



# Nemko



**Test Report:** 6W65224.2

**Applicant:** Jyga Concepts Inc.  
780, rue Craig  
Saint-Nicolas, QC  
G7A 2N2

**Apparatus:** Gestal FM Feed Delivery Unit  
FDFM101

**FCC ID:** T9S-FDFM101

**In Accordance With:** FCC Part 15 Subpart C, 15.247  
FHSS System and Digitally Modulated Radiators  
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

**Tested By:** Nemko Canada Inc.  
303 River Road  
Ottawa, Ontario  
K1V 1H2

**Authorized By:**

Jason Nixon, Telecom Specialist

**Date:** June 30, 2006

**Total Number of Pages:** 28

## Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

**Apparatus Assessed:** Gestal FM Feed Delivery Unit  
FDFM101

**Specification:** FCC Part 15.247, Subpart C

**Compliance Status:** Complies

**Exclusions:** None

**Non-compliances:** None

**Report Release History:** Original Release

Author: Xu Jin, Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

---

## TABLE OF CONTENTS

<b>Report Summary</b> .....	<b>2</b>
<b>Section 1: Equipment Under Test</b> .....	<b>4</b>
1.1    Product Identification .....	4
1.2    Samples Submitted for Assessment.....	4
1.3    Technical Specifications of the EUT .....	5
<b>Section 2: Test Conditions</b> .....	<b>6</b>
2.1    Specifications .....	6
2.2    Deviations From Laboratory Test Procedures .....	6
2.3    Test Environment .....	6
2.4    Test Equipment.....	6
<b>Section 3: Observations</b> .....	<b>7</b>
3.1    Modifications Performed During Assessment.....	7
3.2    Record Of Technical Judgements .....	7
3.3    EUT Parameters Affecting Compliance .....	7
3.4    Test Deleted.....	7
<b>Section 4: Results Summary</b> .....	<b>8</b>
4.1    FCC Part 15 Subpart C, 15.247: Test Results.....	9
<b>Appendix A: Test Results</b> .....	<b>10</b>
<b>Appendix B : Setup Photographs</b> .....	<b>27</b>
<b>Appendix C : Block Diagram of Test Setups</b> .....	<b>28</b>

## **Section 1: Equipment Under Test**

### **1.1 Product Identification**

The Equipment Under Test was identified as follows:

Gestal FM Feed Delivery Unit

FDFM101

### **1.2 Samples Submitted for Assessment**

The following samples of the apparatus have been submitted for type assessment:

<b>Sample No.</b>	<b>Description</b>	<b>Serial No.</b>
1	Gestal FM Feed Delivery Unit FDFM101	N/A

The first samples were received on: April.24, 2006

### **1.3 Technical Specifications of the EUT**

<b>Manufacturer:</b>	Jyga Concepts Inc.
<b>Frequency Range</b>	2400-2483.5MHz
<b>Operation Frequency</b>	2405-2480MHz
<b>Emission Designator</b>	F1D
<b>Modulation:</b>	802.15.4
<b>Antenna Data:</b>	1dBi (integral antenna)

## Section 2: Test Conditions

### 2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators  
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

### 2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

### 2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30°C
Humidity range	:	20 - 7 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

### 2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 17/06
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18/06
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18/06
Biconical (2) Antenna	EMCO	3109	FA000904	Aug. 26/06
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 29/06
Horn Antenna #1	EMCO	3115	FA000649	Jan 12/07
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 3, 2007
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	July 14/06
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	July 14/06
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	July 14/06
5.0 - 18GHz Amplifier	Narda	DWT-186N23U40	FA001409	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU
Signal Generator	Rhode & Schwarz	SMR 40	FA001879	July 13/06
LISN	EMCO	4825/2	FA001545	Jan. 30/07
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	May 25/06

\* COU (Calibrate on Use)

## **Section 3: Observations**

### **3.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **3.2 Record Of Technical Judgements**

Manufacture declared that the feeding device has the same RF circuits as the Interface module. But there is extra motor position encoder system in the feeding device. Therefore all the test data were taken from the interface module test data except for the AC power conducted emission test and the radiated spurious emission test.

### **3.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **3.4 Test Deleted**

No Tests were deleted from this assessment.

## Section 4: Results Summary

This section contains the following:

FCC Part 15.247, Subpart C: Test Result

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N      No: not applicable / not relevant.

Y      Yes: Mandatory i.e. the apparatus shall conform to these tests.

N/T     Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

**4.1 FCC Part 15 Subpart C, 15.247: Test Results**

Section	Clause	Test Description	Required	Result
1	15.207(a)	Power-line Conducted Emissions	Y	PASS
2	15.247(a)(2)	6dB Bandwidth	Y	PASS
3	15.247(b)(3)	Output Power	Y	PASS
4	15.247(c)	Spurious Emissions	Y	PASS
5	15.247(d)	Peak Power Spectral Density	Y	PASS
6	15.31(e)	Supply Voltage Variation	Y	PASS

## Appendix A: Test Results

### Section 1. Power Line Conducted Emissions

**Criteria: Clause 15.207(a)**

Frequency of Conducted limit (dB $\mu$ V)		
Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	21°C
<b>Date:</b>	April.25, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin

