

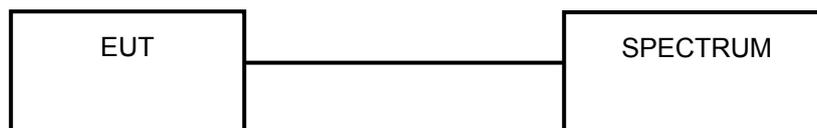
#### 4.4.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer.
2. Set the spectrum bandwidth span to view the entire spectrum.
3. Using peak detector and Max-hold function for Trace 1 (RB=1MHz, VB=3MHz) and 2 (RB=1MHz, VB=300KHz).
4. The largest difference between Trace 1 and Trace 2 in any 1MHz band on any frequency was recorded.

#### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



#### 4.4.7 TEST RESULTS

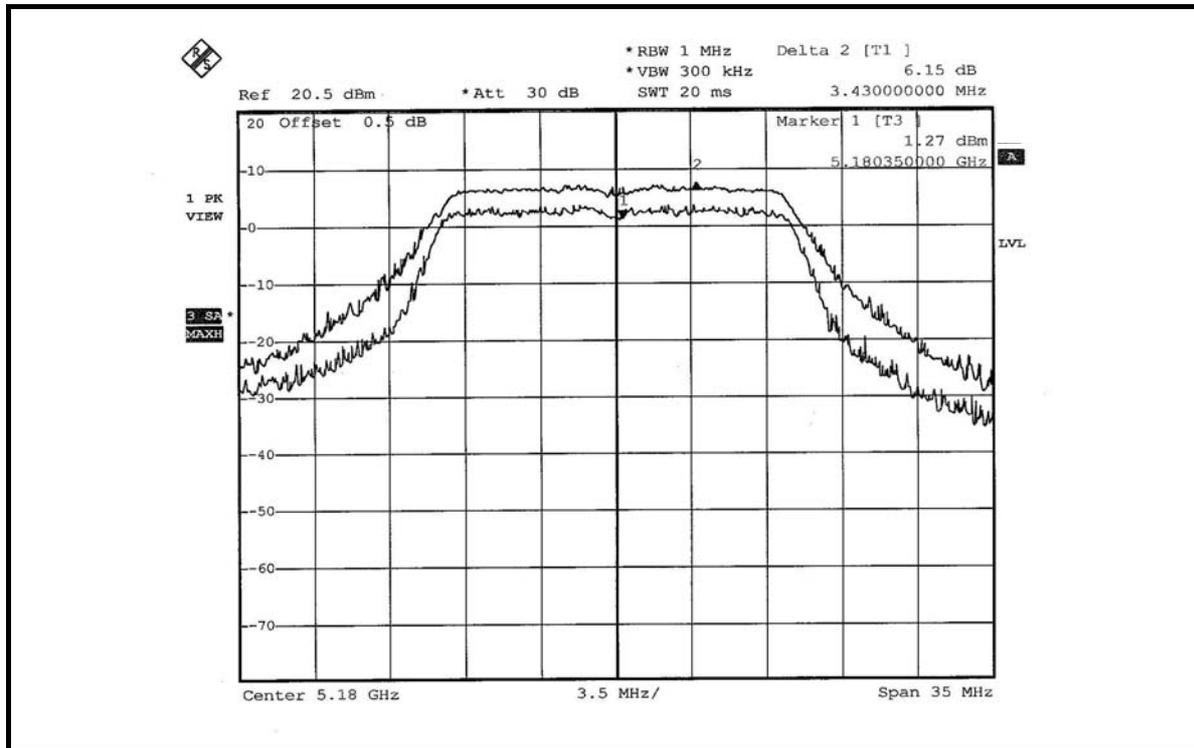
##### 802.11a OFDM MODULATION

##### FOR ANTENNA ITEM 3 (5.0dBi gain)

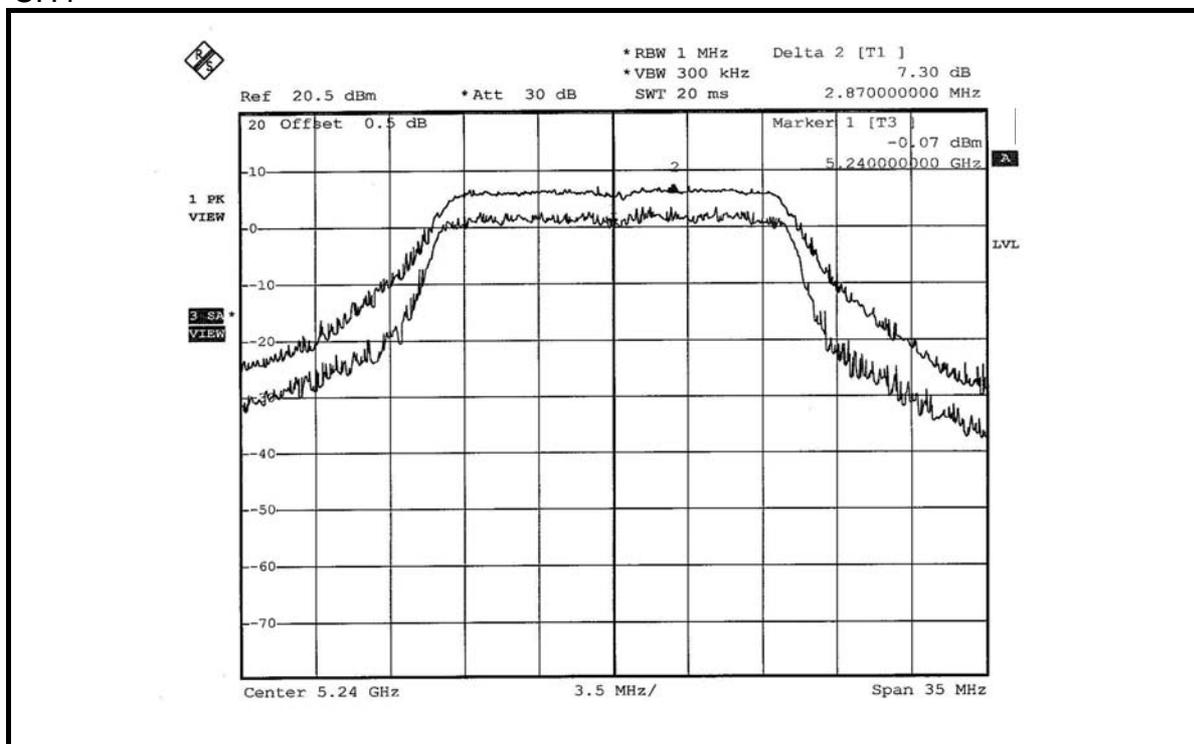
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	22deg.C, 63%RH, 991hPa
<b>TESTED BY</b>	Brad Wu		

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>PEAK POWER EXCURSION (dB)</b>	<b>PEAK to AVERAGE EXCURSION LIMIT (dB)</b>	<b>PASS/FAIL</b>
1	5180	6.15	13	PASS
4	5240	7.30	13	PASS
5	5260	7.31	13	PASS
8	5320	7.50	13	PASS
9	5745	7.03	13	PASS
11	5785	7.42	13	PASS
12	5805	7.62	13	PASS

