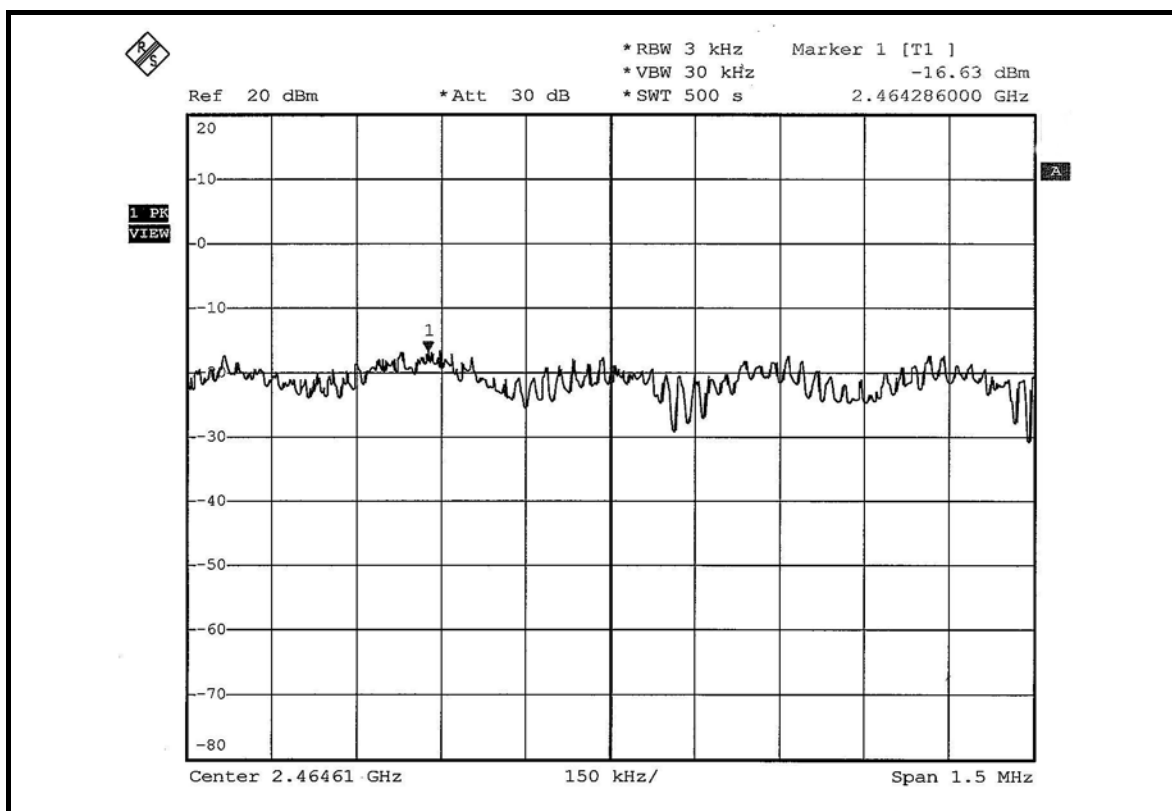




# CH 11

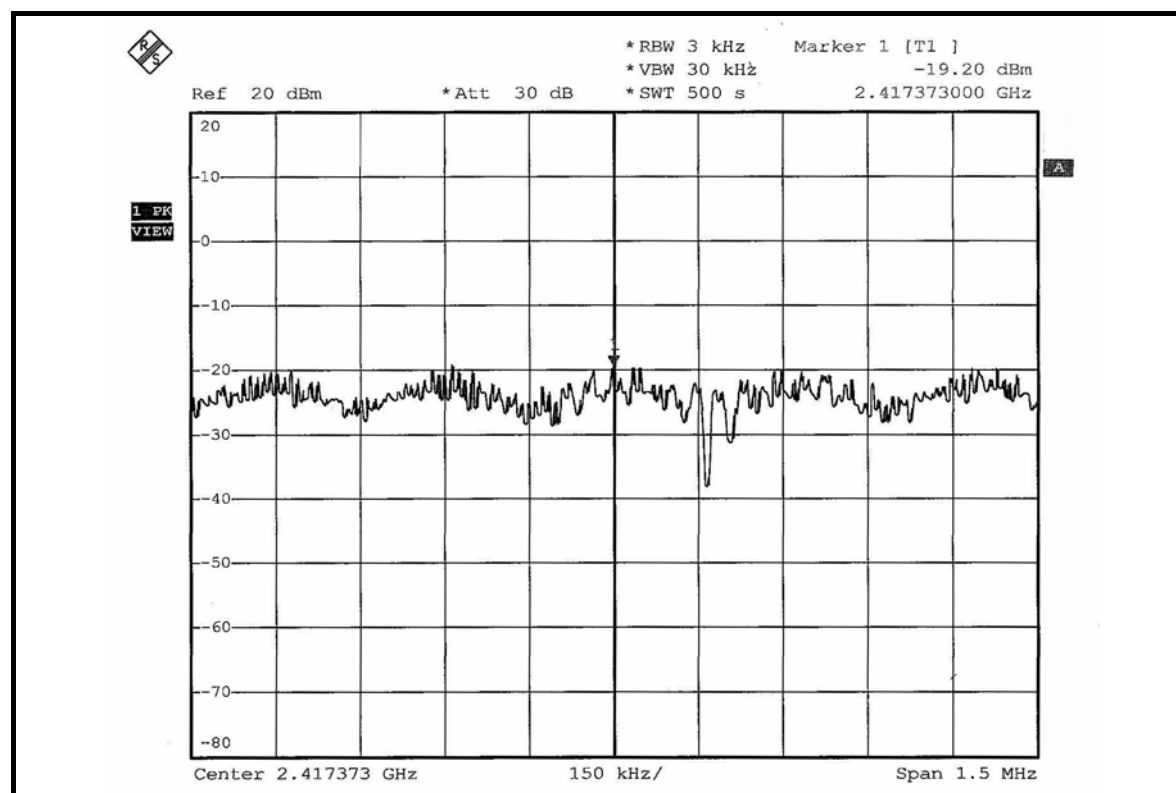


### DRAFT 802.11n (40MHz) OFDM MODULATION – DUAL TX:

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	15.0Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	25deg.C, 63% RH, 991hPa
<b>TESTED BY</b>	Long Chen		

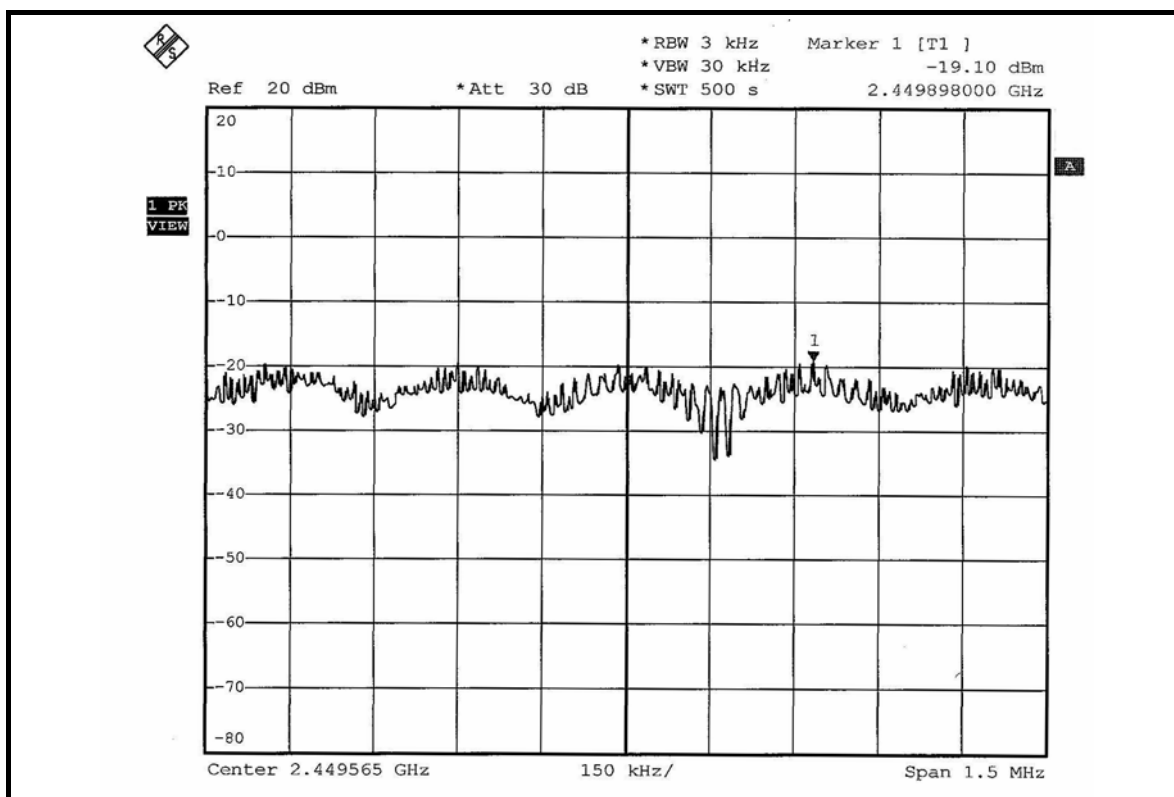
CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (mW)		RF POWER LEVEL IN 3kHz BW (dBm)		TOTAL POWER DENSITY (mW)	TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1				
1	2422	0.012	0.013	-19.20	-18.99	0.025	-16.08	8	PASS
4	2437	0.021	0.020	-16.81	-17.00	0.041	-13.89	8	PASS
7	2452	0.013	0.012	-18.99	-19.10	0.025	-16.03	8	PASS

### FOR CHAIN 0: CH 1









## 4.6 BAND EDGES MEASUREMENT

### 4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below  $-20\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100040	Jun. 07, 2007

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.6.3 TEST PROCEDURE

##### For Single TX:

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 10Hz bandwidth from band edge. The band edges were measured and recorded.

The spectrum plots (Peak RBW = VBW = 100kHz; Average RBW = 1MHz, VBW = 10Hz) are attached on the following pages.

