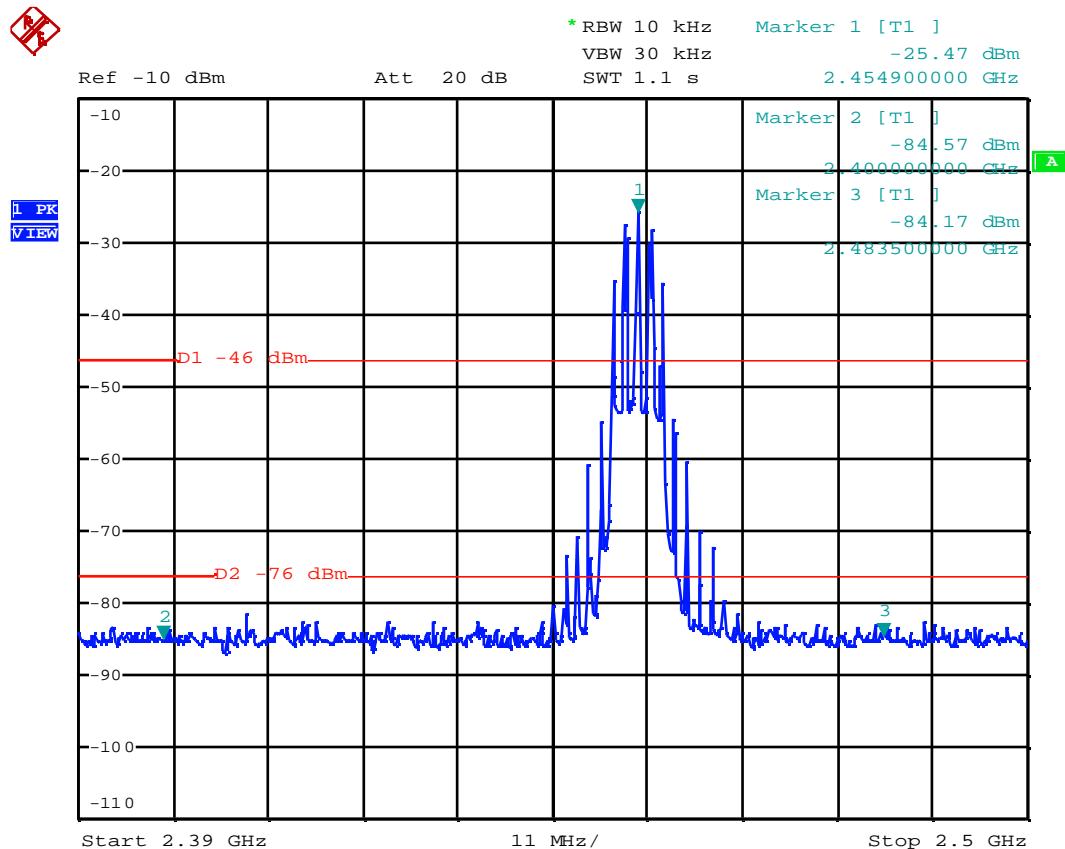
**2. For Channel 6:**

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:09:45

## (2). Band Edge:



Date: 15.DEC.2005 15:30:50

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