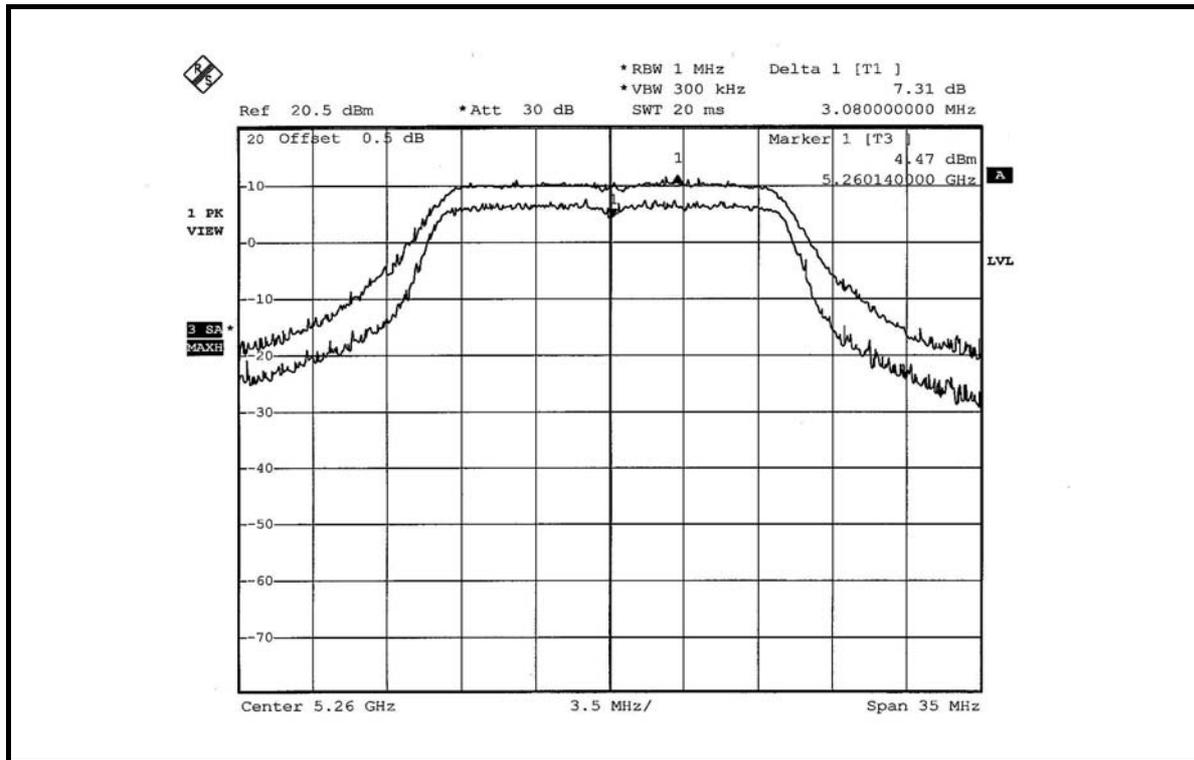
### CH1



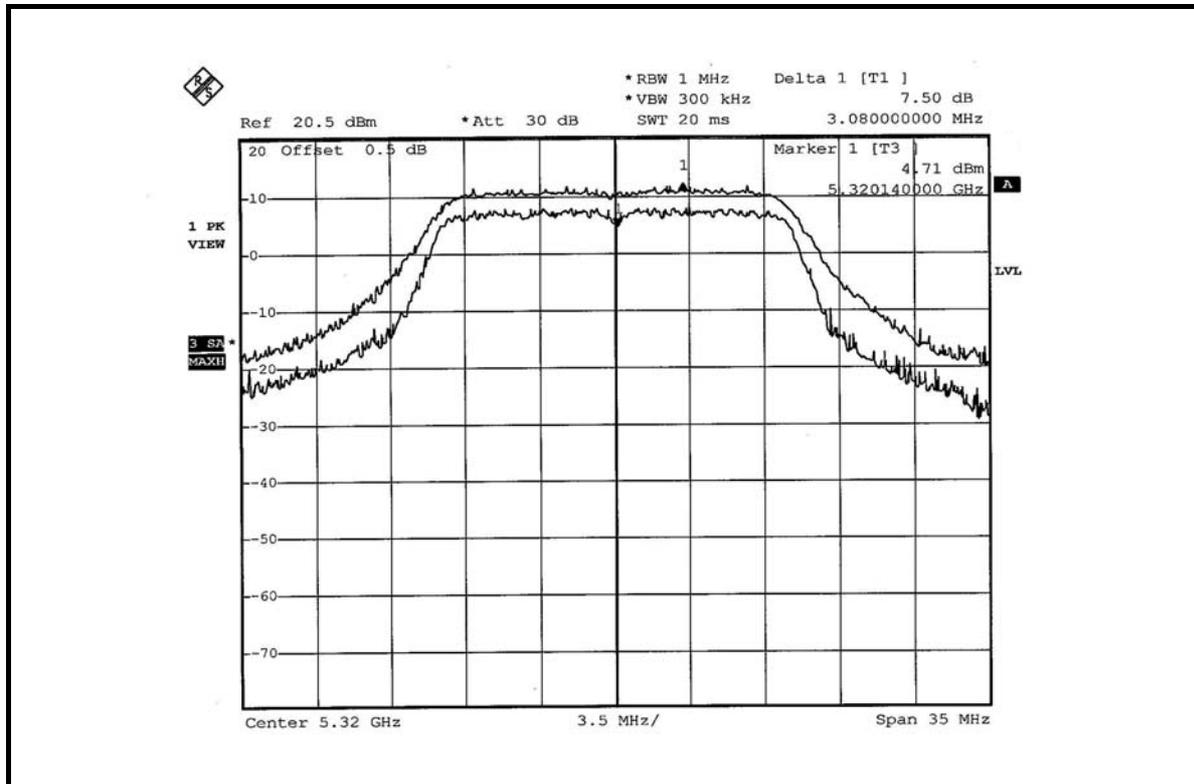
### CH4



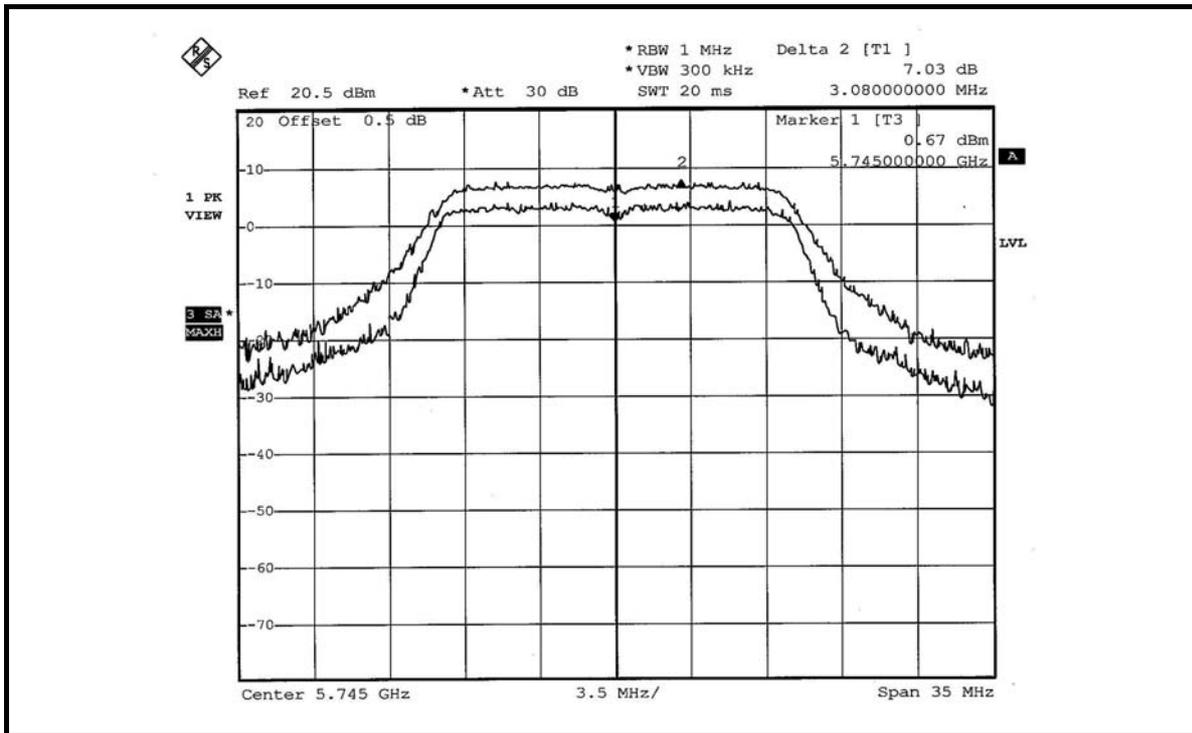
CH5



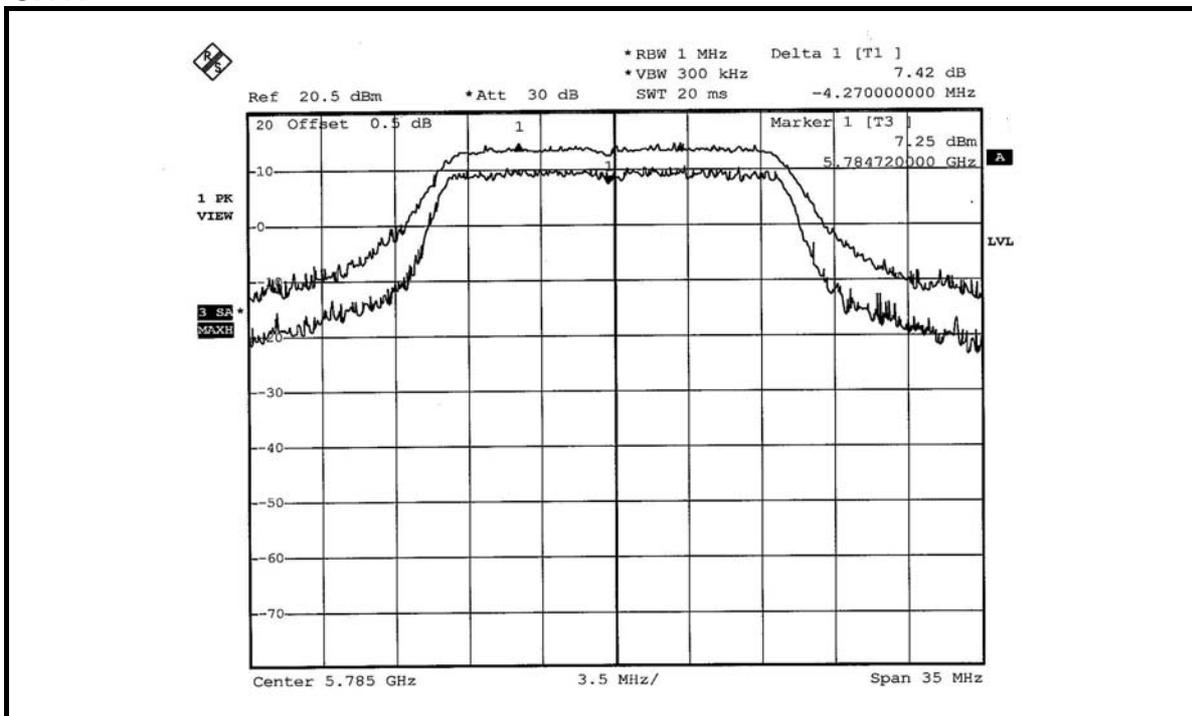
CH8



CH9



CH11





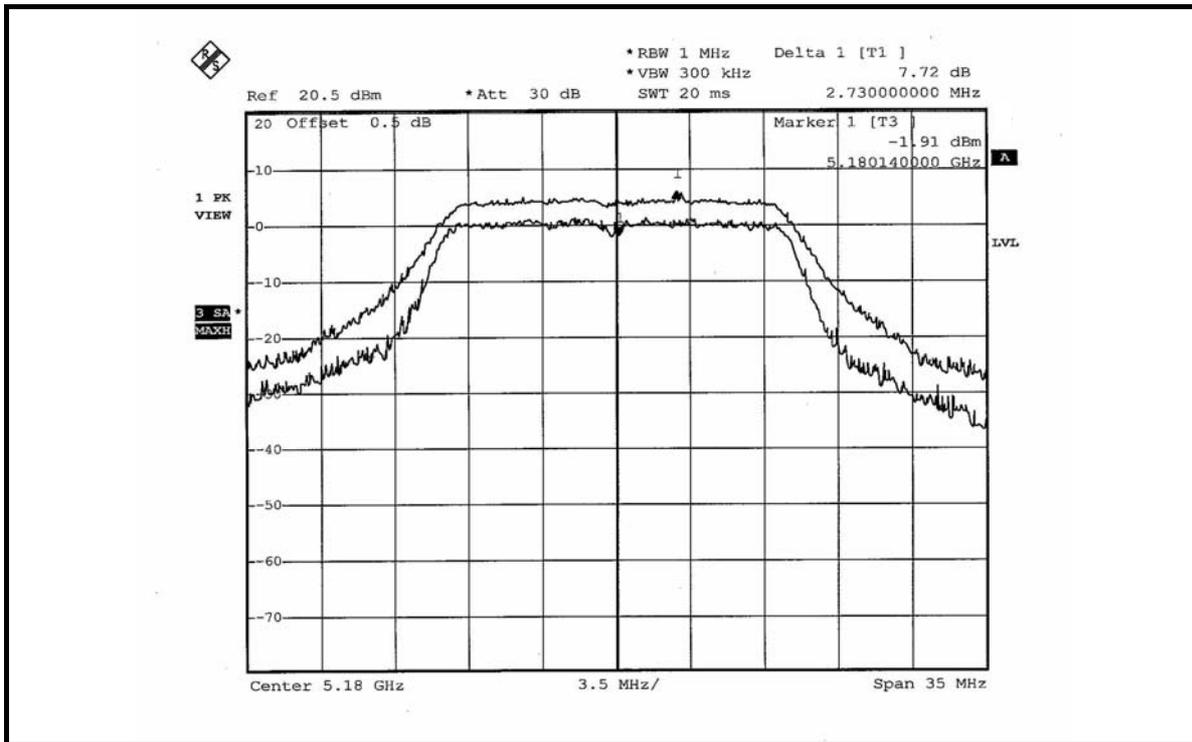


**FOR ANTENNA ITEM 4 (13.0dBi gain)**

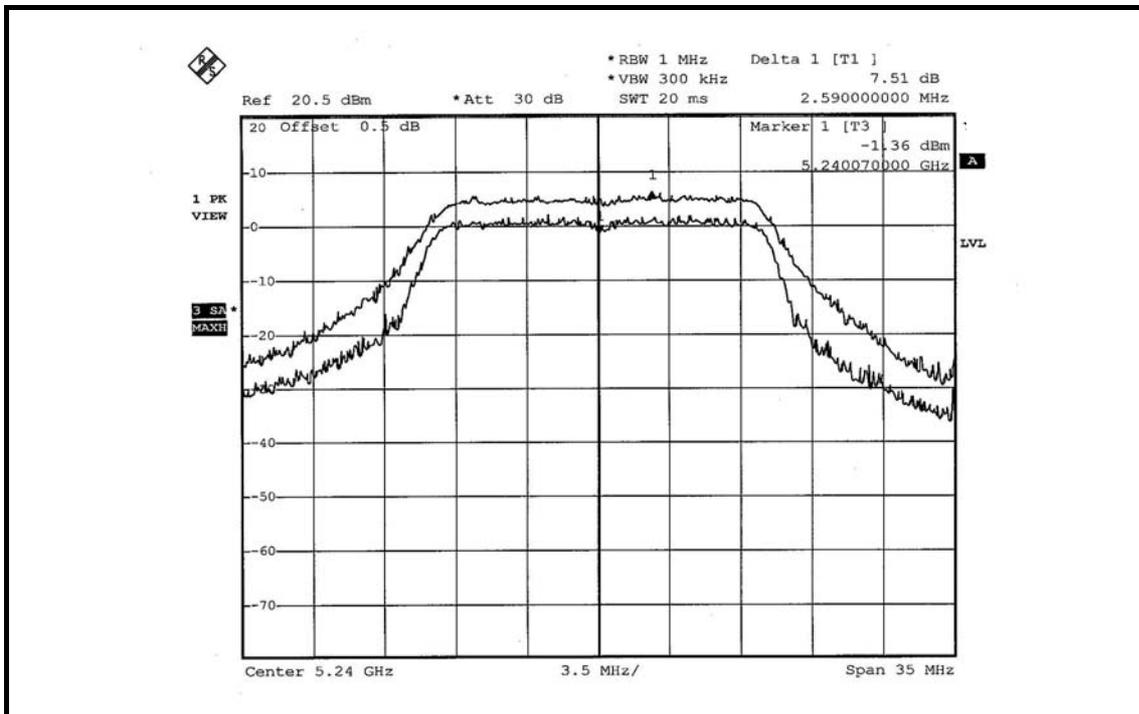
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	22deg.C, 63%RH, 991hPa
<b>TESTED BY</b>	Brad Wu		

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>PEAK POWER EXCURSION (dB)</b>	<b>PEAK to AVERAGE EXCURSION LIMIT (dB)</b>	<b>PASS/FAIL</b>
1	5180	7.72	13	PASS
4	5240	7.51	13	PASS
5	5260	7.76	13	PASS
8	5320	7.38	13	PASS
9	5745	7.09	13	PASS
11	5785	7.53	13	PASS
12	5805	7.51	13	PASS