##### For Dual TX:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges were measured and recorded.

The spectrum plots (Peak RBW = VBW = 100kHz; Average RBW = 1MHz, VBW = 10Hz)

**NOTE:** The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation



#### 4.6.5 EUT OPERATING CONDITION

Same as Item 4.3.6

#### 4.6.6 TEST RESULTS

The spectrum plots are attached on the following 24 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

#### 802.11b DSSS MODULATION – SINGLE TX:

##### NOTE 1:

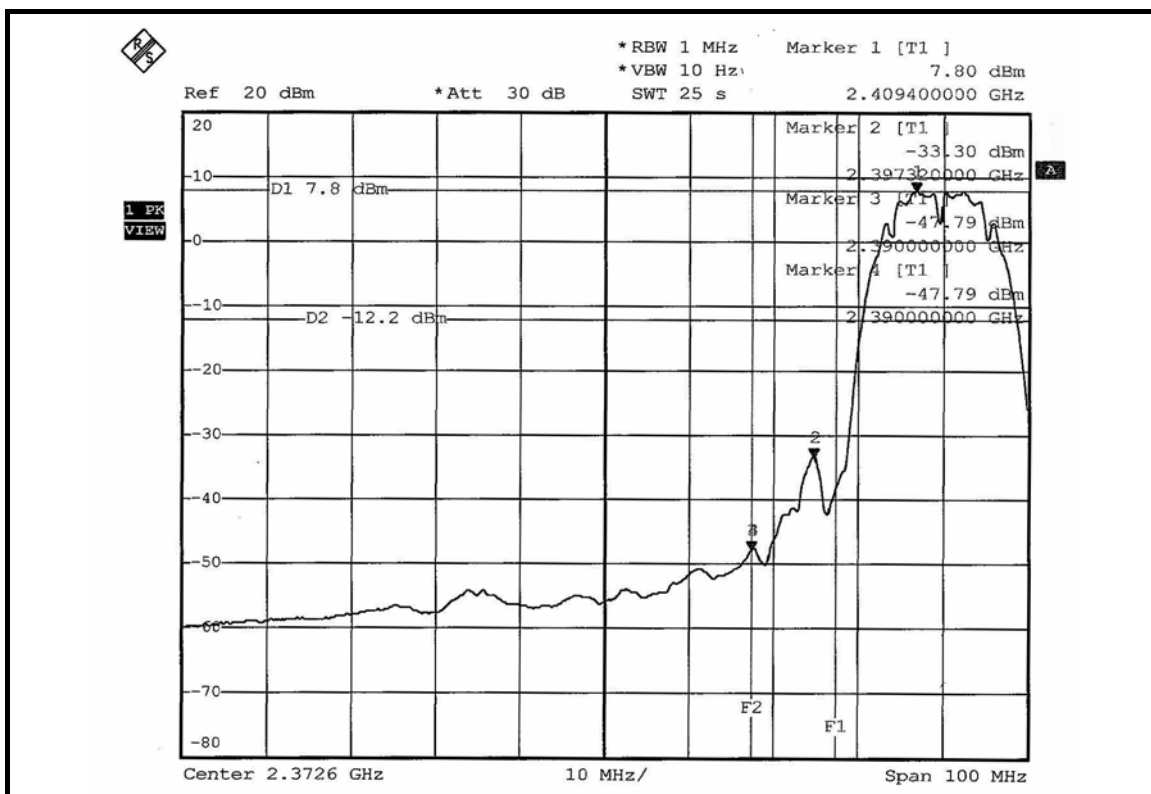
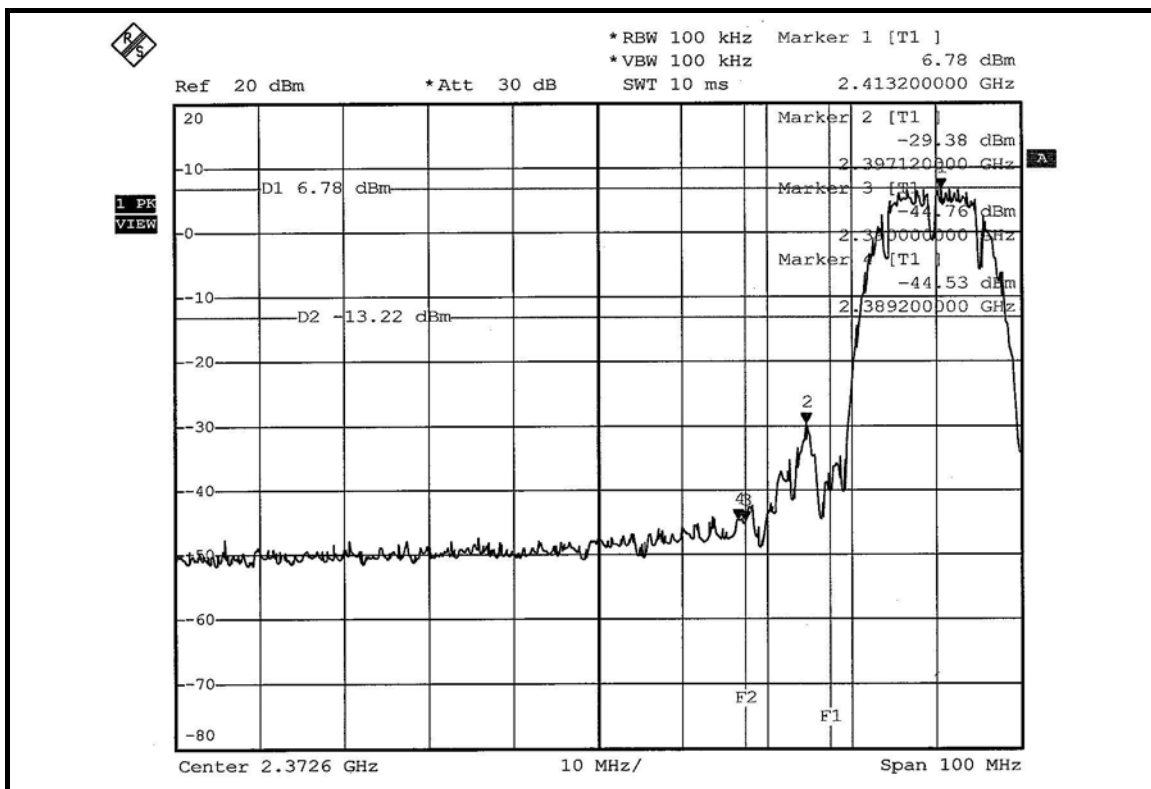
The band edge emission plot of DSSS technique on the next page shows 51.31dBc between carrier maximum power and local maximum emission in restrict band (2.389200000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 112.50dBuV/m (Peak), so the maximum field strength in restrict band is  $112.50 - 51.31 = 61.19\text{dBuV/m}$  which is under 74dBuV/m limit.

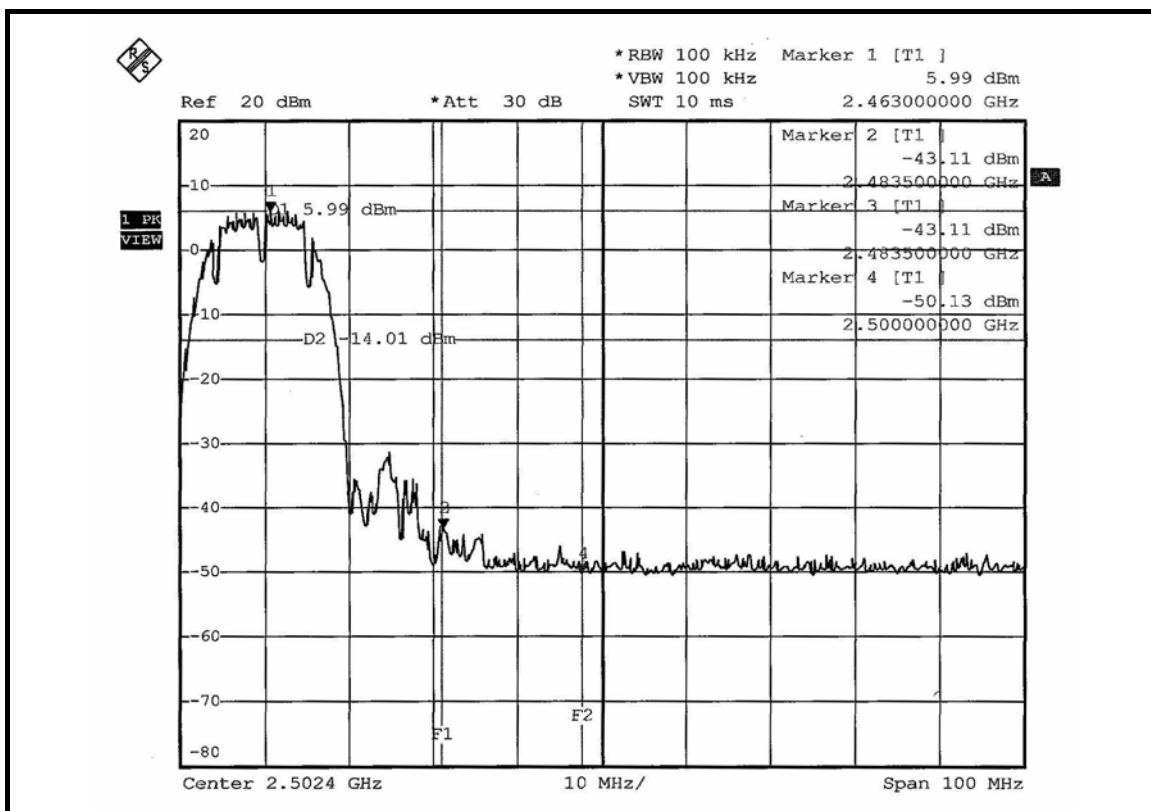
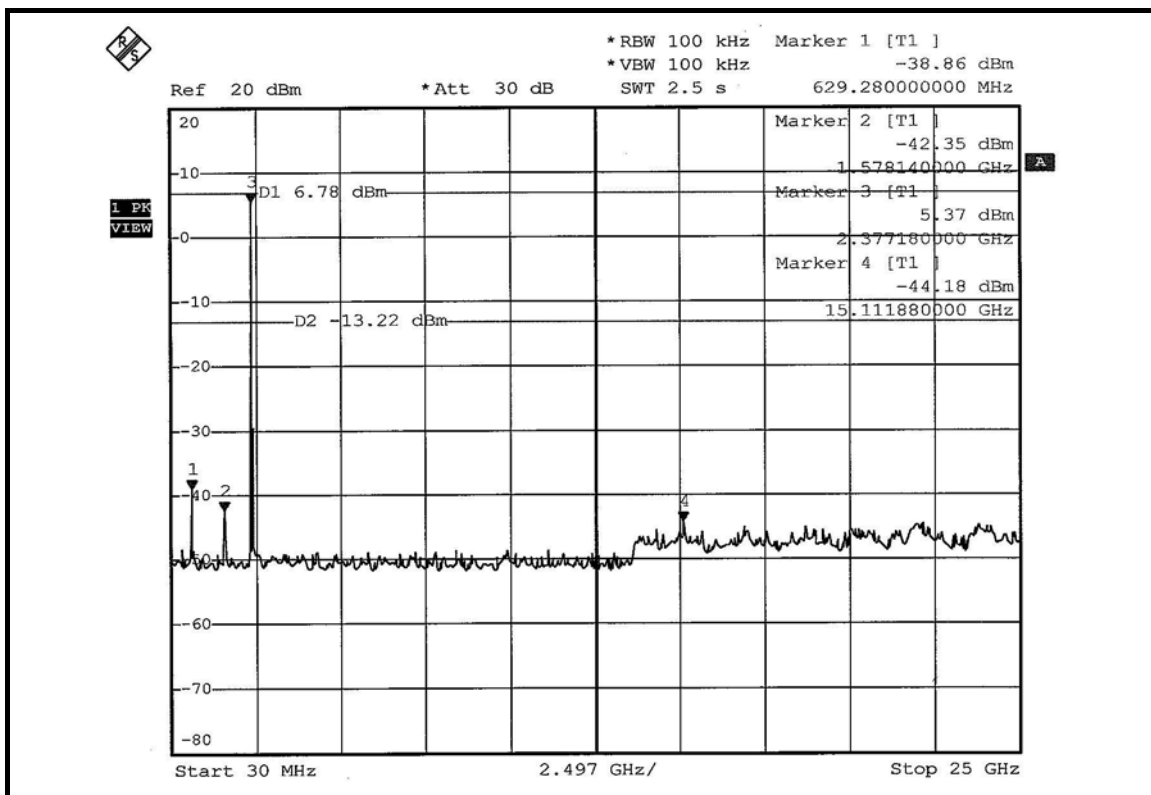
The band edge emission plot of DSSS technique on the next page shows 55.59dBc between carrier maximum power and local maximum emission in restrict band (2.390000000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 107.98dBuV/m (Average), so the maximum field strength in restrict band is  $107.98 - 55.59 = 52.39\text{dBuV/m}$  which is under 54dBuV/m limit.