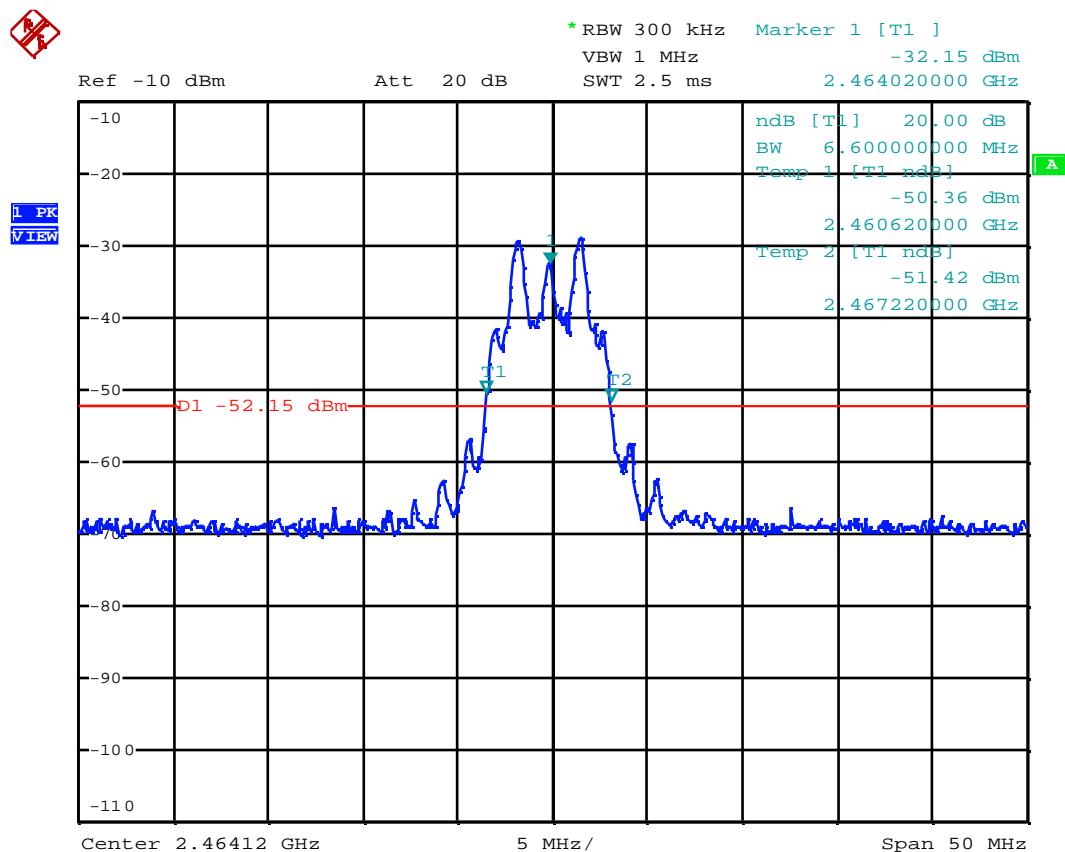
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

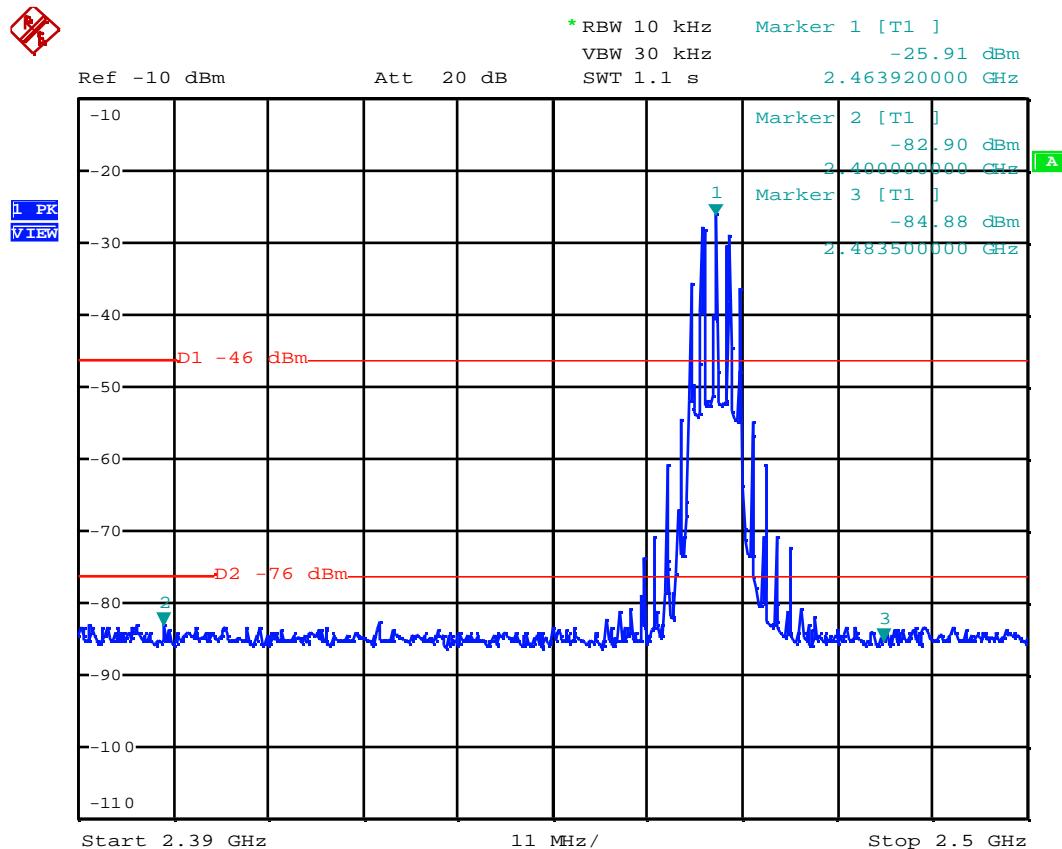
**The results: The unit does meet the FCC requirements.**