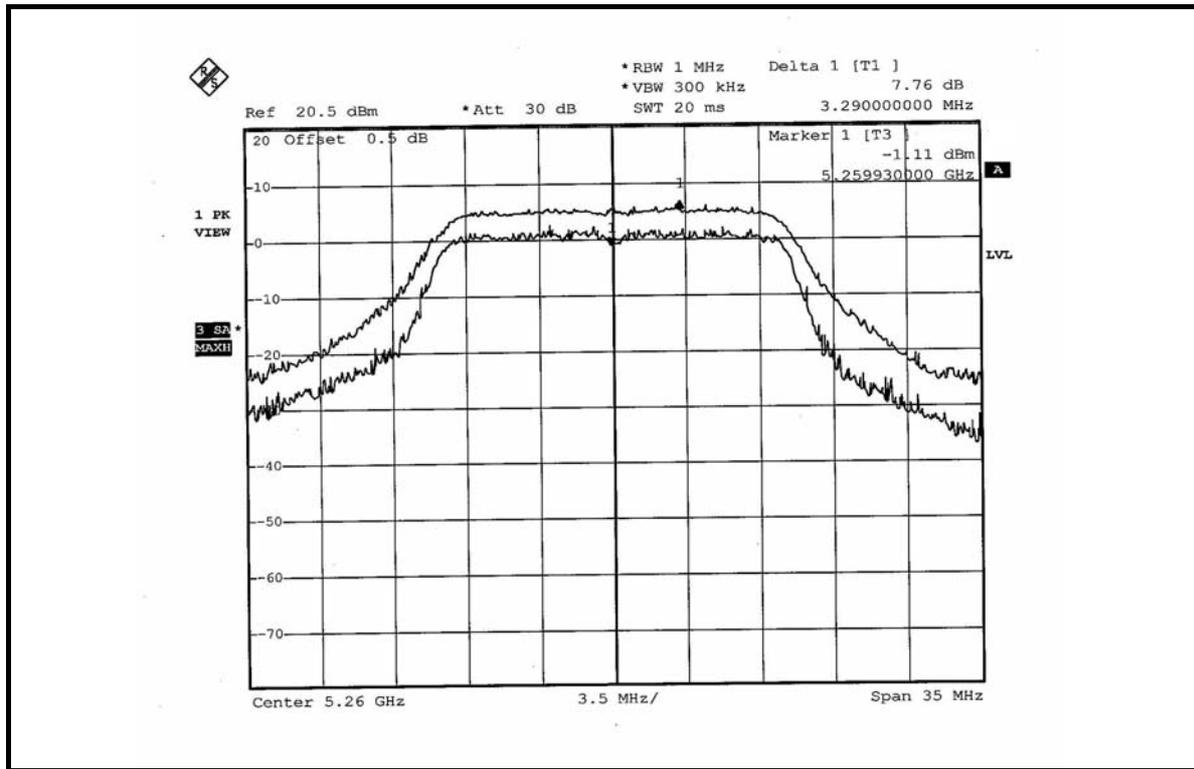
CH1



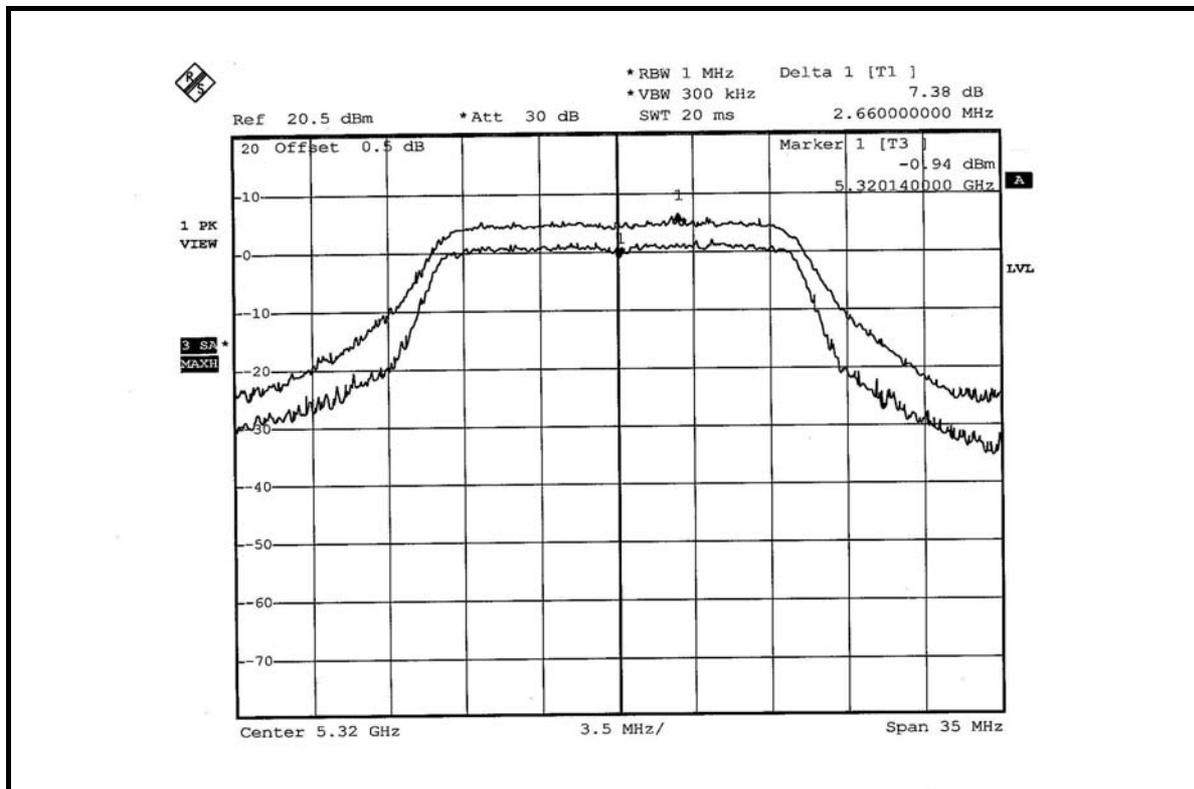
CH4



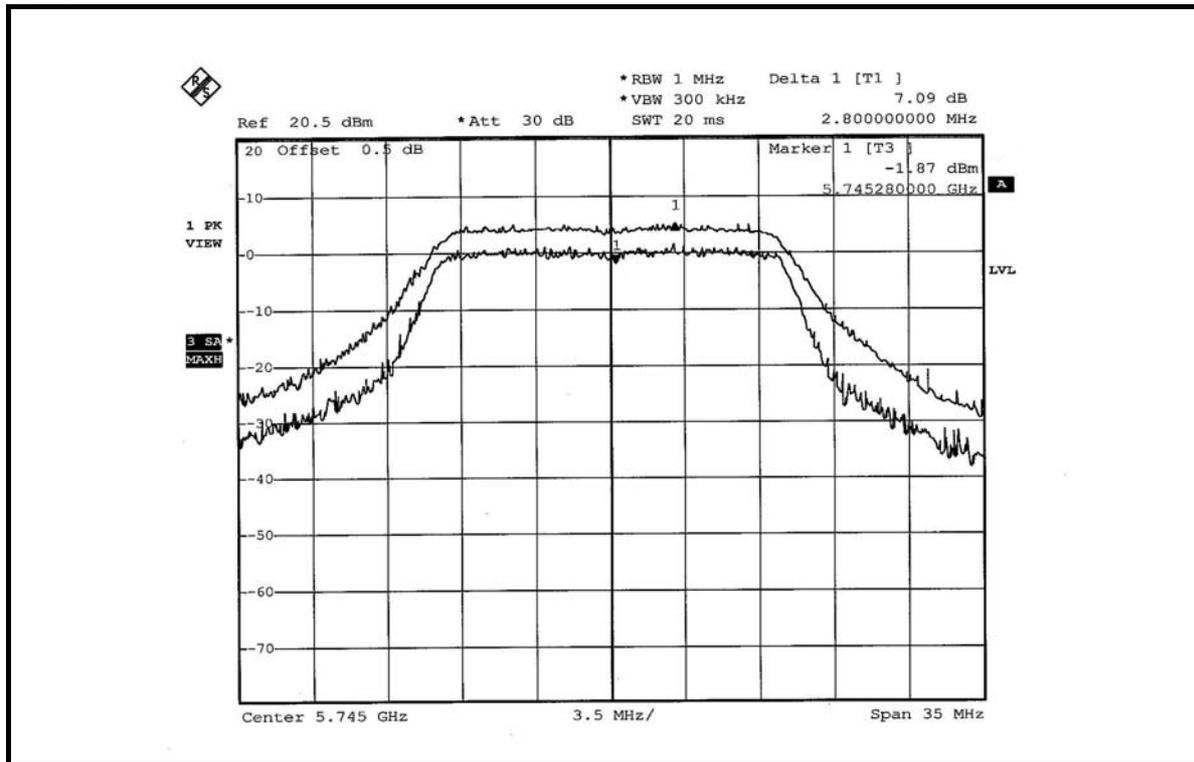
CH5



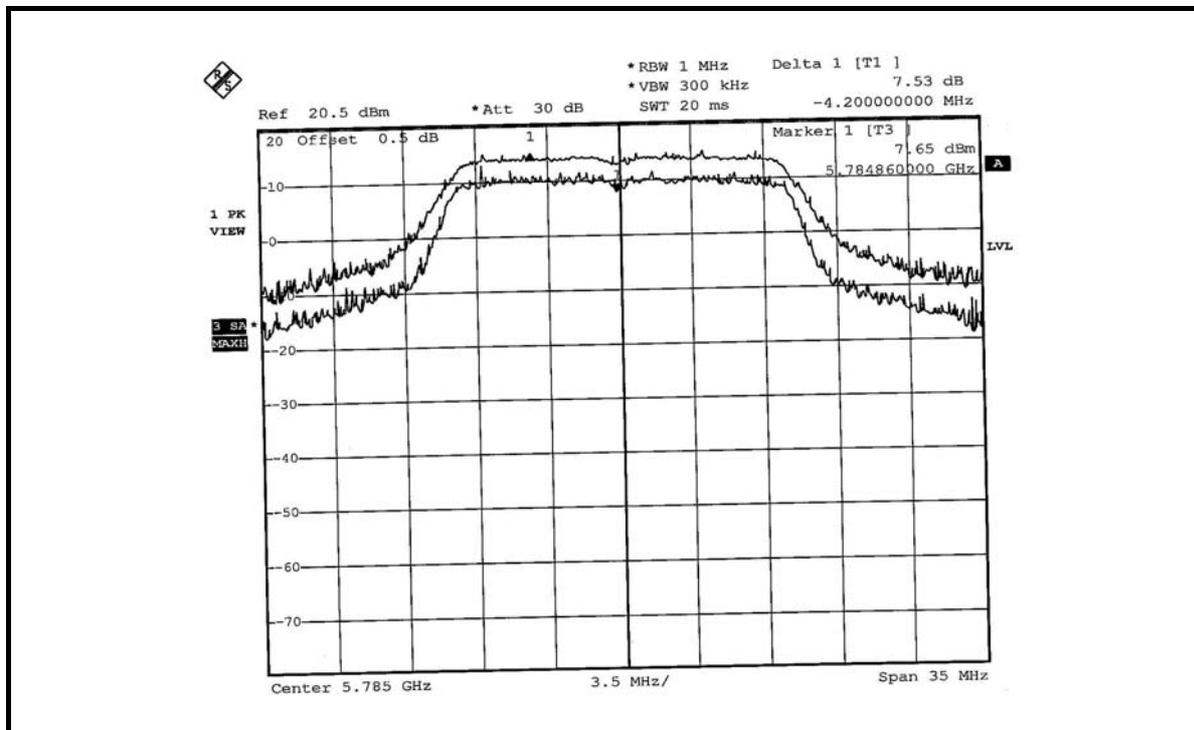
CH8



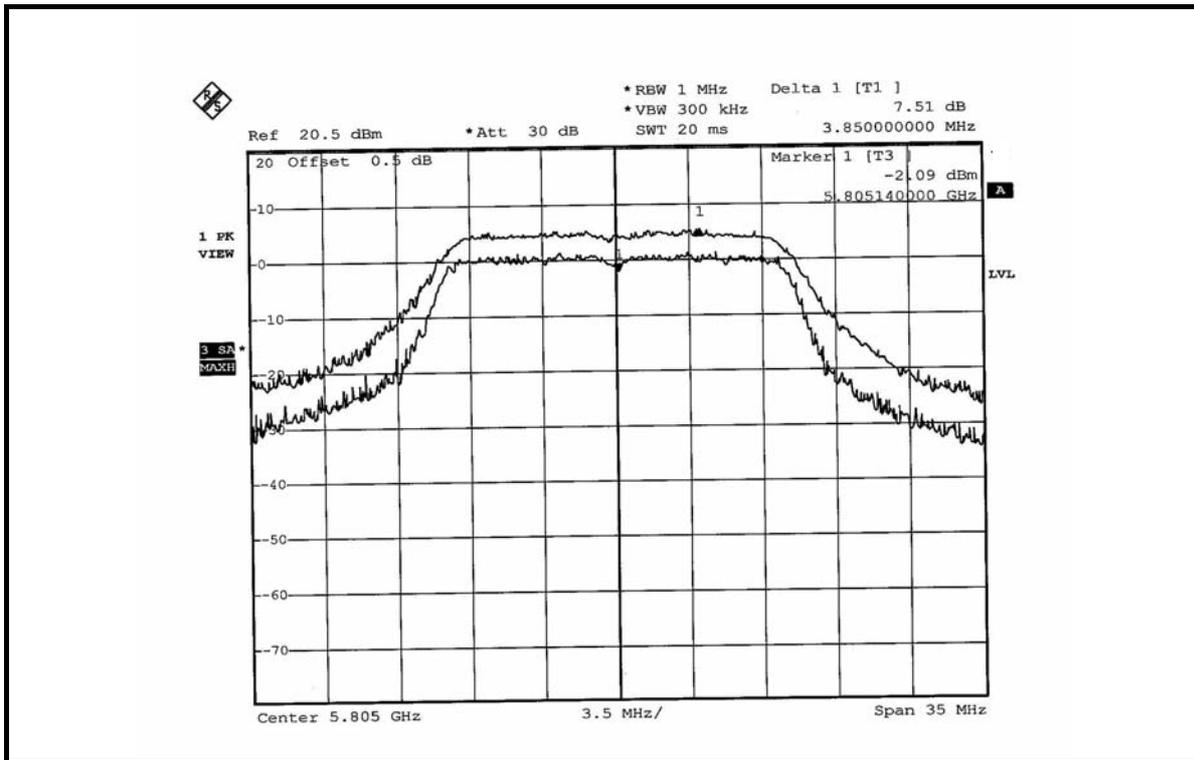
### CH9



### CH11



CH12



## 4.5 PEAK POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

FREQUENCY BAND	LIMIT
5.15 ~ 5.25GHz	4dBm
5.25 ~ 5.35GHz	11dBm
5.725 ~ 5.825GHz	17dBm

### 4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK 30	100049	Aug. 14, 2006

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

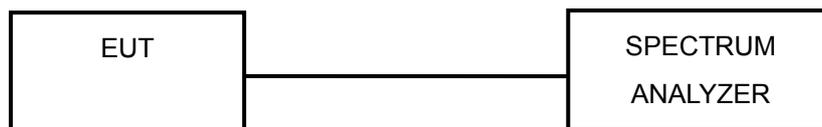
#### 4.5.3 TEST PROCEDURES

1. The transmitter output was connected to the spectrum analyzer.
2. Set RBW=1MHz, VBW=3MHz. The PPSD is the highest level found across the emission in any 1MHz band.

#### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITIONS

Same as 5.3.6



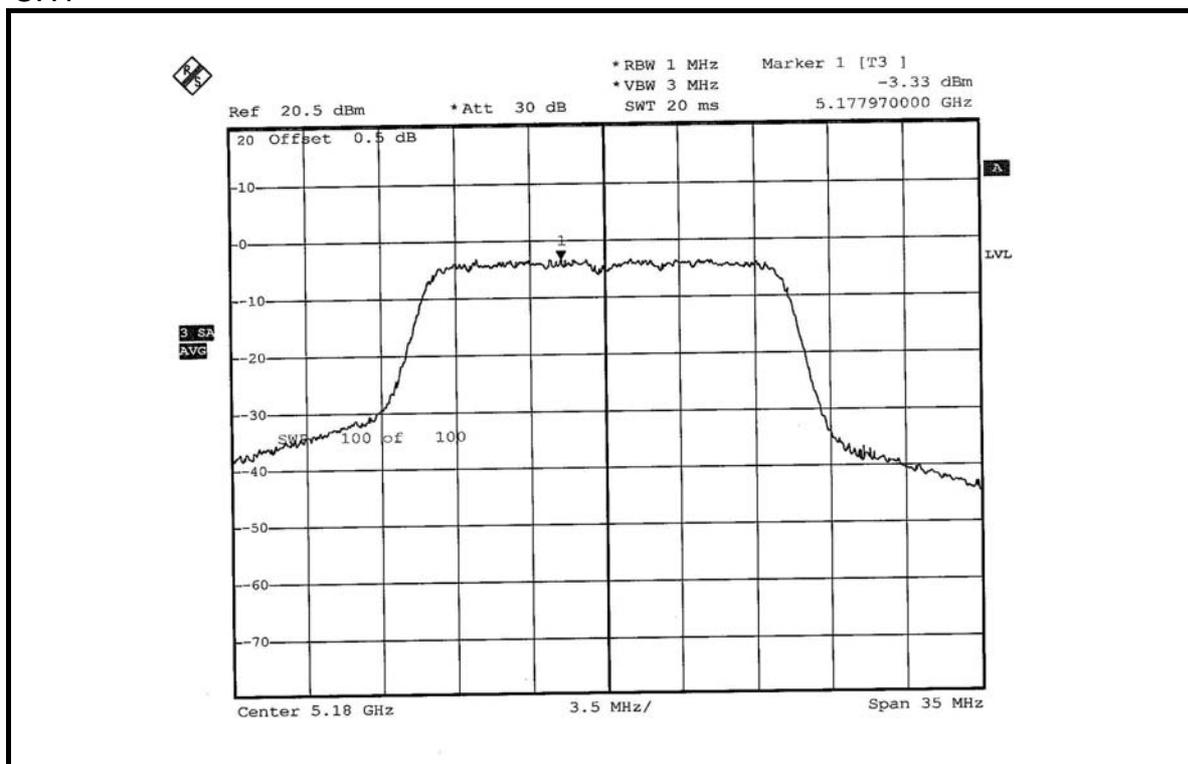
### 4.5.7 TEST RESULTS

#### 802.11a OFDM MODULATION FOR ANTENNA ITEM 3 (5.0dBi gain)

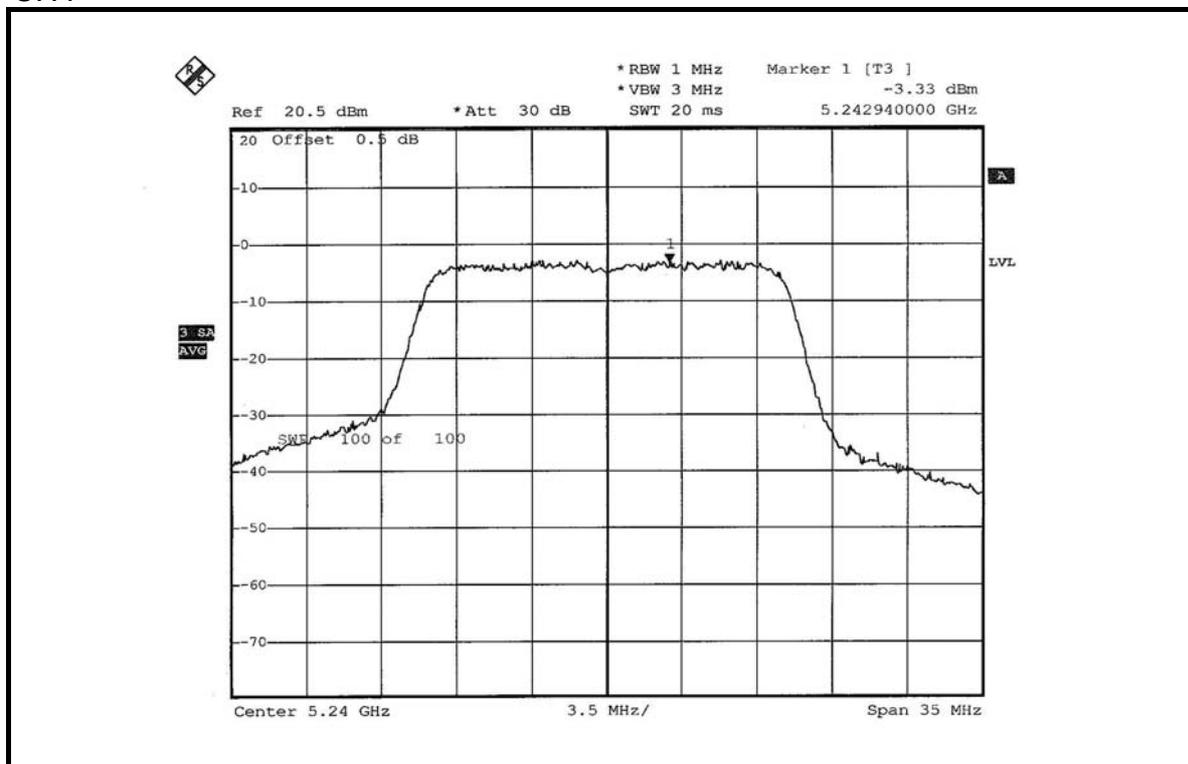
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	22deg.C, 63%RH, 991hPa
<b>TESTED BY</b>	Brad Wu		

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz )</b>	<b>RF POWER LEVEL IN 3 kHz BW (dBm)</b>	<b>MAXIMUM LIMIT (dBm)</b>	<b>PASS/FAIL</b>
1	5180	-3.33	4	PASS
4	5240	-3.33	4	PASS
5	5260	0.31	11	PASS
8	5320	0.89	11	PASS
9	5745	-3.57	17	PASS
11	5785	4.51	17	PASS
12	5805	-2.49	17	PASS