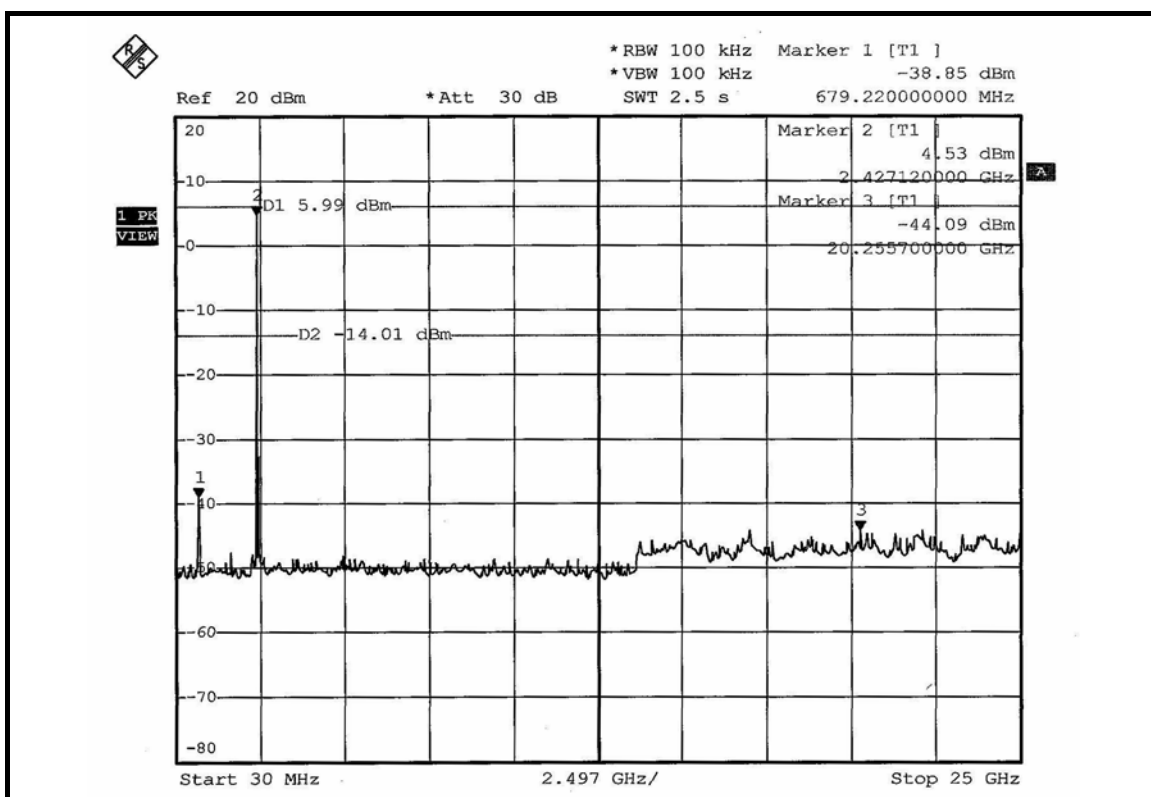
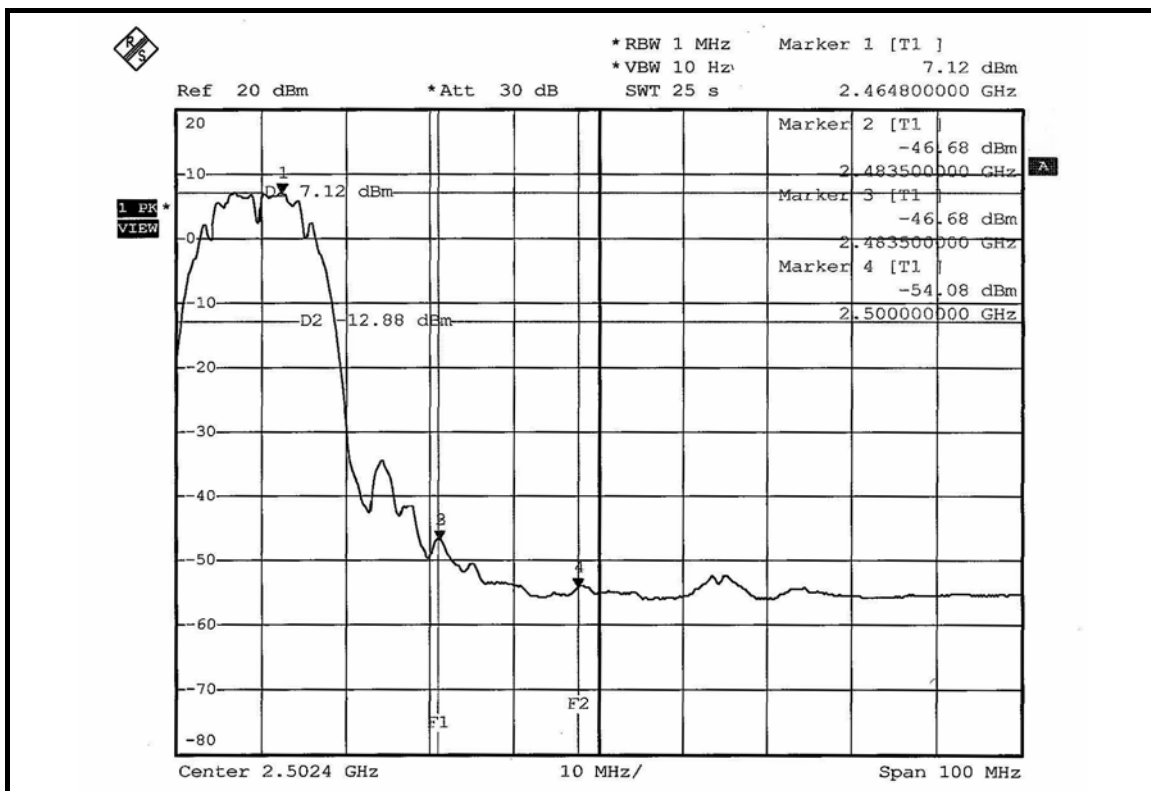
##### NOTE 2:

The band edge emission plot of DSSS technique on the next second page shows 49.10dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 111.36dBuV/m (Peak), so the maximum field strength in restrict band is  $111.36 - 49.10 = 62.26\text{dBuV/m}$  which is under 74dBuV/m limit.

The band edge emission plot of DSSS technique on the next third page shows 53.80dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 106.75dBuV/m (Average), so the maximum field strength in restrict band is  $106.75 - 53.80 = 52.95\text{dBuV/m}$  which is under 54dBuV/m limit.







## 802.11g OFDM MODULATION – SINGLE TX:

### NOTE 1:

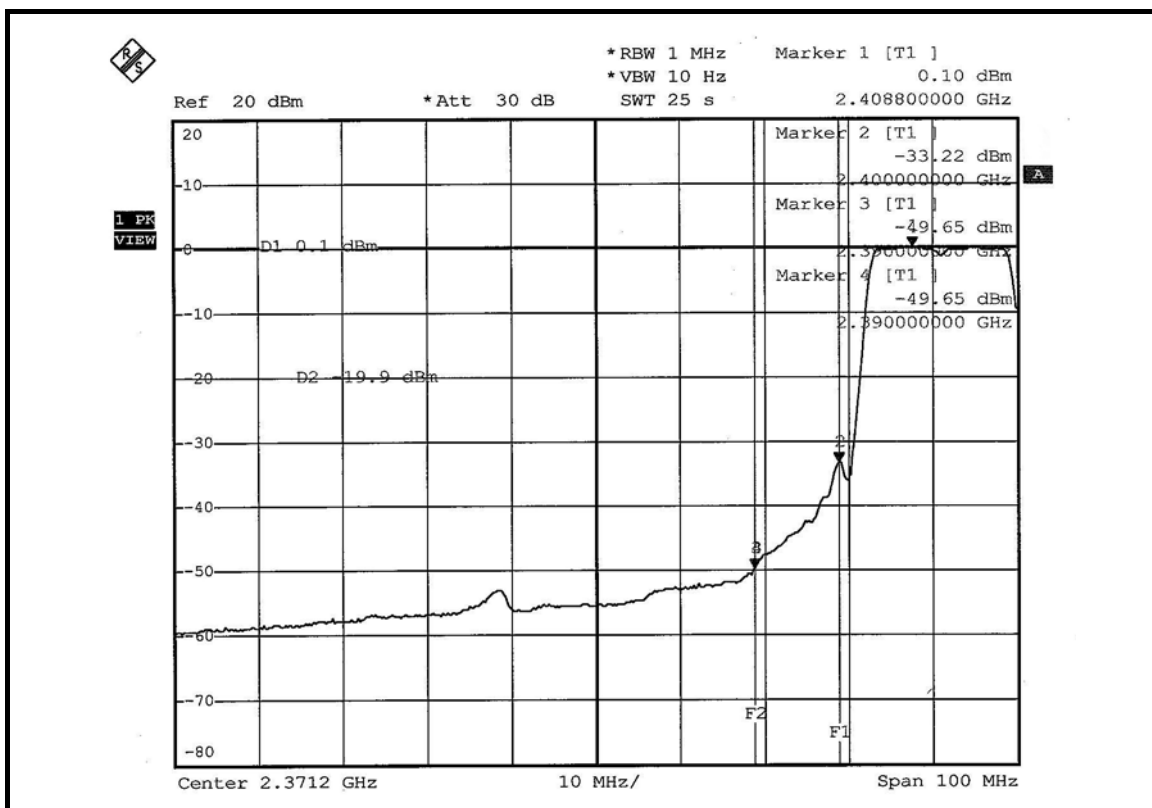
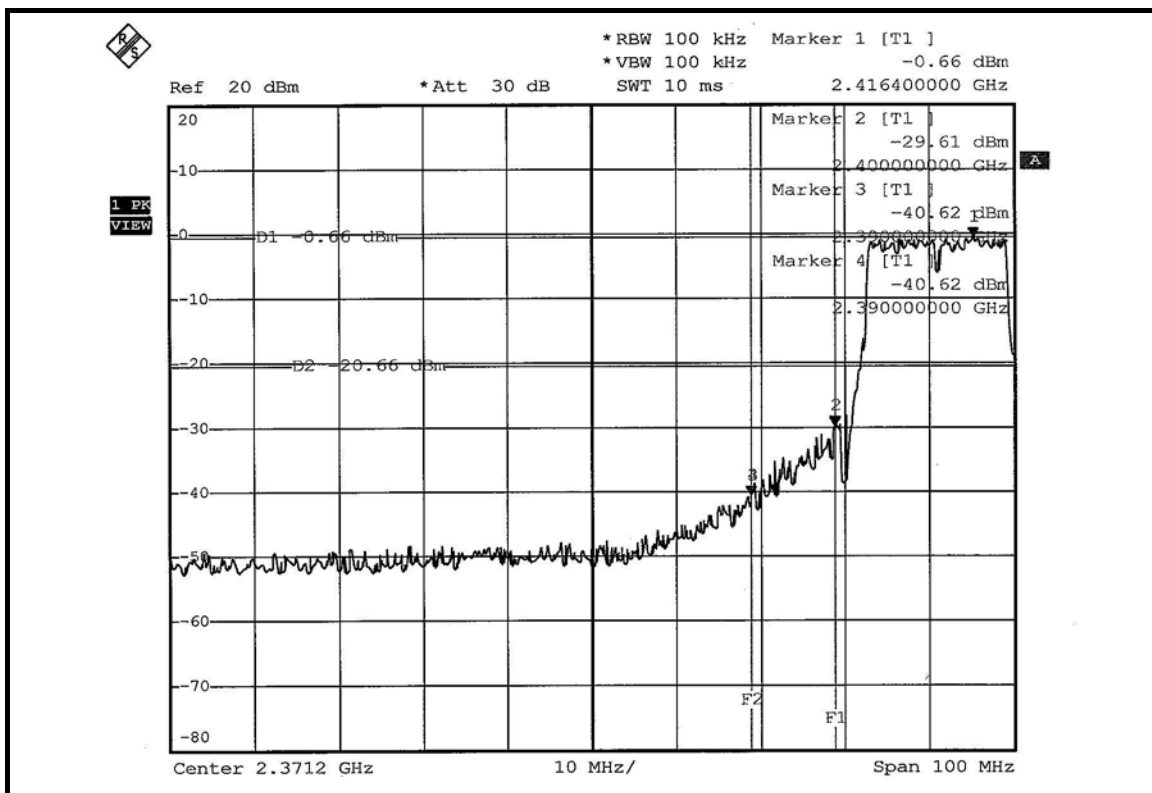
The band edge emission plot of OFDM technique on the next page shows 39.96dBc between carrier maximum power and local maximum emission in restrict band (2.390000000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 110.76dBuV/m (Peak), so the maximum field strength in restrict band is  $110.76 - 39.96 = 70.80\text{dBuV/m}$  which is under 74dBuV/m limit.