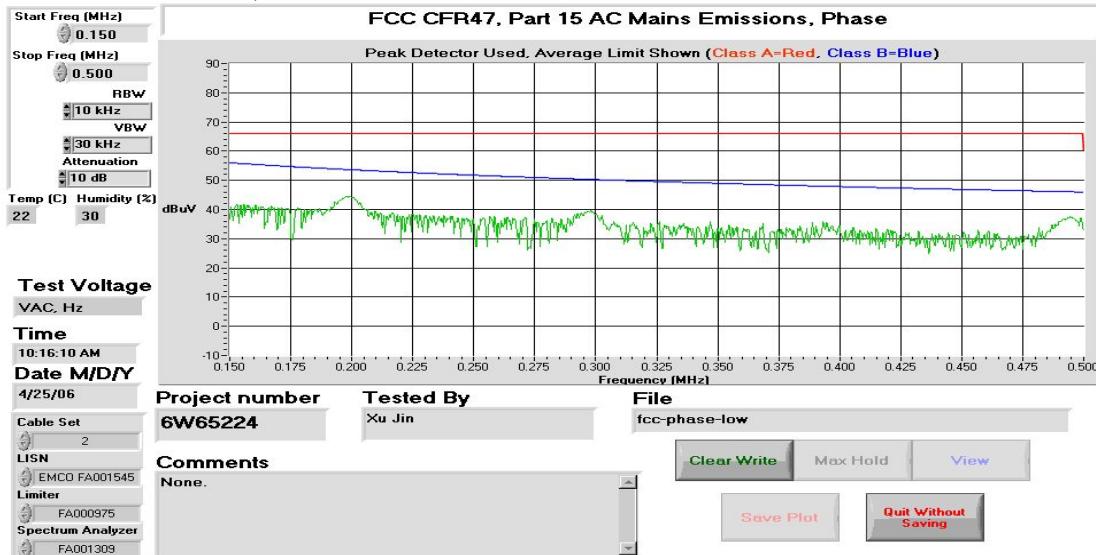
**Test Results:** Complies**Test Data:** See Attached Plots and Tables.