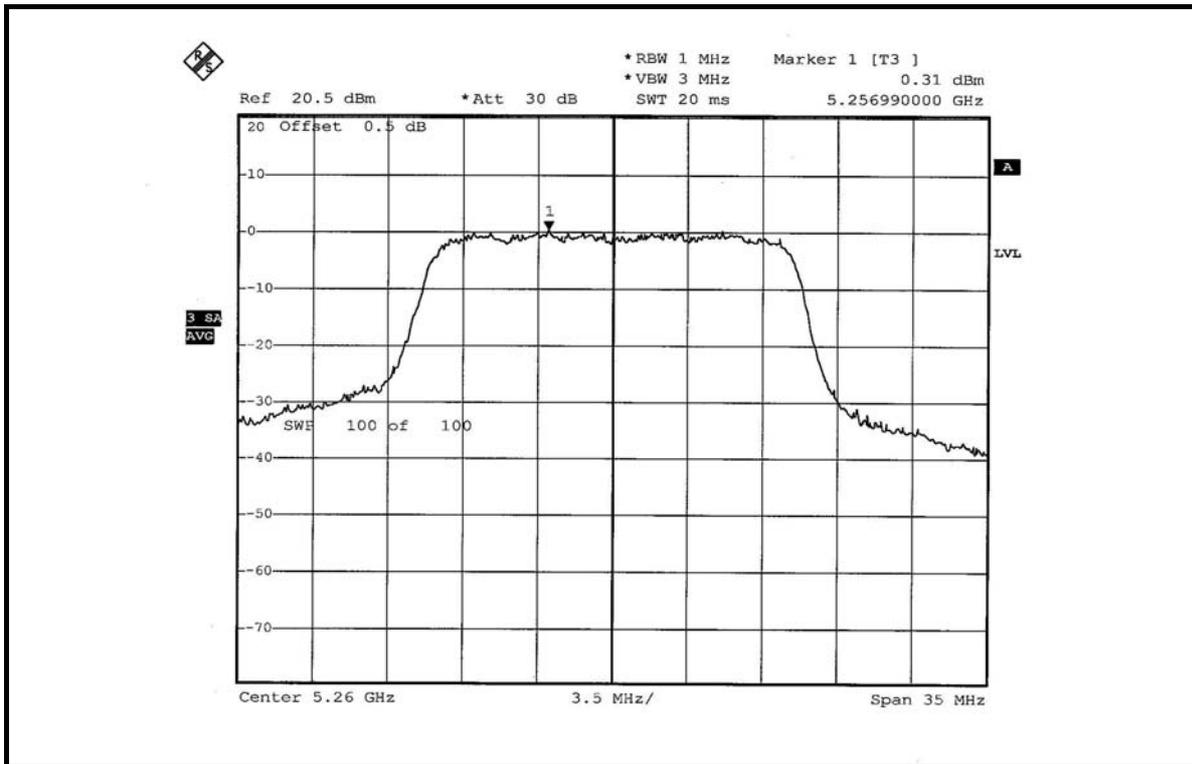
### CH1



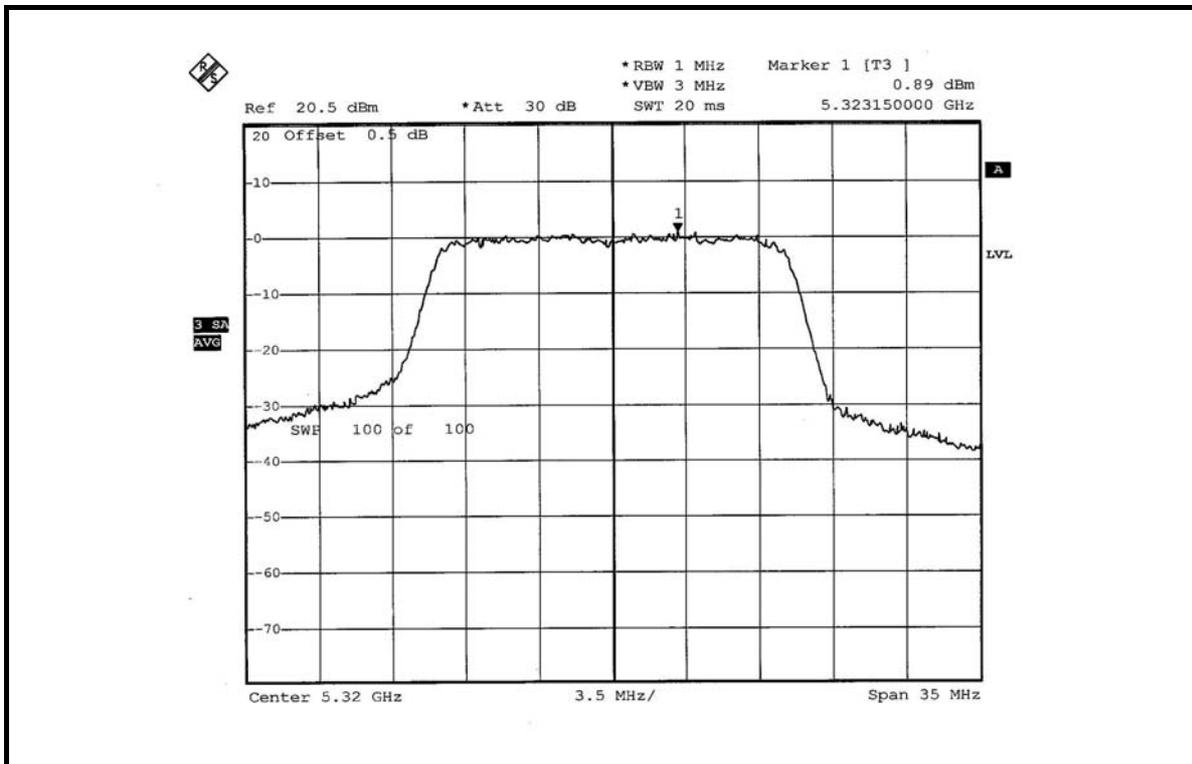
### CH4



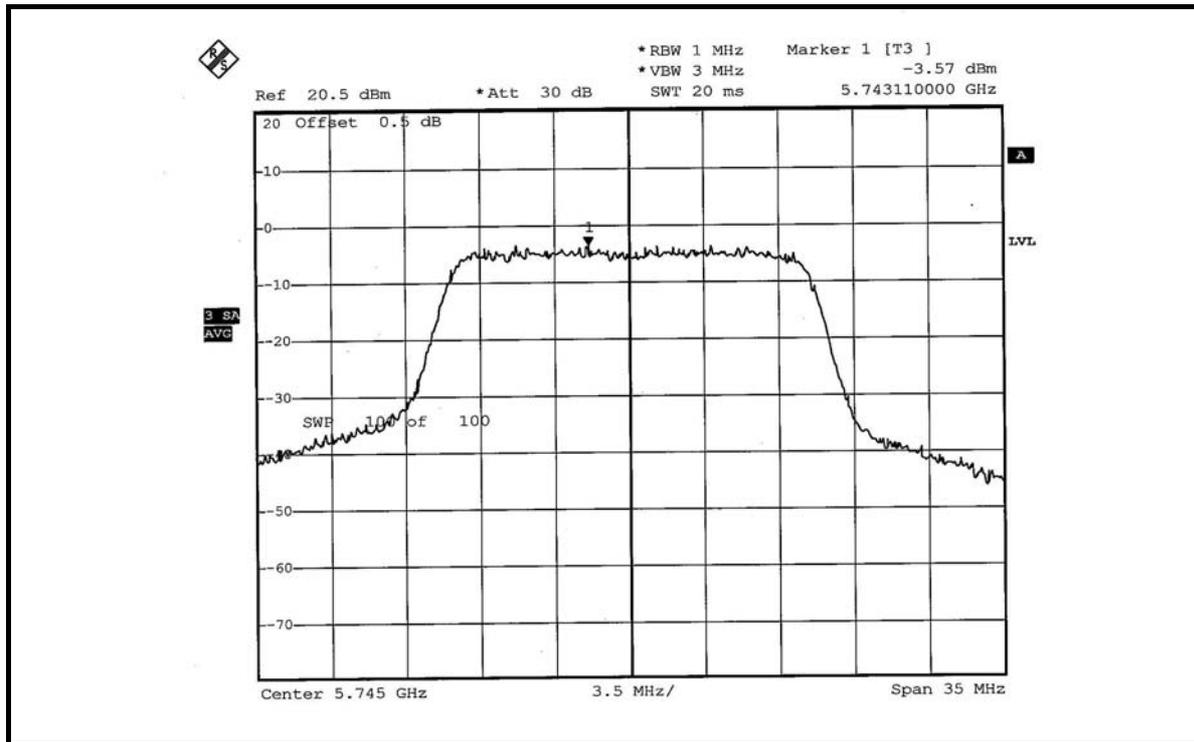
### CH5



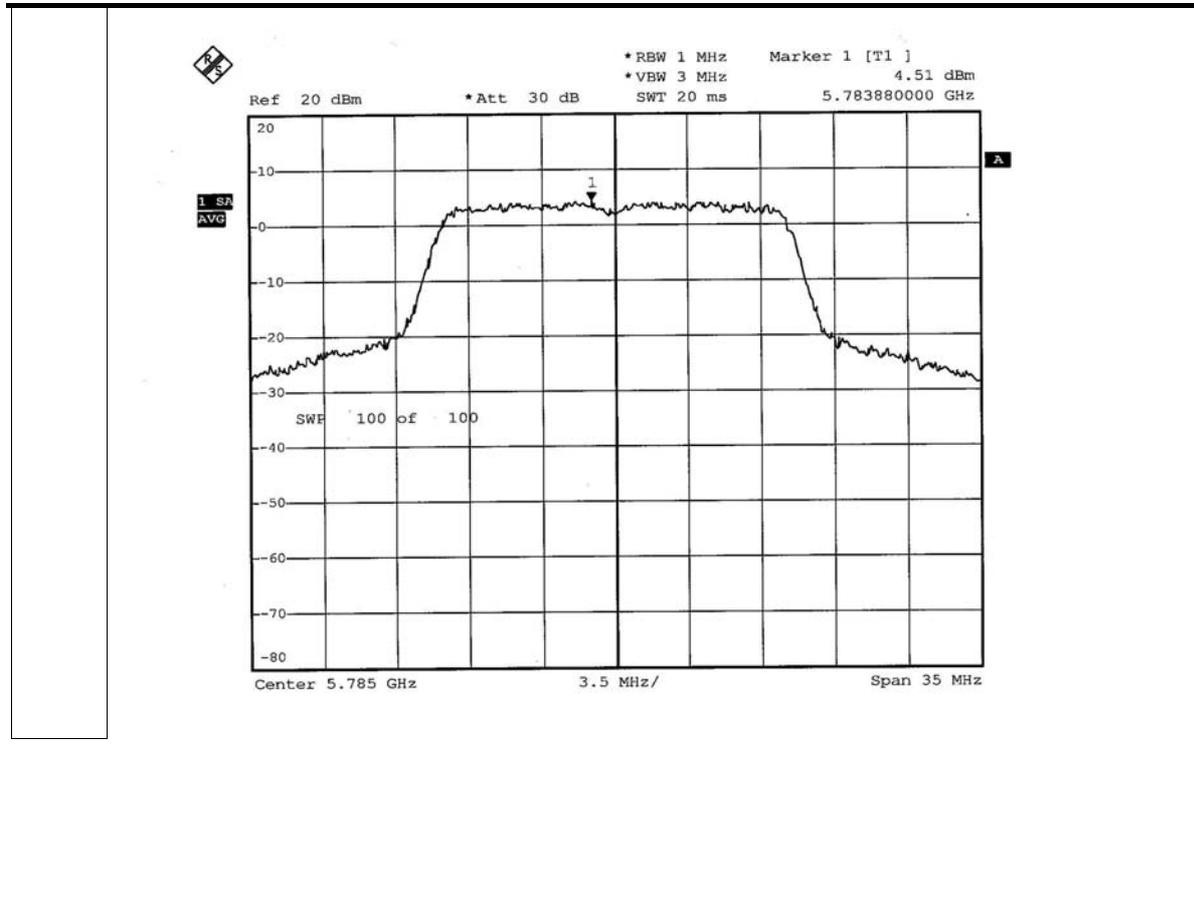
### CH8



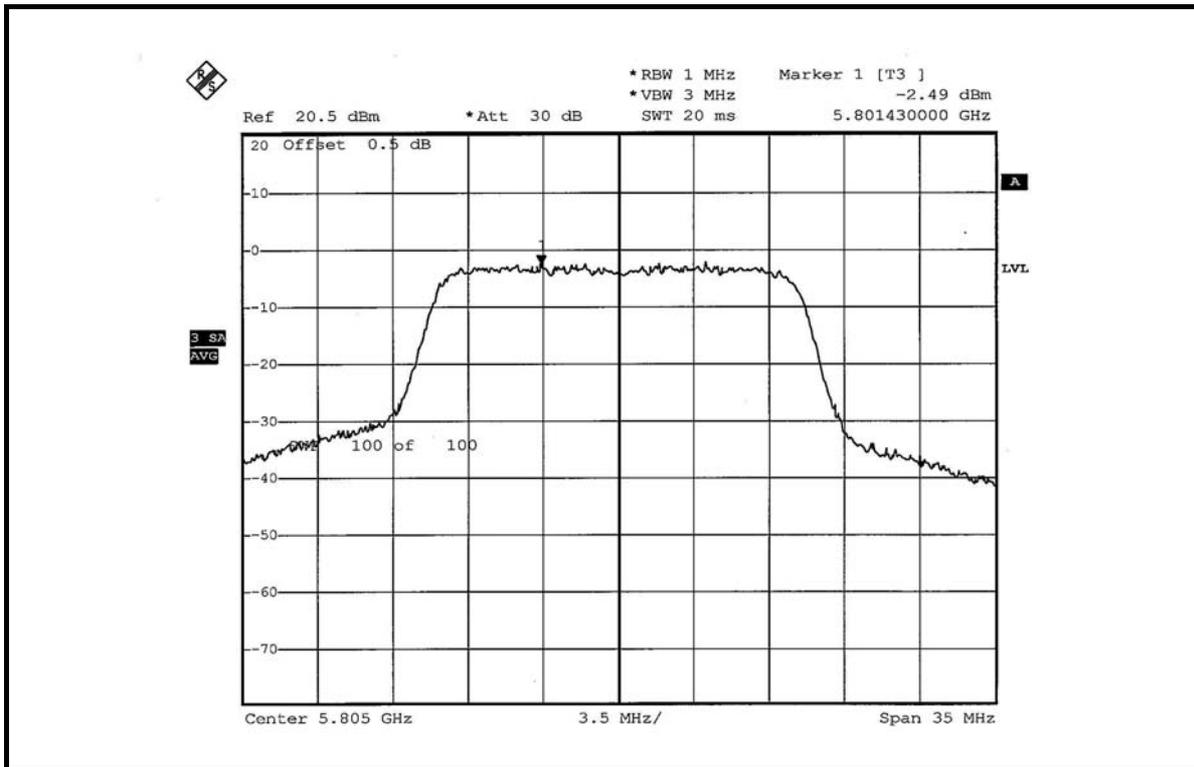
CH9



CH11



CH12





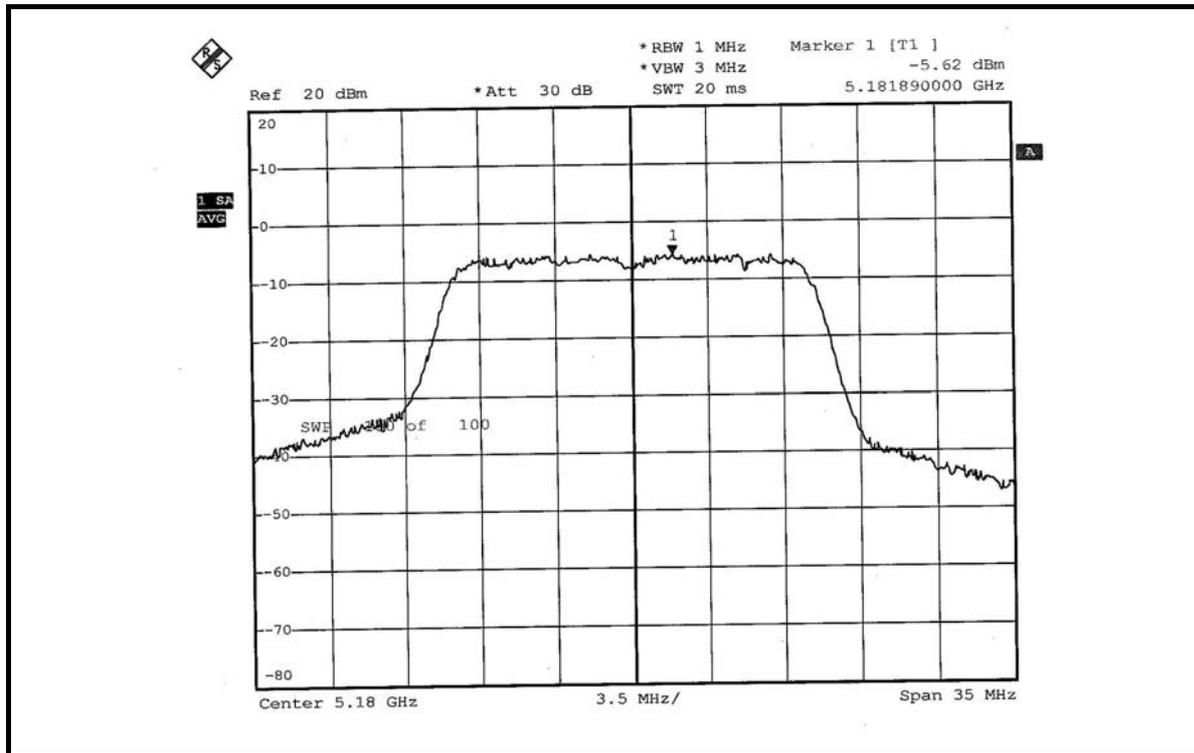
**FOR ANTENNA ITEM 4 (13.0dBi gain)**

<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	22deg.C, 63%RH, 991hPa
<b>TESTED BY</b>	Brad Wu		