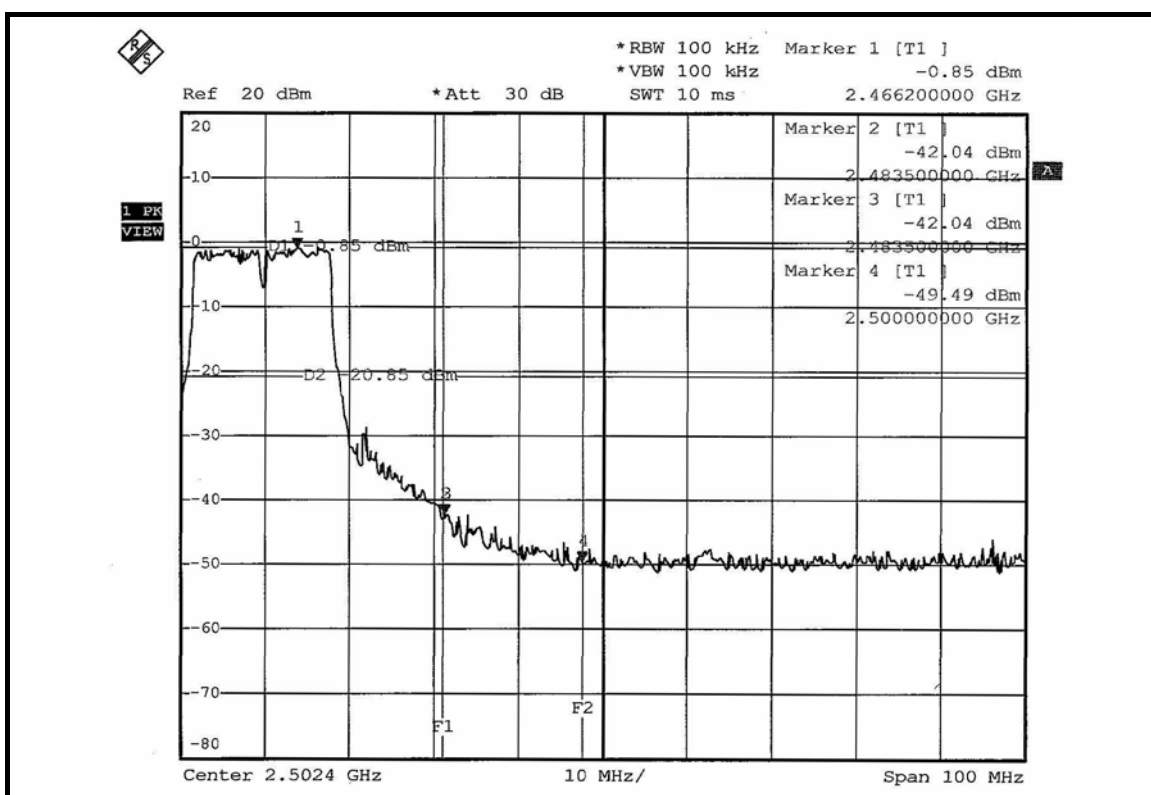
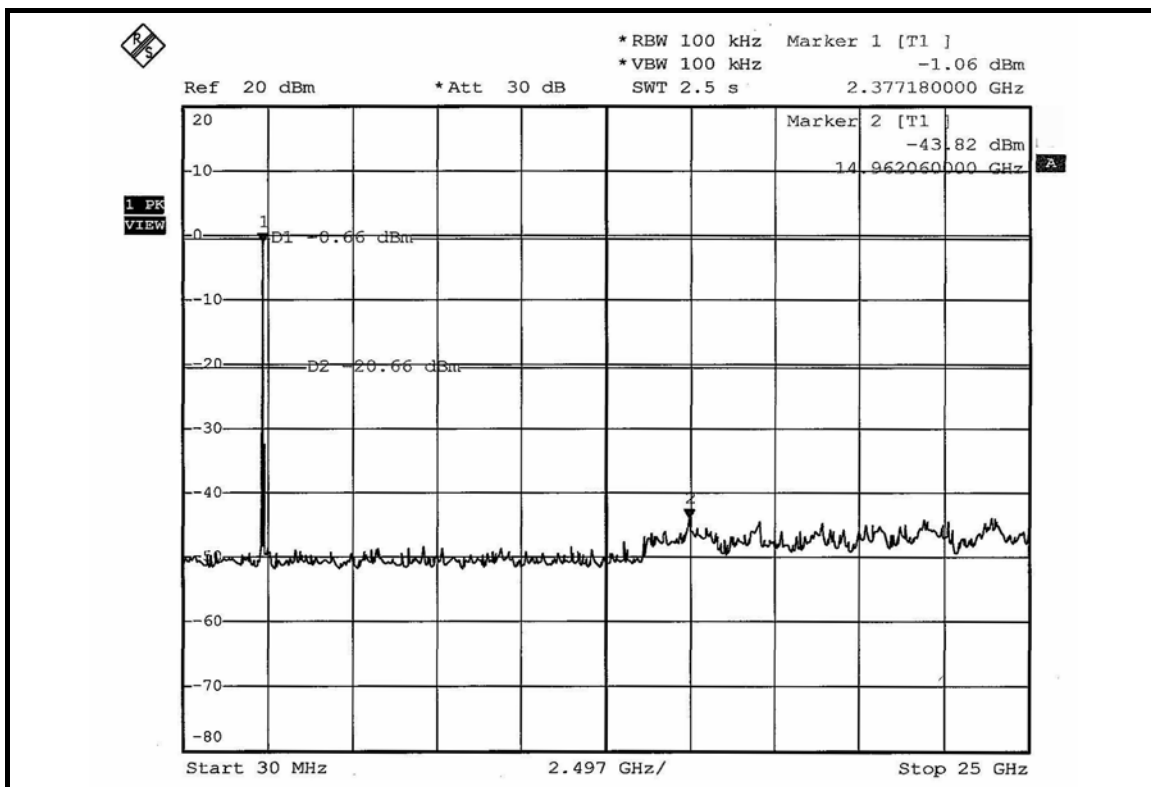
The band edge emission plot of OFDM technique on the next page shows 49.75dBc between carrier maximum power and local maximum emission in restrict band (2.390000000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 100.14dBuV/m (Average), so the maximum field strength in restrict band is  $100.14 - 49.75 = 50.39\text{dBuV/m}$  which is under 54dBuV/m limit.