**Conducted Disturbance at Mains, Setup Photos**

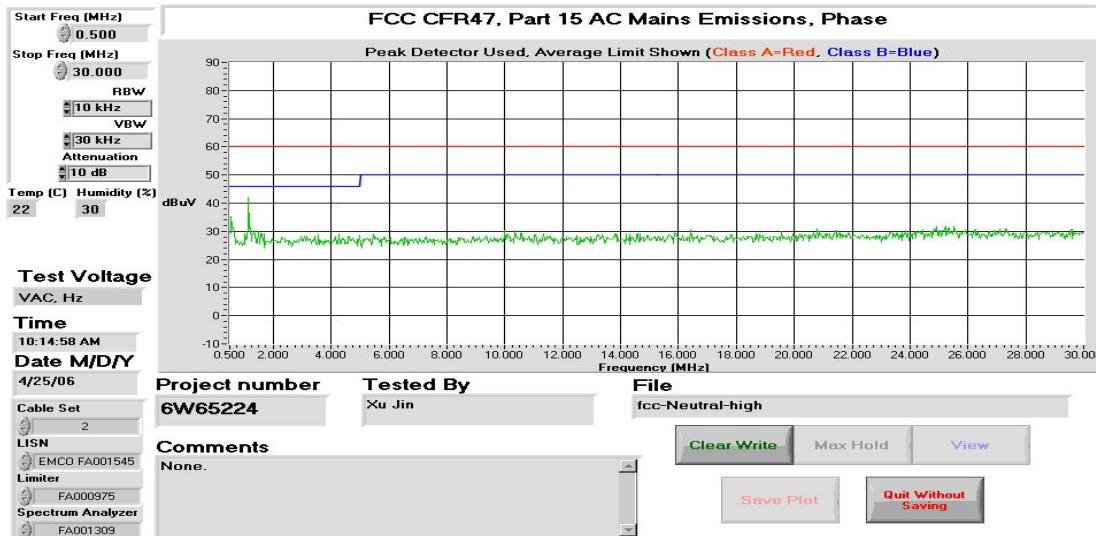


**Conducted Disturbance at Mains, Plots**

**Phase, 0.150 – 0.500 MHz**

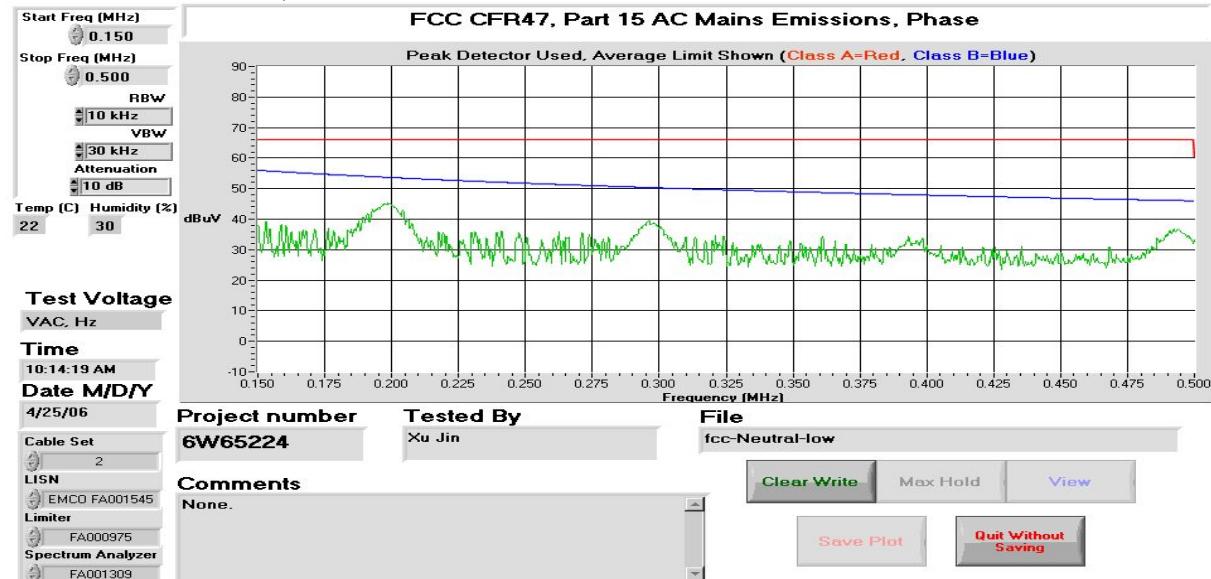


**Phase, 0.500 – 30 MHz**

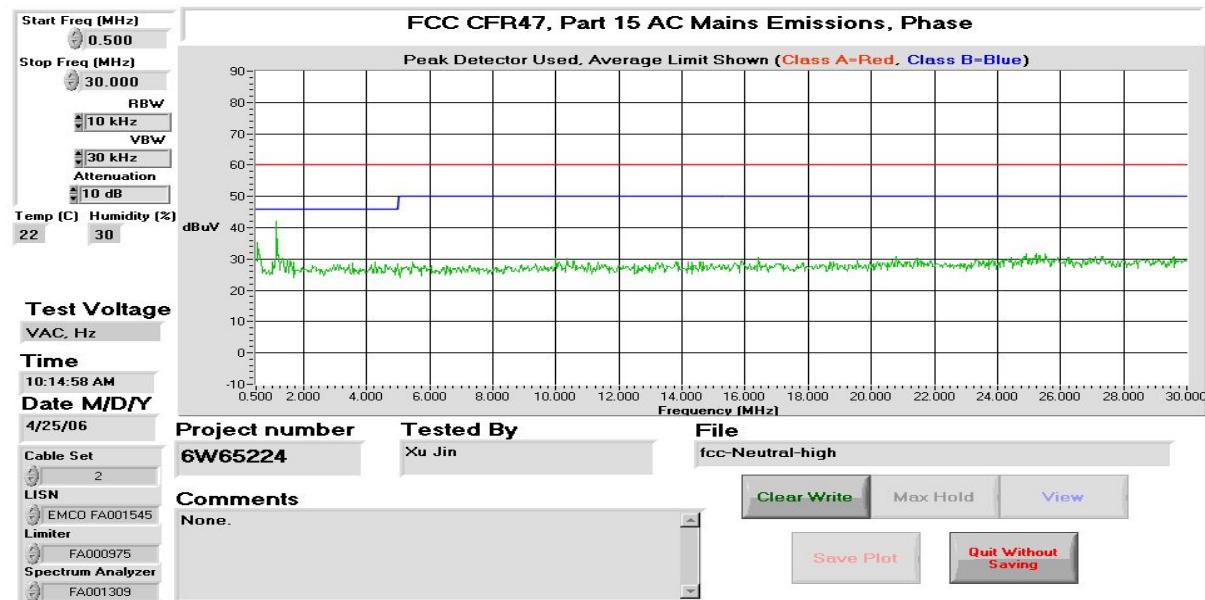


Conducted Disturbance at Mains Plots, continued

Neutral, 0.150 – 0.500 MHz



Neutral, 0.500 – 30 MHz



**Section 2. 6dB Bandwidth****Criteria: Clause 15.247(a)**

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

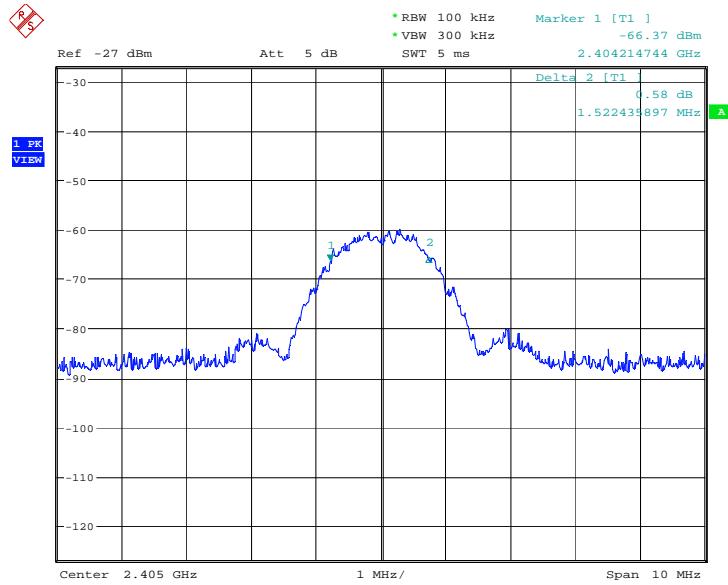
**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	21°C
<b>Date:</b>	April.25, 2006	<b>Humidity:</b>	50%
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin
		<b>Laboratory:</b>	Ottawa