## 2. For Channel 7:

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:11:27

**(2). Band Edge:**


Date: 15.DEC.2005 15:32:08

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

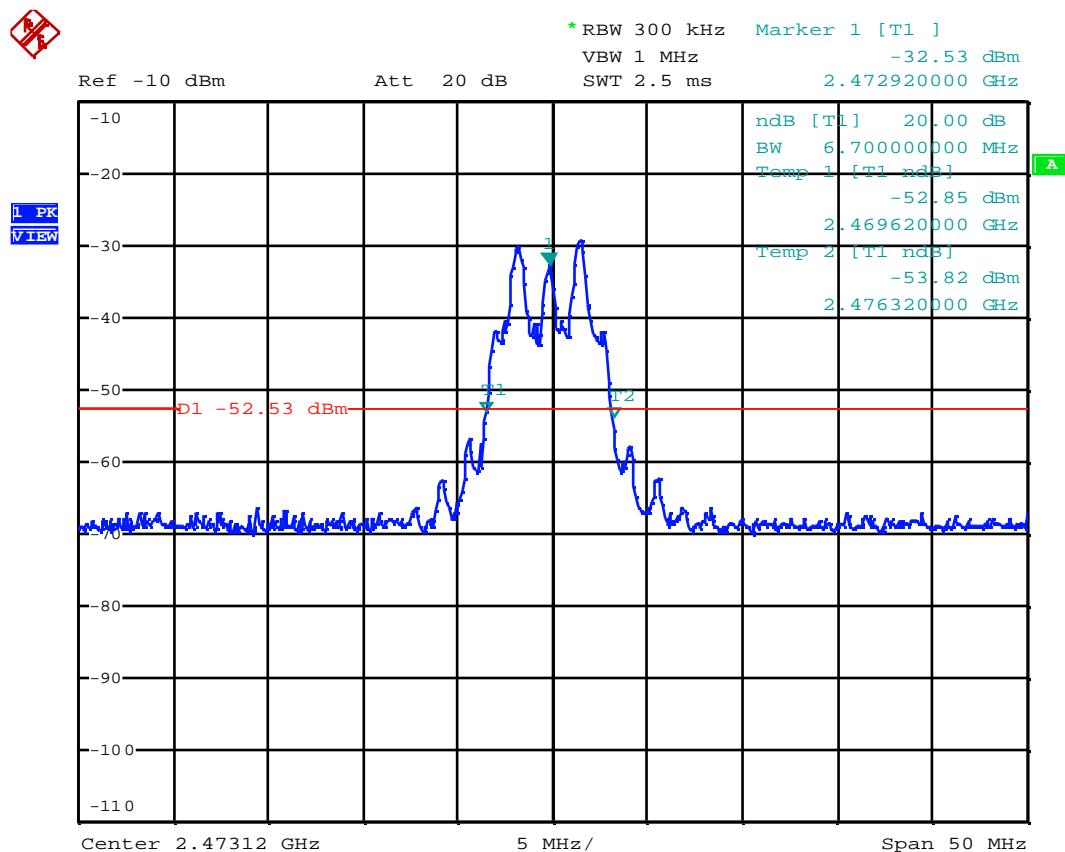
For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