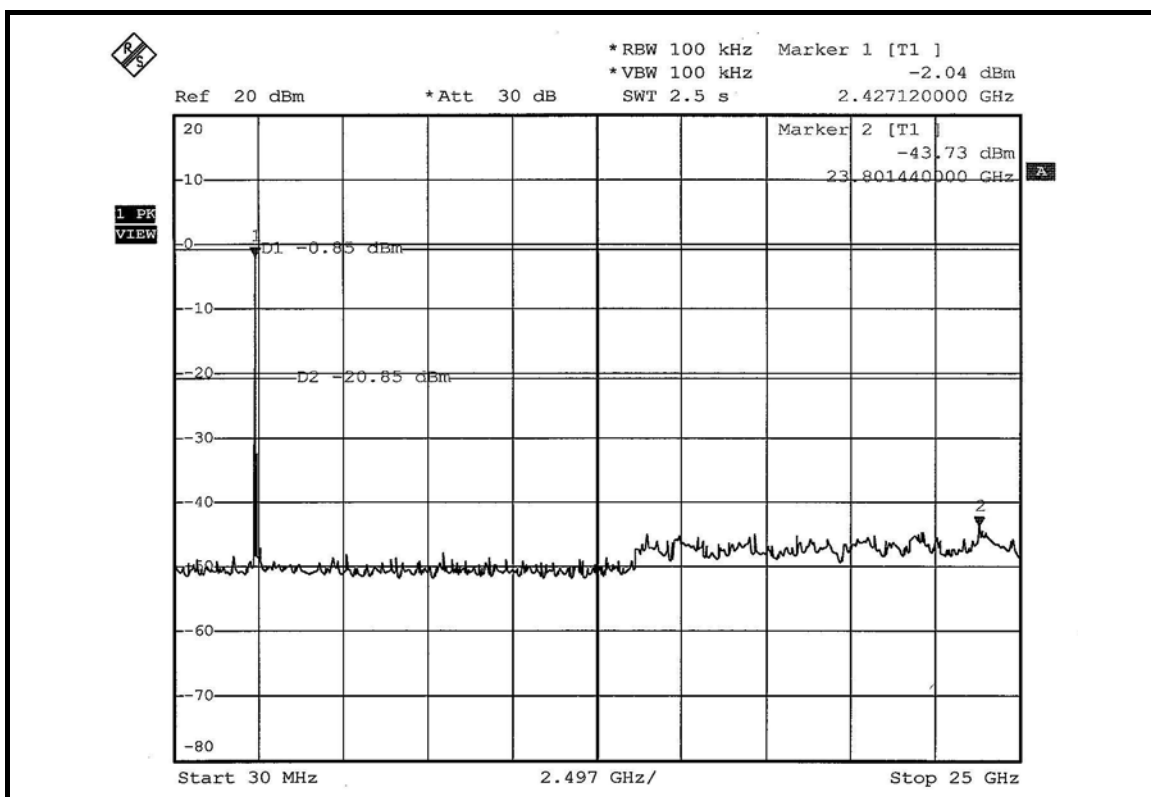
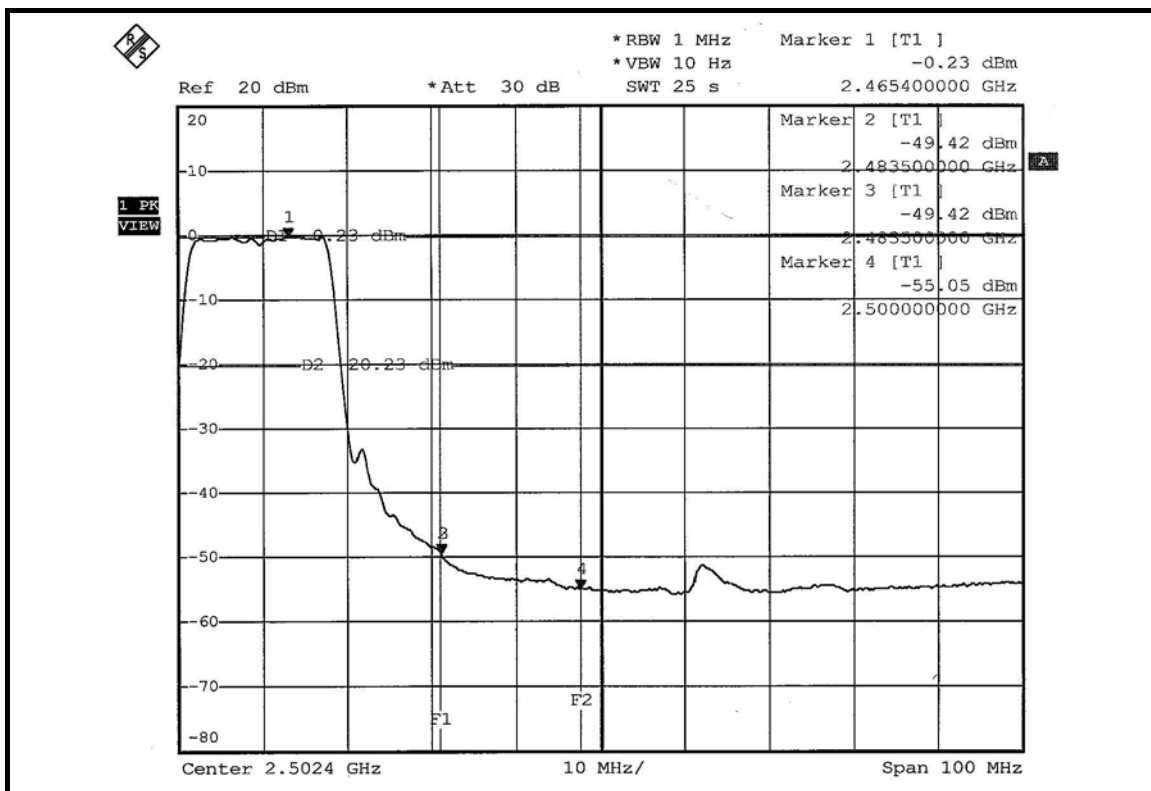
### NOTE 2:

The band edge emission plot of OFDM technique on the next second page shows 41.19dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 110.91dBuV/m (Peak), so the maximum field strength in restrict band is  $110.91 - 41.19 = 69.72\text{dBuV/m}$  which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 49.19dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 100.21dBuV/m (Average), so the maximum field strength in restrict band is  $100.21 - 49.19 = 51.02\text{dBuV/m}$  which is under 54dBuV/m limit.









## **DRAFT 802.11n (20MHz) OFDM MODULATION – DUAL TX:**

### **NOTE 1:**

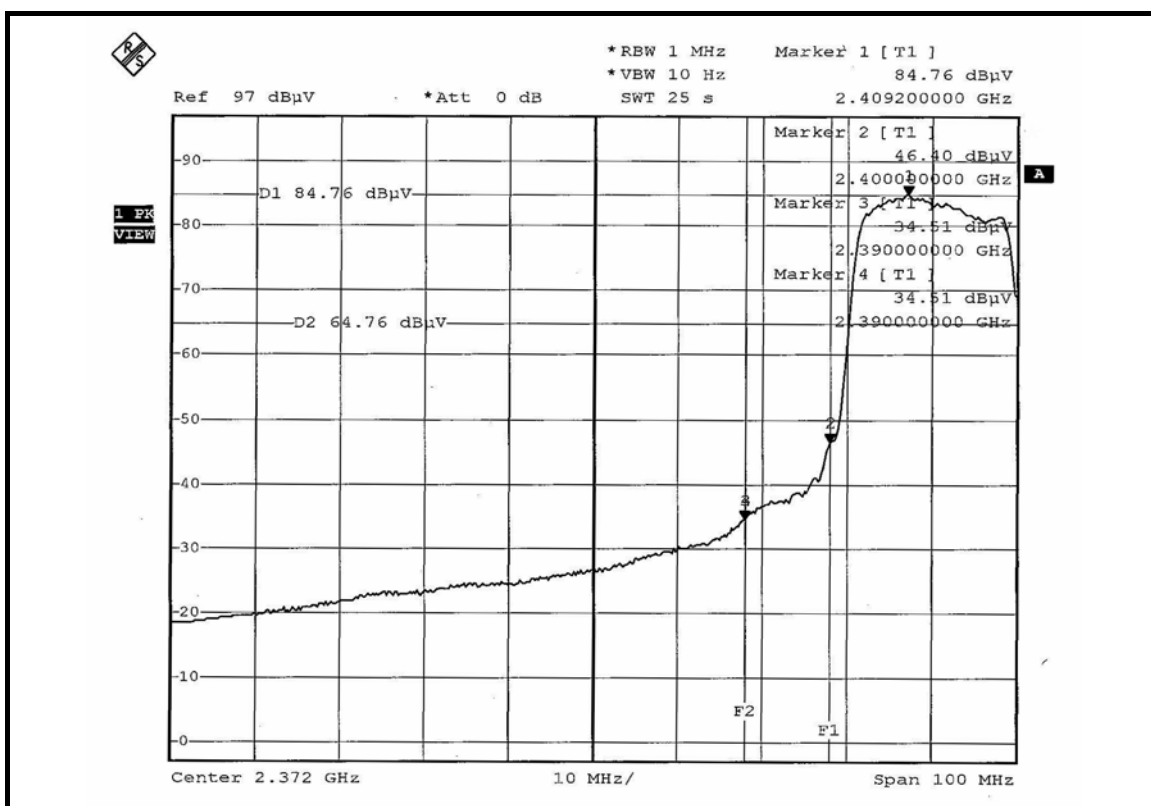
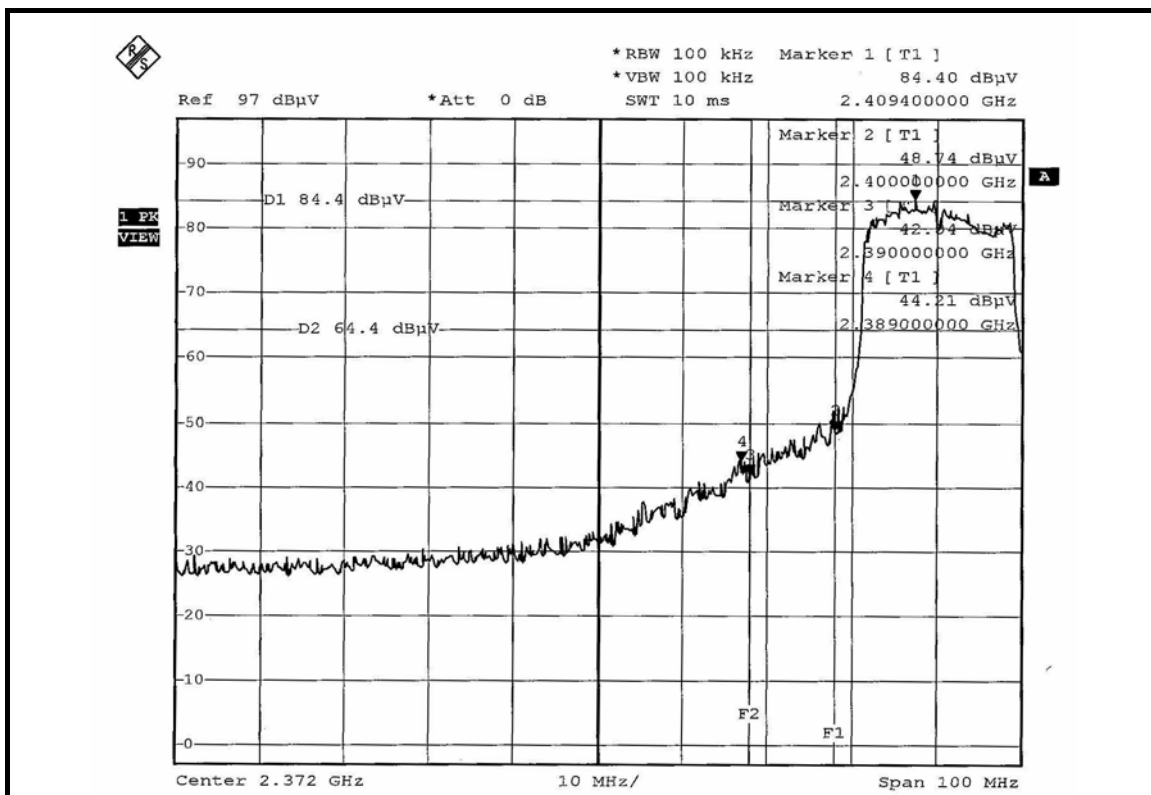
The band edge emission plot of OFDM technique on the next page shows 40.19Bc between carrier maximum power and local maximum emission in restrict band (2.389000000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 111.56dBuV/m (Peak), so the maximum field strength in restrict band is  $111.56 - 40.19 = 71.37\text{dBuV/m}$  which is under 74dBuV/m limit.