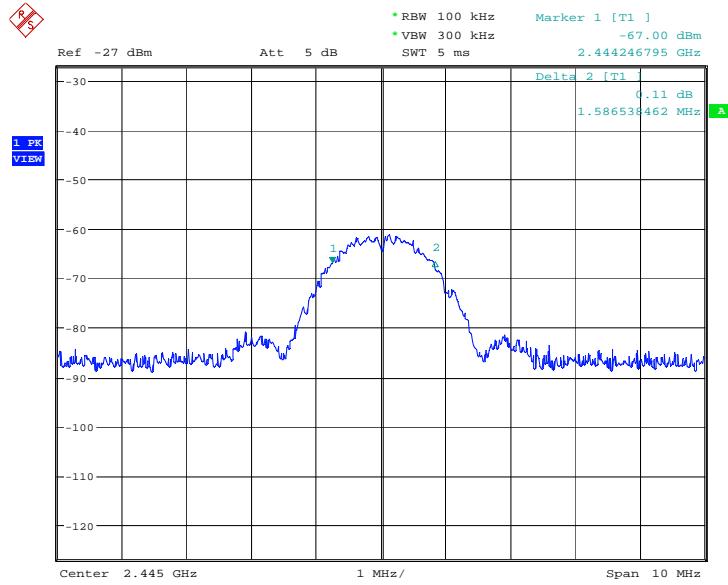
**Test Results:** Complies**Test Data:** See attached table and graphics

## 6dB Occupied Bandwidth (MHz)

Channel 0 2405(MHz)	1.52
Channel 8 2445(MHz)	1.59
Channel 15 2480(MHz)	1.57

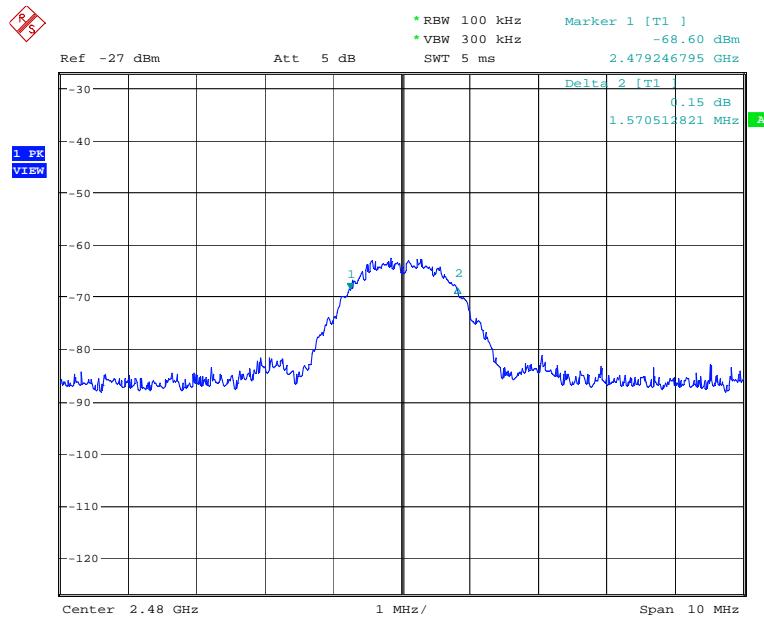
**Ch0—2405MHz**

Date: 25.APR.2006 13:39:53

**Ch8---2445MHz**

Date: 25.APR.2006 13:41:09

Ch 15---2480MHz



Date: 25.APR.2006 13:42:24

**Section 3. Output Power****Criteria: Clause 15.247(b)(3)**

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode

**Test Conditions:**

Sample Number:	1	Temperature:	21 °C
Date:	April 25, 2006	Humidity:	50 %
Modification State:	0	Tester:	Xu Jin

**Test Results:** Complies**Test Data:** See attached tables.

The EUT uses integral antenna. Radiated measurement was performed at 3 meter

The spectrum analyzer was set to 'Positive Peak' detector mode with RBW/VBW setting as 2MHz/3MHz.

The conducted power output level was achieved by converting the field strength to transmitter output power with the following equation.

$$TP = (FS \times D)^2 / (30 \times G)$$

**Output Power Measurement Data**

Freq. (MHz)	Antenna	Polarity	RCVD Signal (dB $\mu$ V)	Antenna factor (dB/m)	Cable Loss	Field strength Level (dB $\mu$ V/m)	Antenna gain (dBi)	Conducted output power (dBm)	Limit (dBm)	Detector
2405	Horn	H	52.10	29	1	82.1	1	-14.13	30	Peak
2405	Horn	V	62.50	28.5	1	92	1	-4.23	30	Peak
2445	Horn	H	52.44	29	1	82.44	1	-13.8	30	Peak
2445	Horn	V	62.64	28.5	1	92.14	1	-4.09	30	Peak
2480	Horn	H	51.19	29	1	81.19	1	-15.04	30	Peak
2480	Horn	V	59.71	28.5	1	89.21	1	-7.02	30	Peak

±15% of AC power supply has been varied, no change for RF output power was observed.