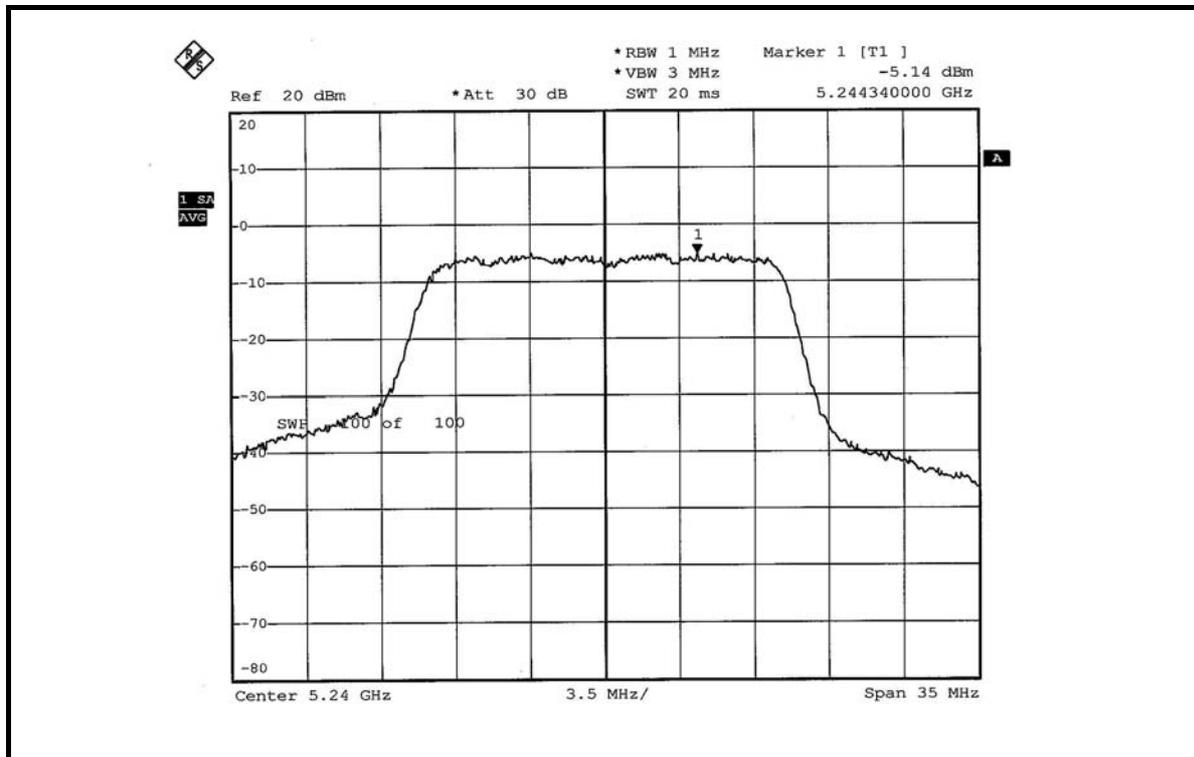
<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>RF POWER LEVEL IN 3 kHz BW (dBm)</b>	<b>MAXIMUM LIMIT (dBm)</b>	<b>PASS/FAIL</b>
1	5180	-5.62	-3	PASS
4	5240	-5.14	-3	PASS
5	5260	-5.62	4	PASS
8	5320	-5.59	4	PASS
9	5745	-5.45	10	PASS
11	5785	4.97	10	PASS
12	5805	-5.27	10	PASS

**NOTE:** According to 15.407 (a) (1) (2) (3), the maximum antenna gain 13dBi is higher than 6dBi, so the limit of peak power spectral density shall be reduced by 7dB.