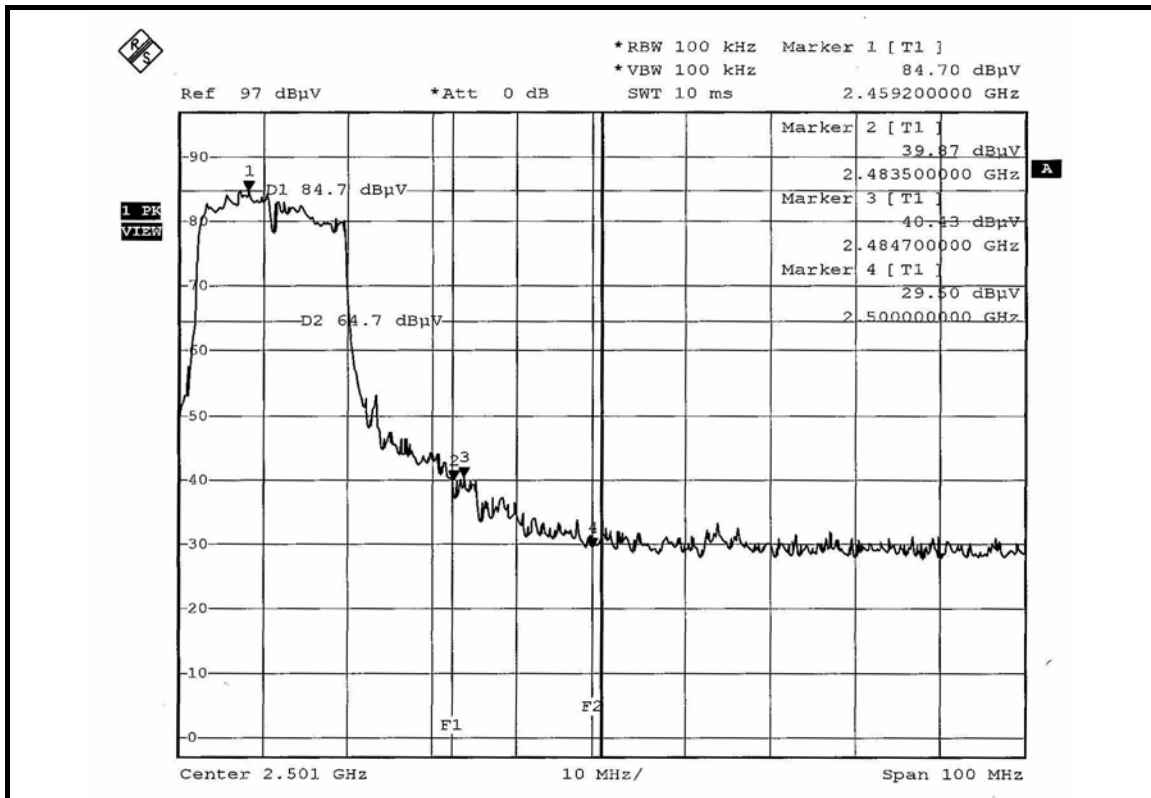
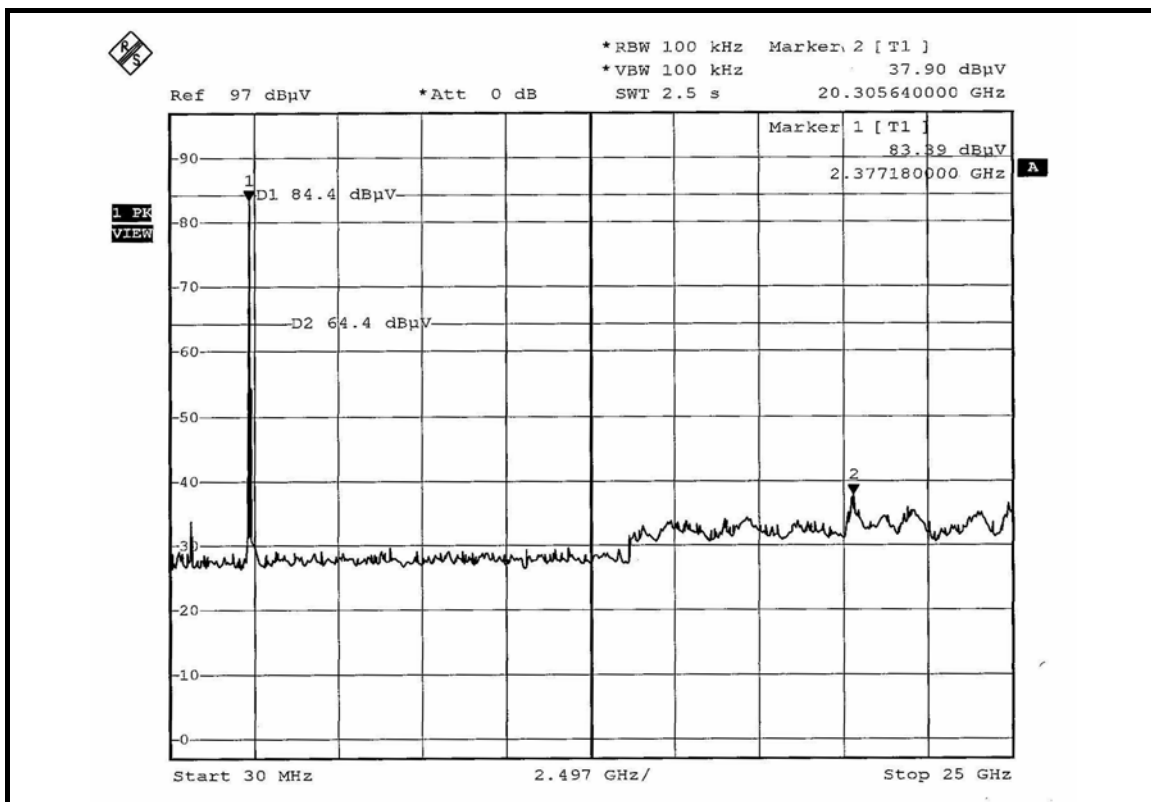
The band edge emission plot of OFDM technique on the next page shows 50.25dBc between carrier maximum power and local maximum emission in restrict band (2.39000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 101.74dBuV/m (Average), so the maximum field strength in restrict band is  $101.74 - 50.25 = 51.49\text{dBuV/m}$  which is under 54dBuV/m limit.

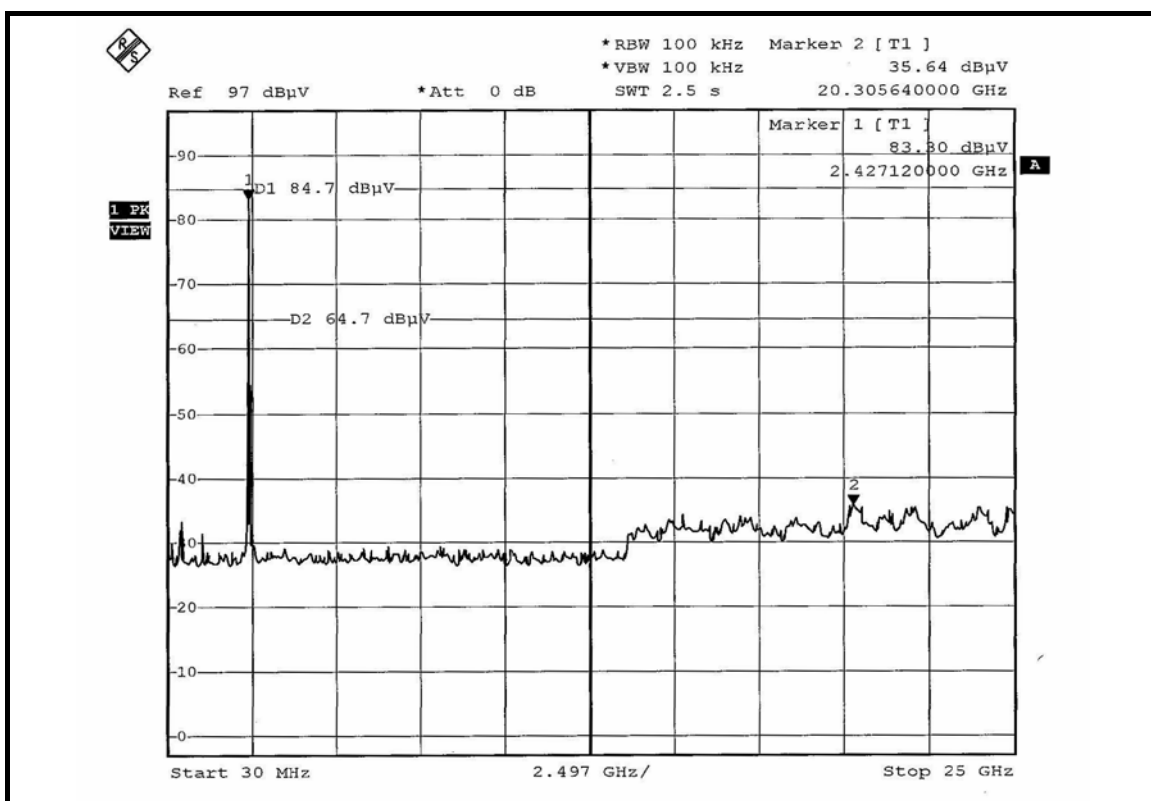
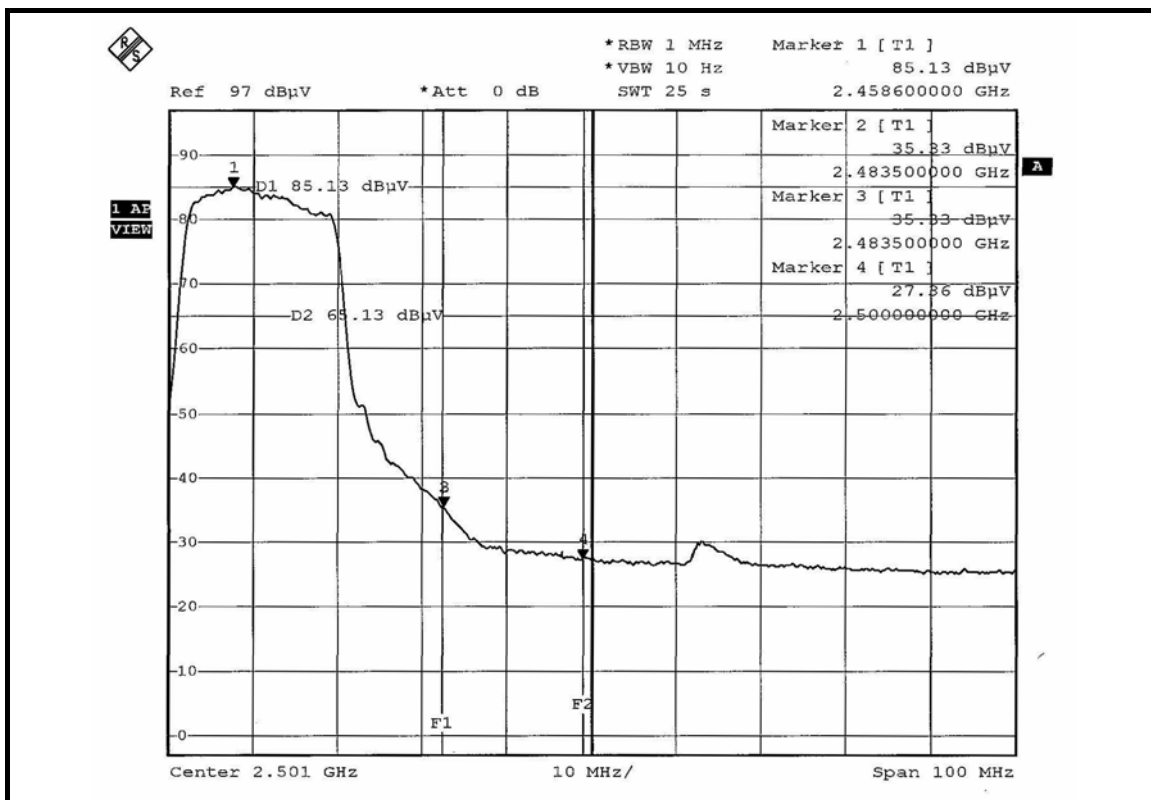
### **NOTE 2:**