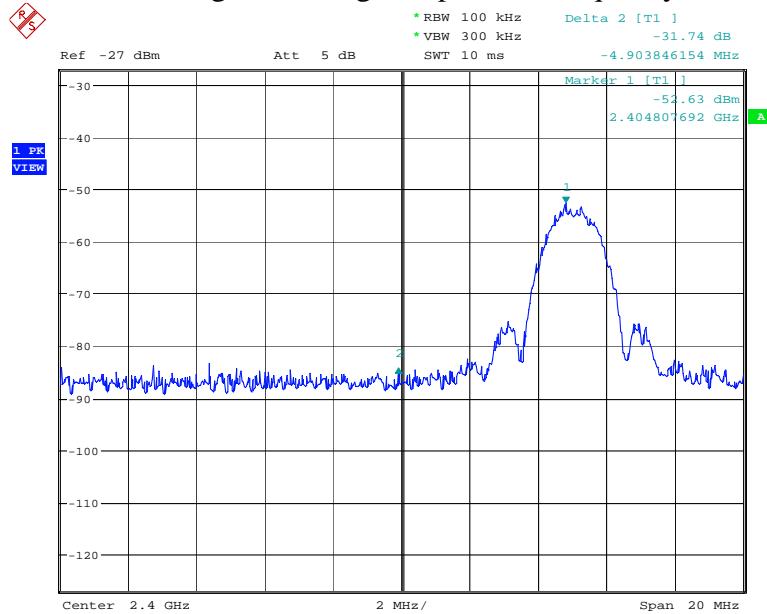
**Section 4. Spurious Emissions****Criteria: Clause 15.247(d)**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

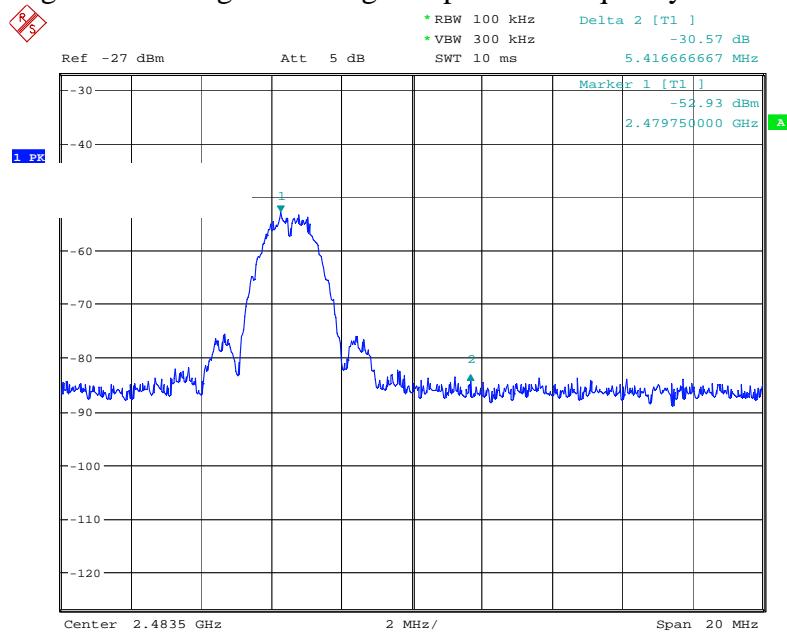
**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	21 °C
<b>Date:</b>	April.25, 2006	<b>Humidity:</b>	50 %
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin

**Test Results:** Complies**Test Data:** See attached plots and comment.

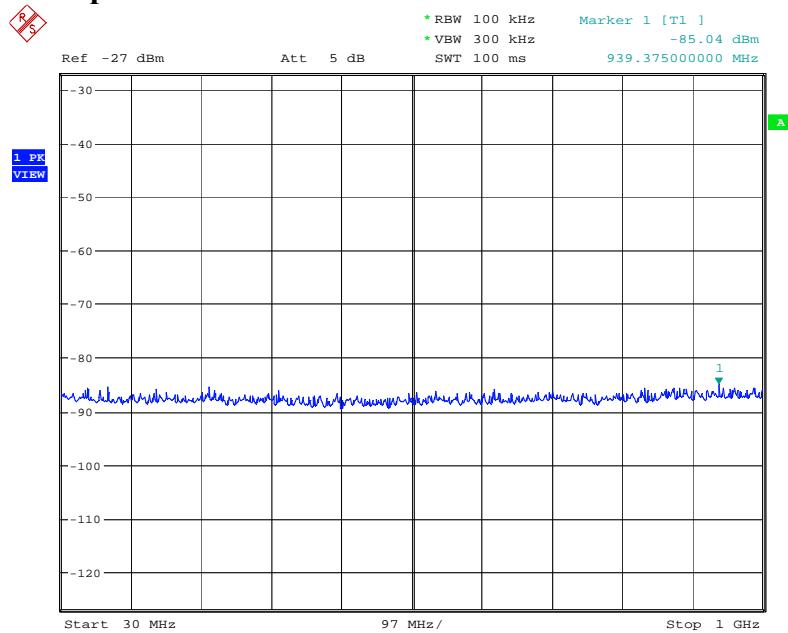
**20dBc Band Edge Check****Lower Band Edge Checking----Operation frequency 2405MHz**