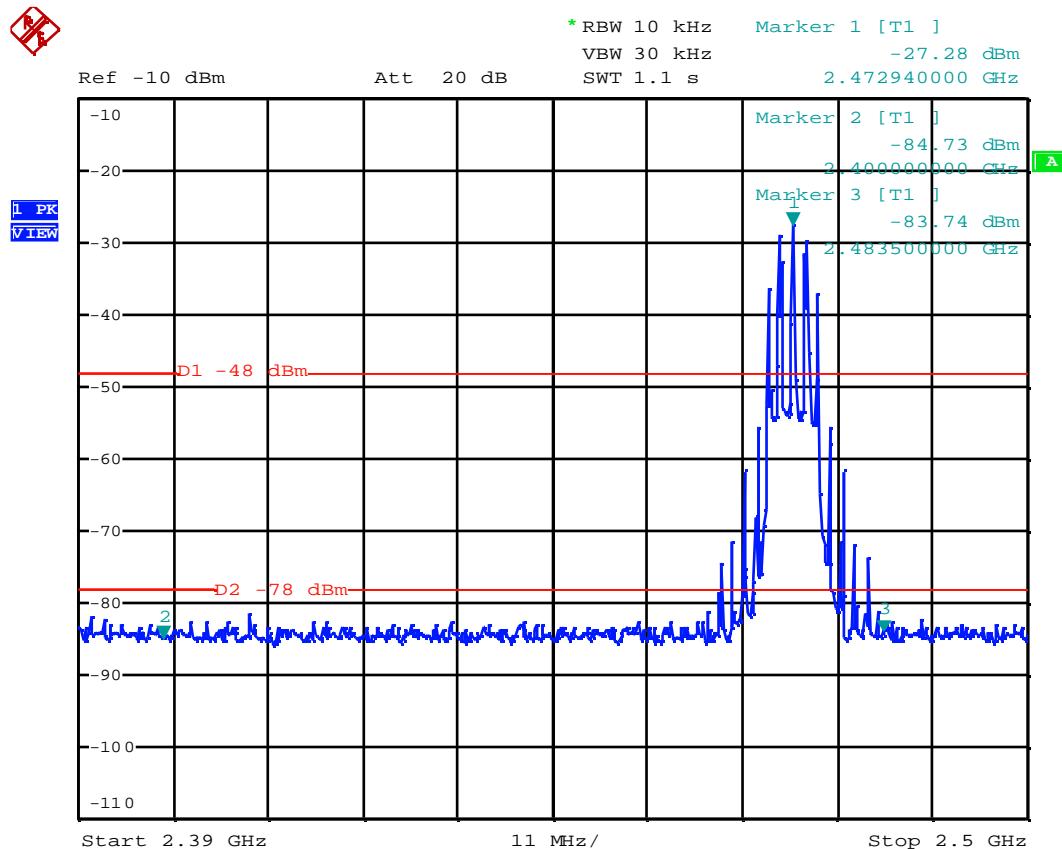
**The results: The unit does meet the FCC requirements.**

**2. For Channel 8:**

(1).The occupied bandwidth as below:



Date: 15.DEC.2005 17:12:33

**(2). Band Edge:**


Date: 15.DEC.2005 15:33:37

The test result for the Emissions radiated outside of the specified frequency bands , please refer the section 5.3.1 of this report.

For the field strength of Lower Edges:2.4000GHz is less than the wave peak value over 50db.

For the field strength of Upper Edges:2.4835GHz is less than the wave peak value over 50db.

**The results: The unit does meet the FCC requirements.**