The band edge emission plot of OFDM technique on the next second page shows 44.27dBc between carrier maximum power and local maximum emission in restrict band (2.484700000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 112.09dBuV/m (Peak), so the maximum field strength in restrict band is  $112.09 - 44.27 = 67.82\text{dBuV/m}$  which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 49.80dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 102.39dBuV/m (Average), so the maximum field strength in restrict band is  $102.39 - 49.80 = 52.59\text{dBuV/m}$  which is under 54dBuV/m limit.







## **DRAFT 802.11n (40MHz) OFDM MODULATION – DUAL TX:**

### **NOTE 1:**

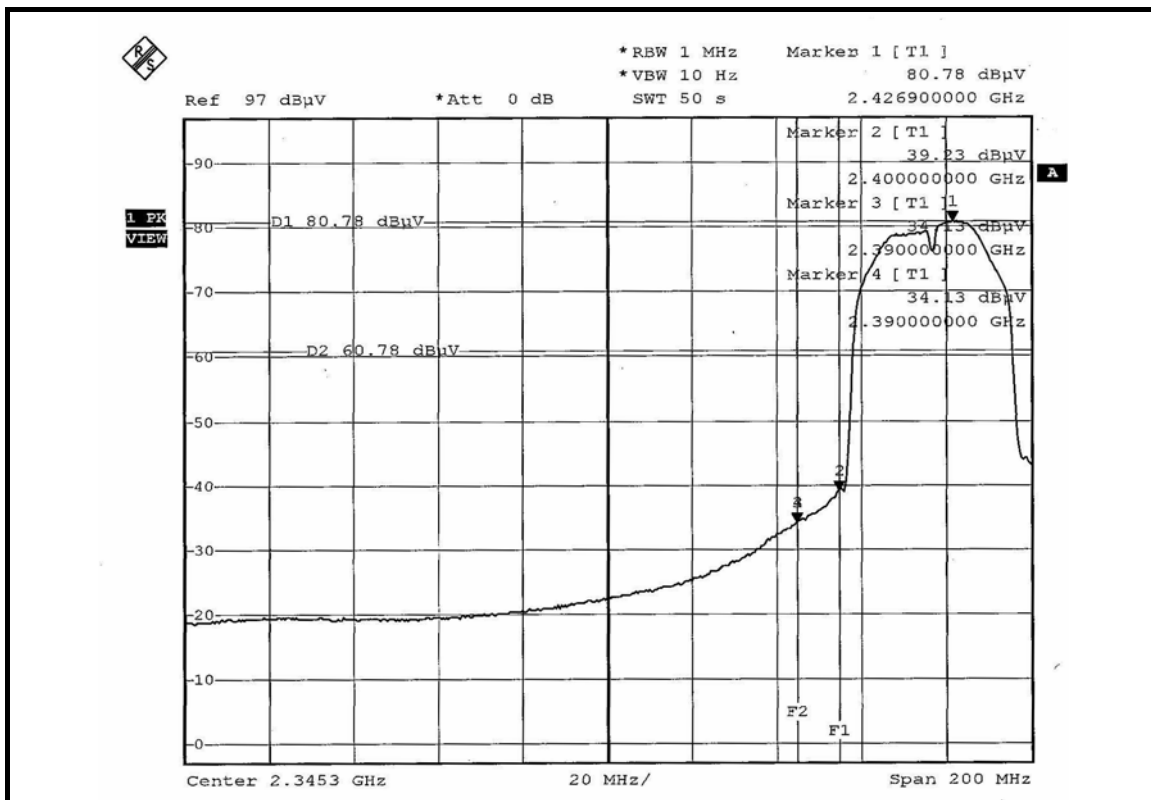
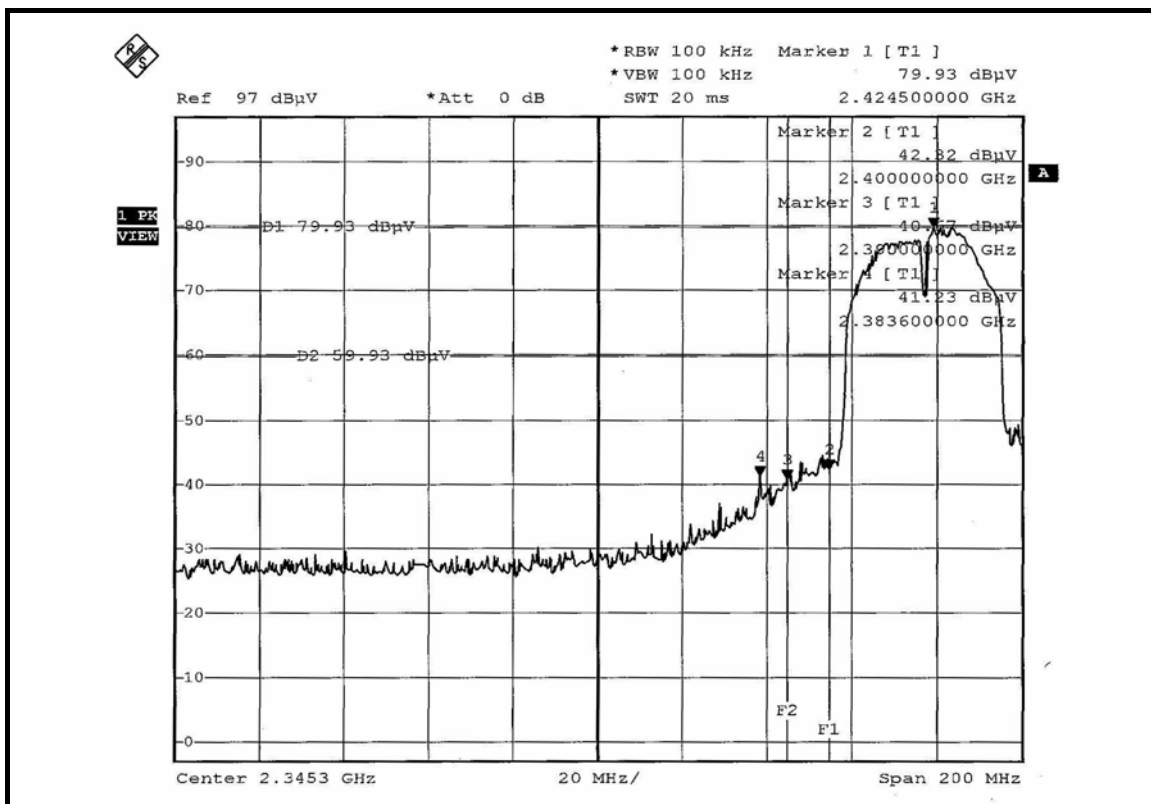
The band edge emission plot of OFDM technique on the next page shows 38.70dBc between carrier maximum power and local maximum emission in restrict band (2.383600000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 109.02dBuV/m (Peak), so the maximum field strength in restrict band is  $109.02 - 38.70 = 70.32\text{dBuV/m}$  which is under 74dBuV/m limit.