Date: 25.APR.2006 14:23:43

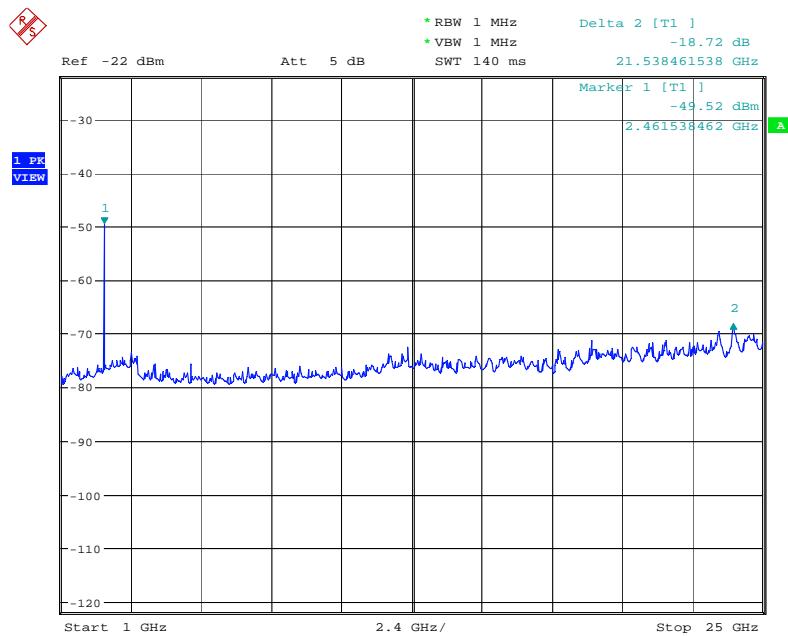
**Higher Band Edge Checking----Operation frequency 2480MHz**

Date: 25.APR.2006 14:24:52

**Full Span**



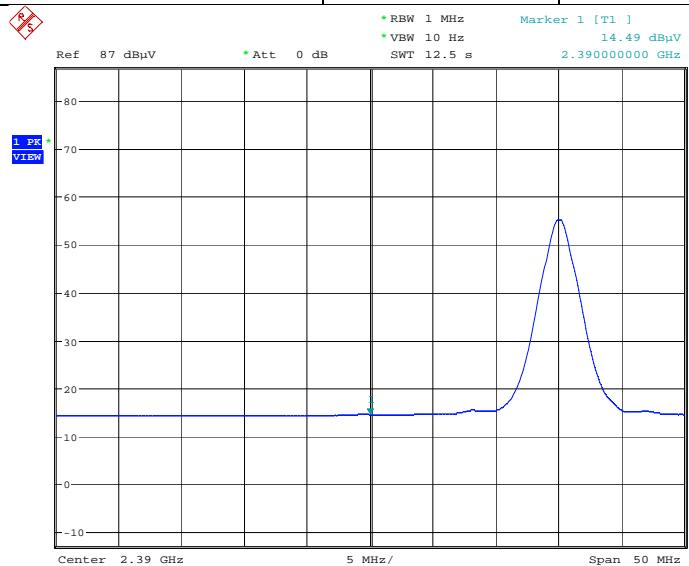
Date: 25.APR.2006 14:29:07



Date: 25.APR.2006 14:30:48

Restricted Band Check  
Lower Band Edge, Ch0, 2405MHz

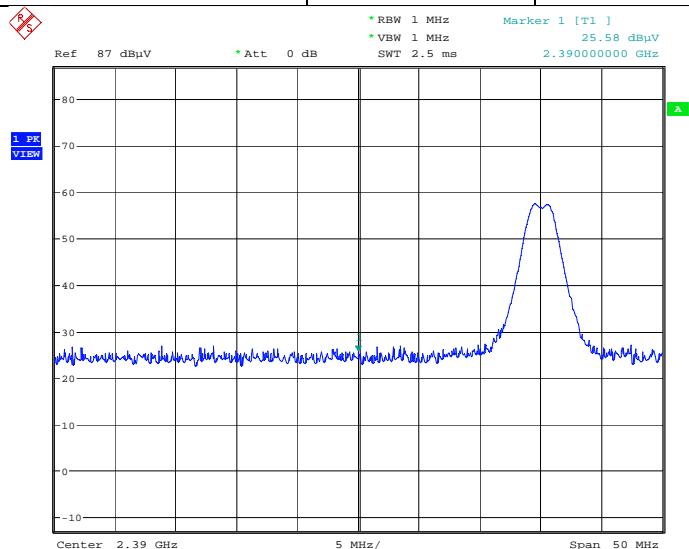
Band Edge Level (Avg) (dB $\mu$ V)	Af (dB/m)	Cable Loss(dB)	Emission Level(dB $\mu$ V/m)	Limit (dB $\mu$ V/m)
14.49	28.5	1	43.99	54



Date: 25.APR.2006 14:42:10

Lower Band Edge, Ch0, 2405MHz

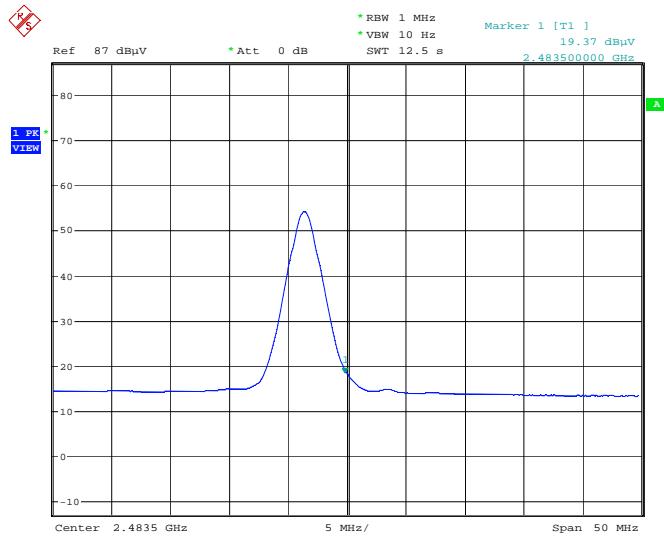
Band Edge Level (PK) (dB $\mu$ V)	Af (dB/m)	Cable Loss(dB)	Emission Level(dB $\mu$ V/m)	Limit (dB $\mu$ V/m)
25.58	28.5	1	55.08	74



Date: 25.APR.2006 14:42:46

## Higher Band Edge, Ch15, 2480MHz

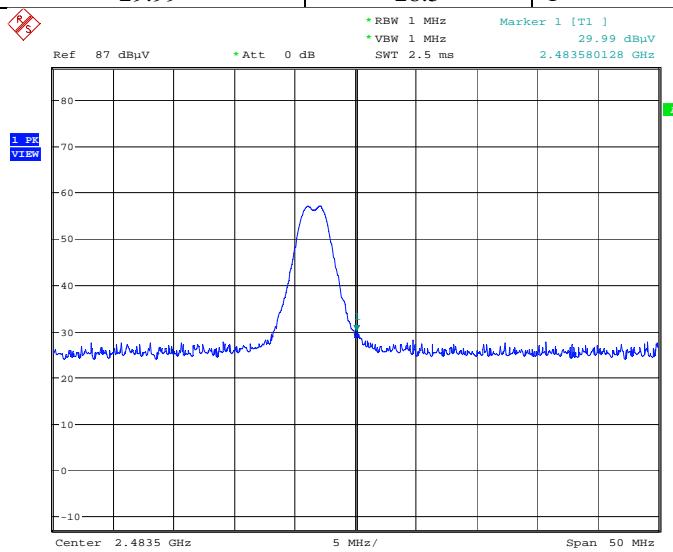
Band Edge Level (Avg) (dB $\mu$ V)	Af (dB/m)	Cable Loss(dB)	Emission Level(dB $\mu$ V/m)	Limit (dB $\mu$ V/m)
19.37	28.5	1	48.87	54



Date: 25.APR.2006 14:44:35

## Higher Band Edge, Ch15, 2480MHz

Band Edge Level (PK) (dB $\mu$ V)	Af (dB/m)	Cable Loss(dB)	Emission Level(dB $\mu$ V/m)	Limit (dB $\mu$ V/m)
29.99	28.5	1	59.49	74



Date: 25.APR.2006 14:45:19

**Additional Note:**

Radiated emission test was conducted at 3 meter at open area test site and the EUT was searched from 30MHz to the 10<sup>th</sup> harmonics and at for low, medium and high frequencies

Measurement equipment setup was 100kHz RBW/VBW with peak detector for measurements below 1GHz and 1MHz RBW/VBW peak detector above 1GHz.

No spurious emission was observed above the noise floor.

**Section 5. Peak Power Spectrum Density****Criteria: Clause 15.247(e)**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	21 °C
<b>Date:</b>	April.26, 2006	<b>Humidity:</b>	50 %
<b>Modification State:</b>	0	<b>Tester:</b>	Xu Jin

**Test Result:** Complies**Test Data:** See attached tables and graphics

## Additional Note:

The EUT uses integral antenna. Radiated measurement was performed at 3 meter

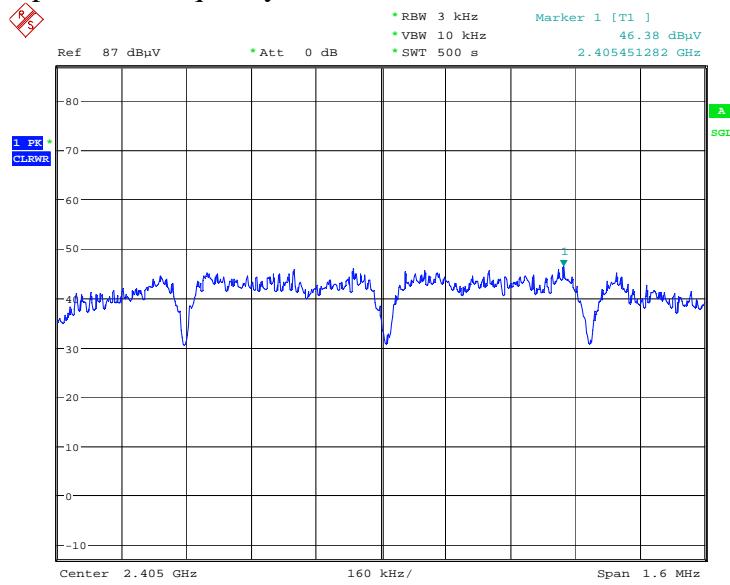
The spectrum analyser was set to 'Positive Peak' detector mode with RBW/VBW setting as 3KHz/10KHz.

The conducted Peak Power Spectrum Density was achieved by converting the field strength with the following equation.

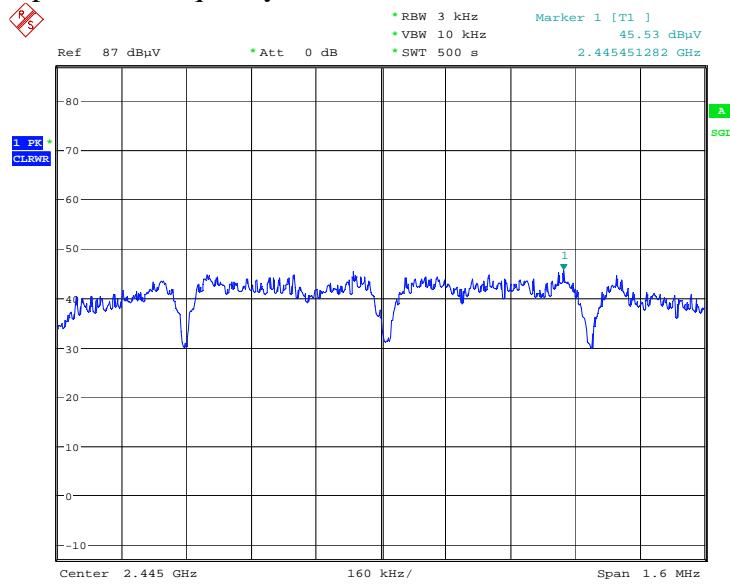
$$TP = (FS \times D)^2 / (30 \times G)$$