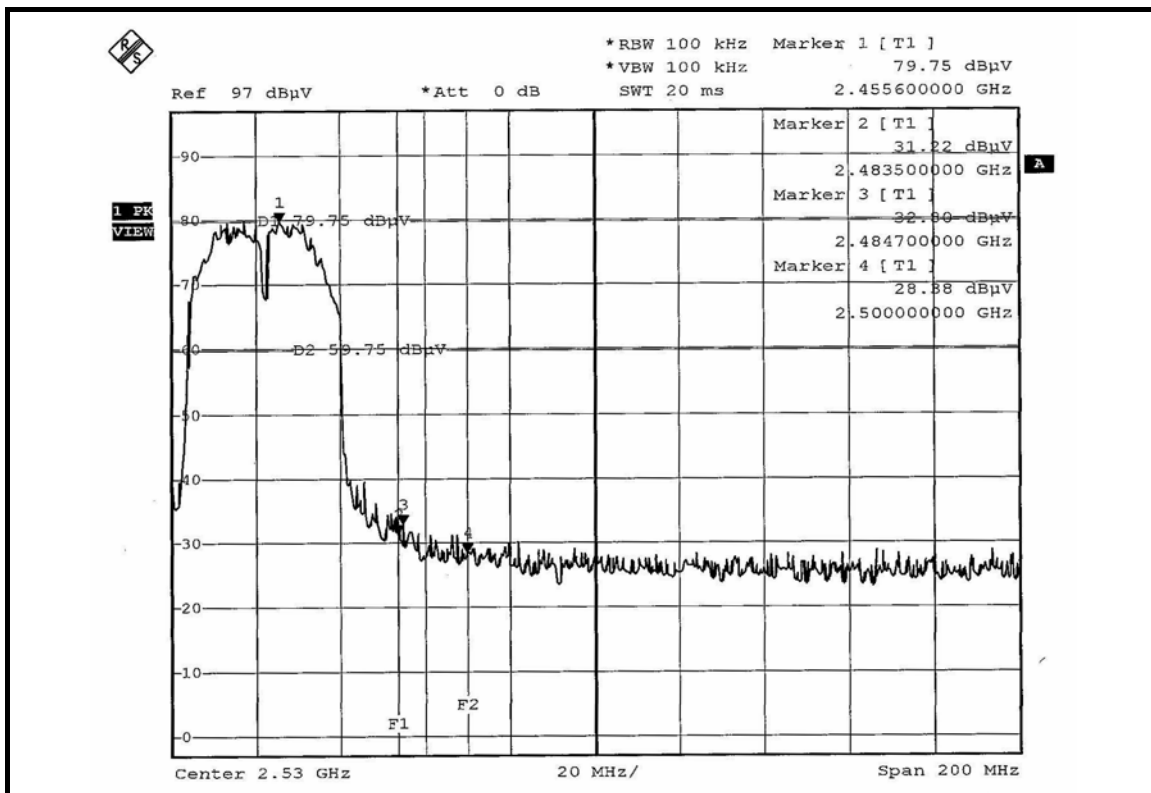
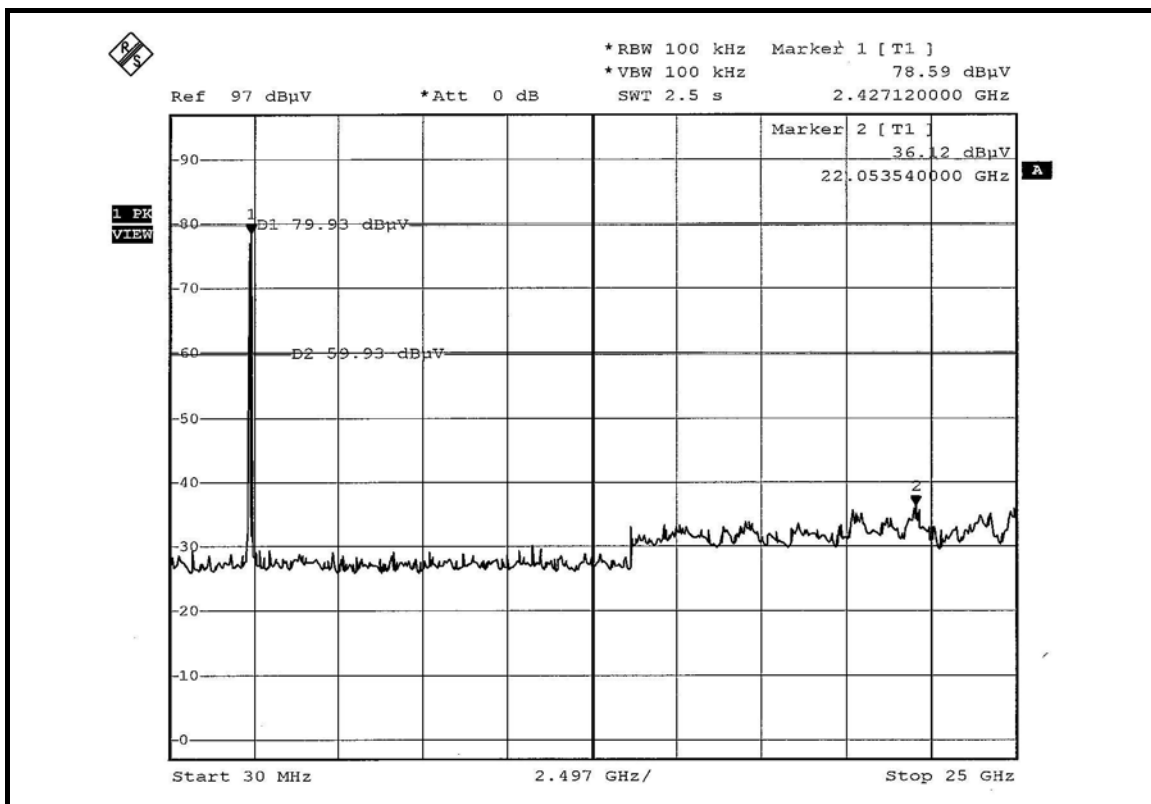
The band edge emission plot of OFDM technique on the next page shows 46.65dBc between carrier maximum power and local maximum emission in restrict band (2.390000000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 97.13dBuV/m (Average), so the maximum field strength in restrict band is  $97.13 - 46.65 = 50.48\text{dBuV/m}$  which is under 54dBuV/m limit.

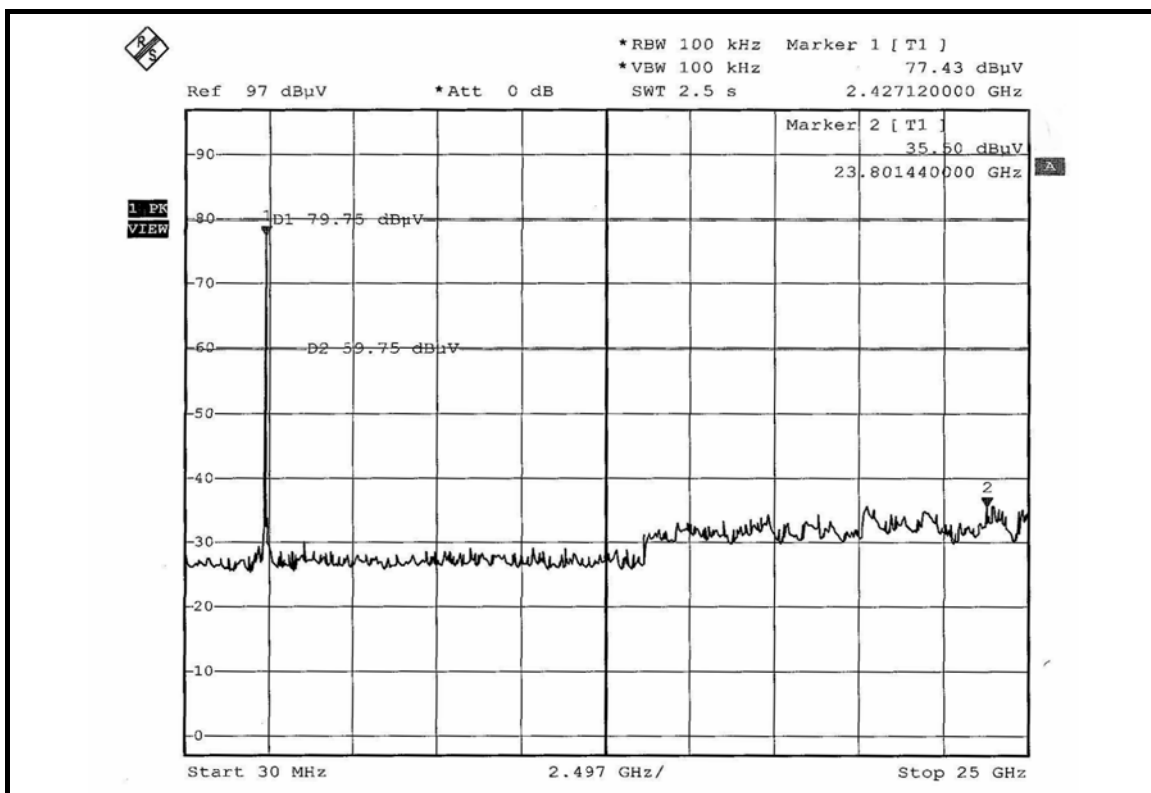
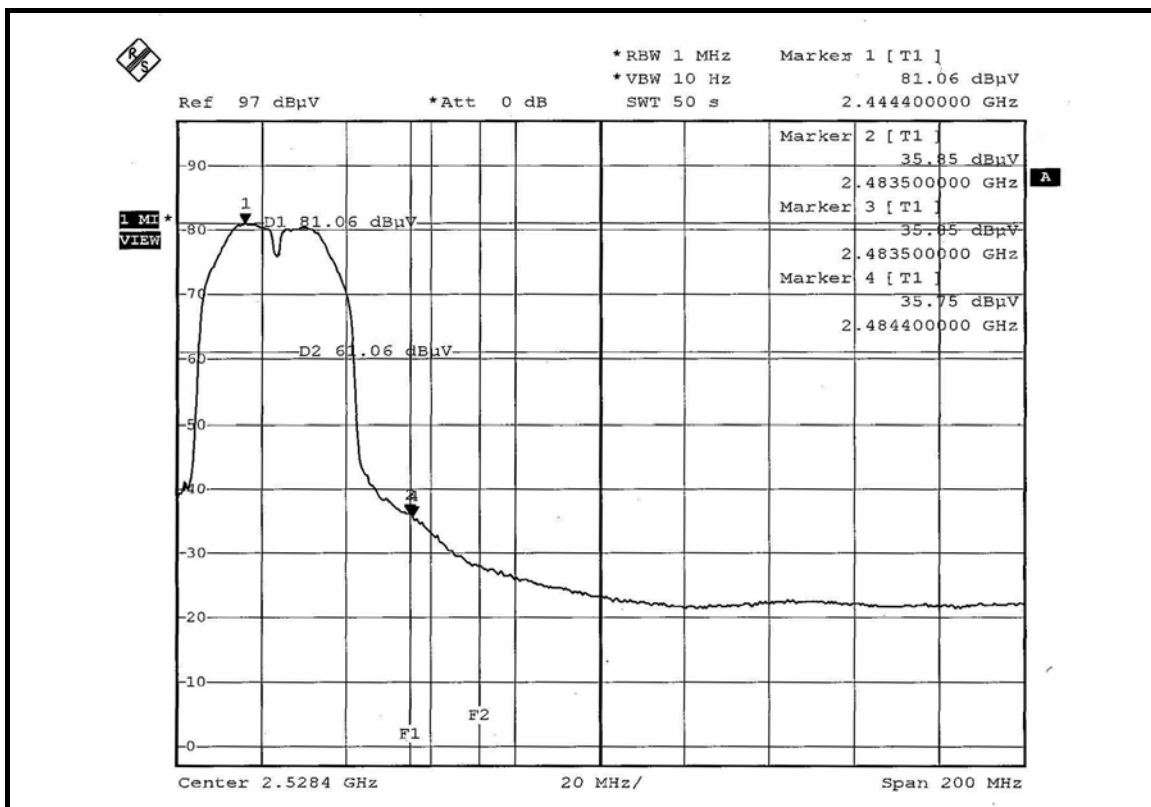
### **NOTE 2:**

The band edge emission plot of OFDM technique on the next second page shows 46.95dBc between carrier maximum power and local maximum emission in restrict band (2.484700000GHz). The emission of carrier strength list in the test result of channel 7 at the item 4.2.7 is 109.13dBuV/m (Peak), so the maximum field strength in restrict band is  $109.13 - 46.95 = 62.18\text{dBuV/m}$  which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 45.21dBc between carrier maximum power and local maximum emission in restrict band (2.483500000GHz). The emission of carrier strength list in the test result of channel 7 at the item 4.2.7 is 97.26dBuV/m (Average), so the maximum field strength in restrict band is  $97.26 - 45.21 = 52.05\text{dBuV/m}$  which is under 54dBuV/m limit.









## **4.7 ANTENNA REQUIREMENT**

### **4.7.1 STANDARD APPLICABLE**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **4.7.2 ANTENNA CONNECTED CONSTRUCTION**

The antenna used in this product is dipole antenna without connector. The maximum Gain of the antenna is 2dBi.

## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

## 6. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, UL, A2LA
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	CNLA, BSMI, NCC
<b>Netherlands</b>	Telefication
<b>Singapore</b>	PSB , GOST-ASIA(MOU)
<b>Russia</b>	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

[www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab:**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**

Tel: 886-3-3183232

Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

The address and road map of all our labs can be found in our web site also.

## **APPENDIX-A**

### **MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.