**Peak Power Spectrum Density Test Data**

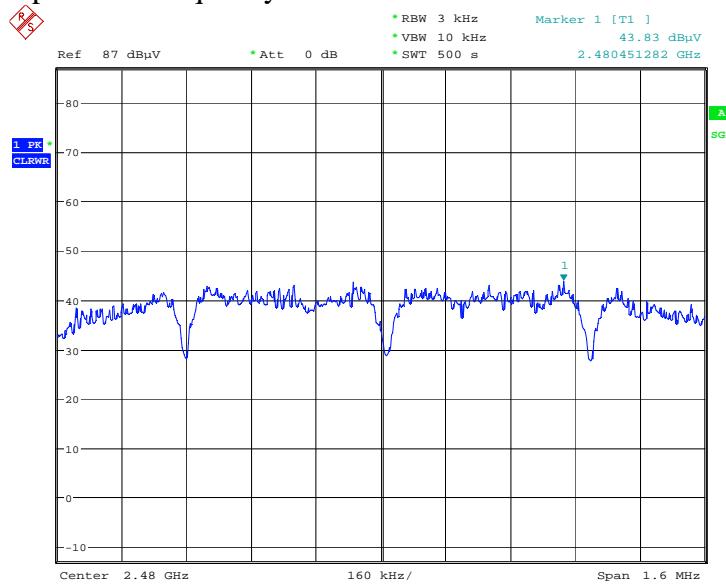
Freq. (MHz)	Antenna	RCVD Signal (dB $\mu$ V)	Antenna factor (dB/m)	Cable Loss (dB)	Field strength Level (dB $\mu$ V/m)	Antenna gain (dBi)	Conducted Peak Power Spectrum Density (dBm/3KHz)	Limit (dBm/3KHz)	Detector
2405	Horn	46.38	28.5	1	75.88	1	-20.35	8	Peak
2445	Horn	45.53	28.5	1	75.03	1	-21.2	8	Peak
2480	Horn	43.83	28.5	1	73.33	1	-22.90	8	Peak

**Operation Frequency 2405MHz**

Date: 26.APR.2006 15:31:12

**Operation Frequency 2445MHz**

Date: 26.APR.2006 15:45:16

**Operation Frequency 2480MHz**

Date: 26.APR.2006 15:14:29

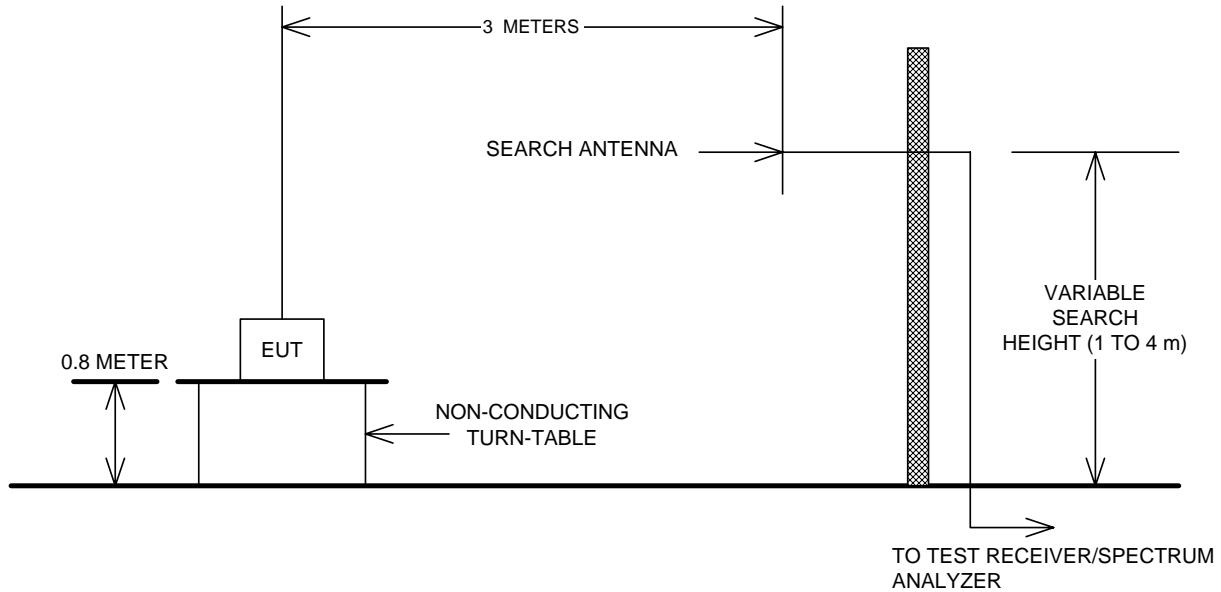
## **Appendix B : Setup Photographs**

Radiated Test Setup Photos



## Appendix C : Block Diagram of Test Setups

### Test Site For Radiated Emissions



### Conducted Emissions