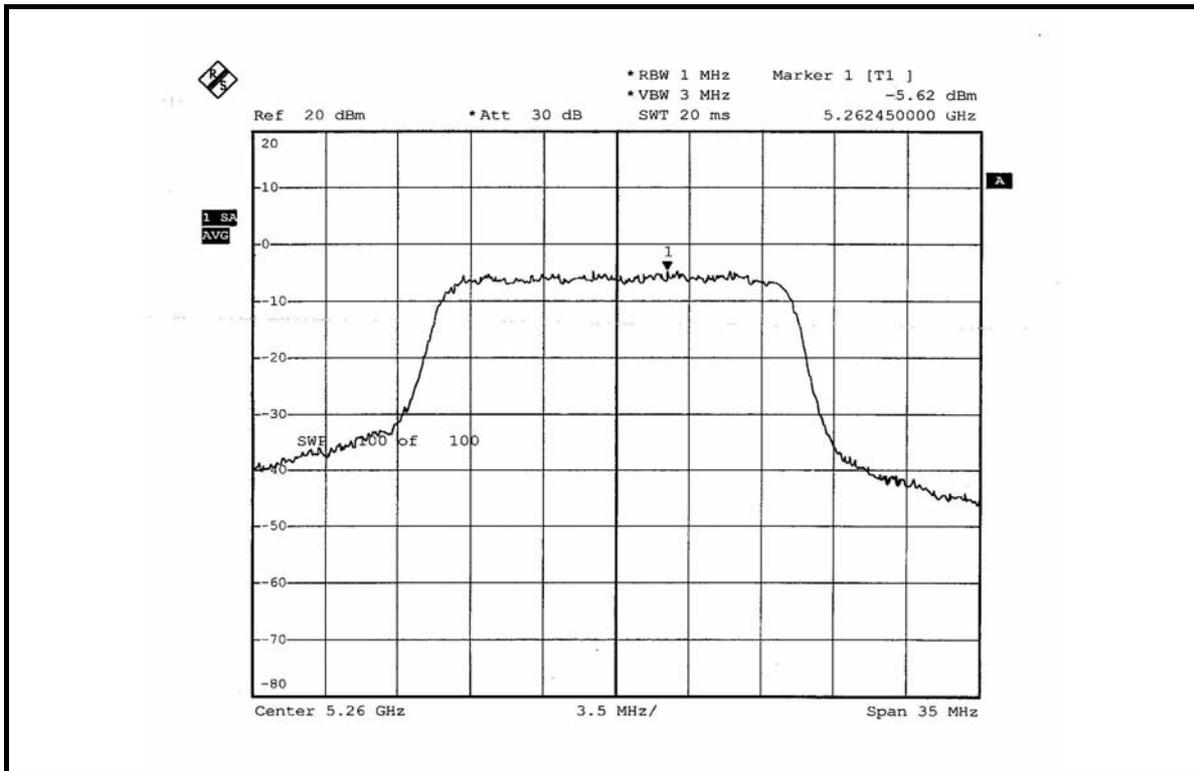
CH1



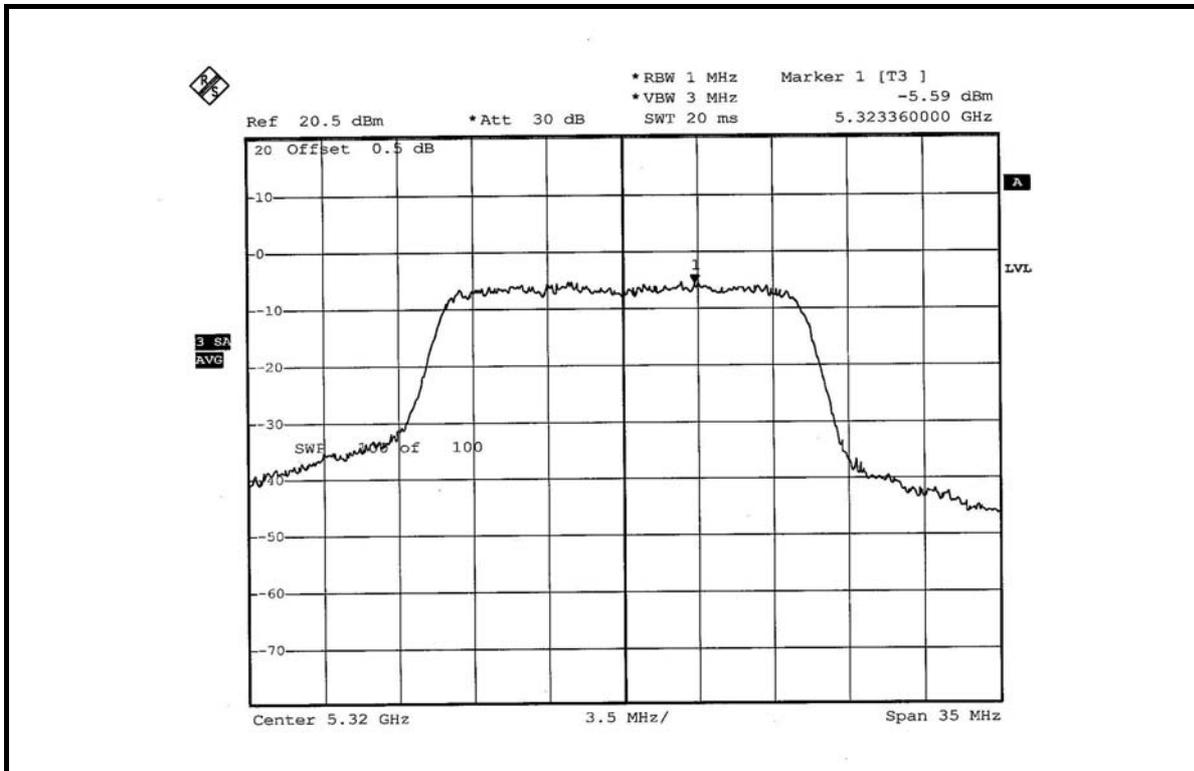
CH4



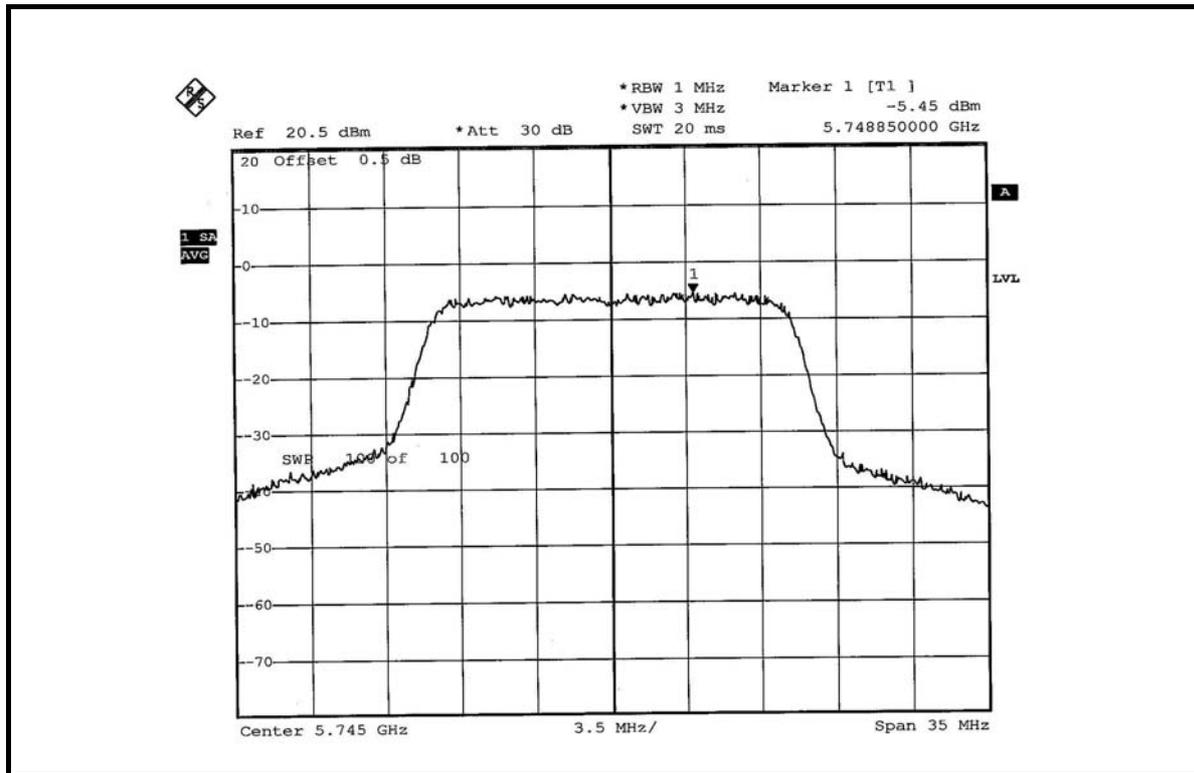
CH5



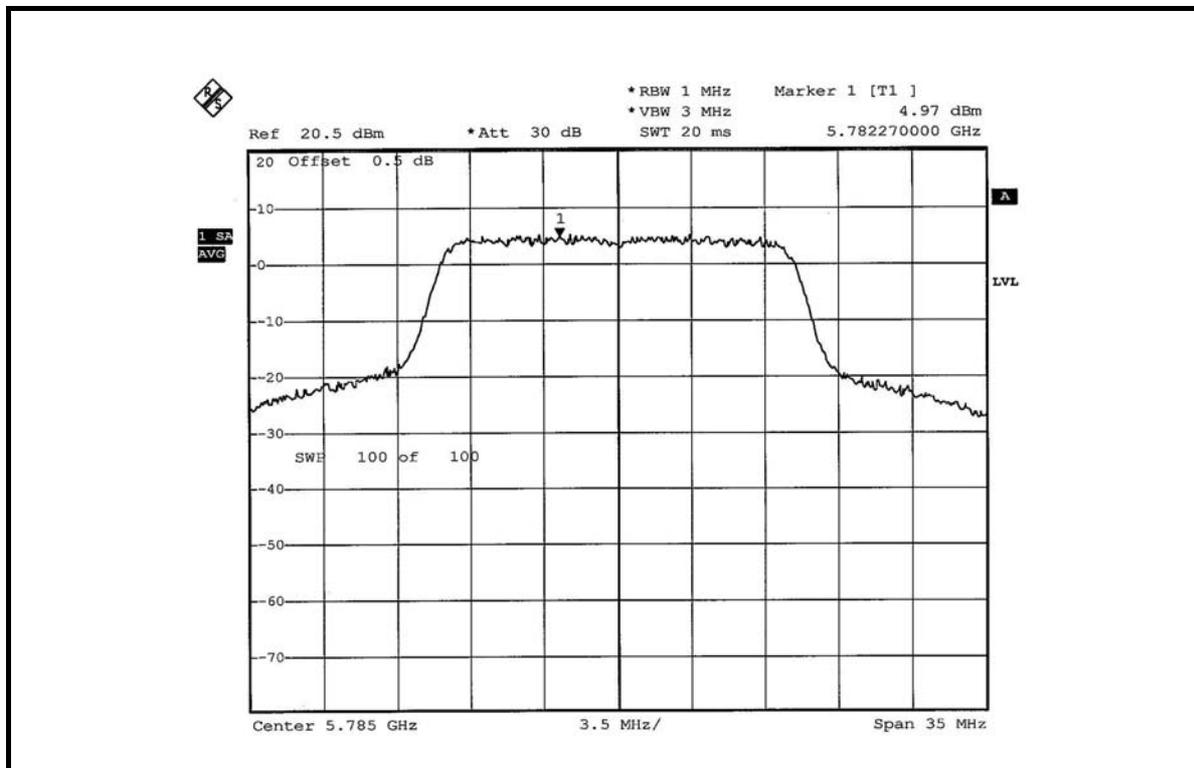
CH8



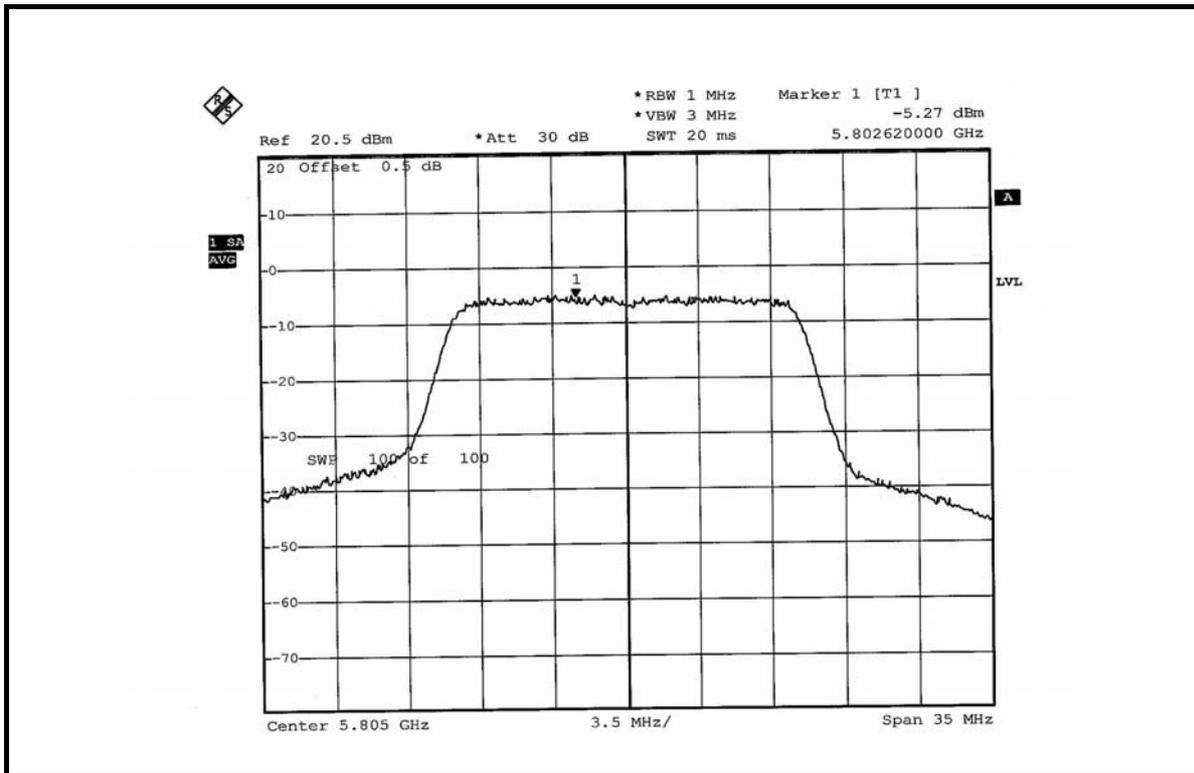
CH9



CH11



CH12





## 4.6 FREQUENCY STABILITY

### 4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.02% of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ANRITSU SPECTRUM ANALYZER	MS2667C	M10281	Mar. 06, 2007
WIT STANDARD TEMPERATURE AND HUMIDITY CHAMBER	TH-4S-C	W981030	Jul. 18, 2006

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

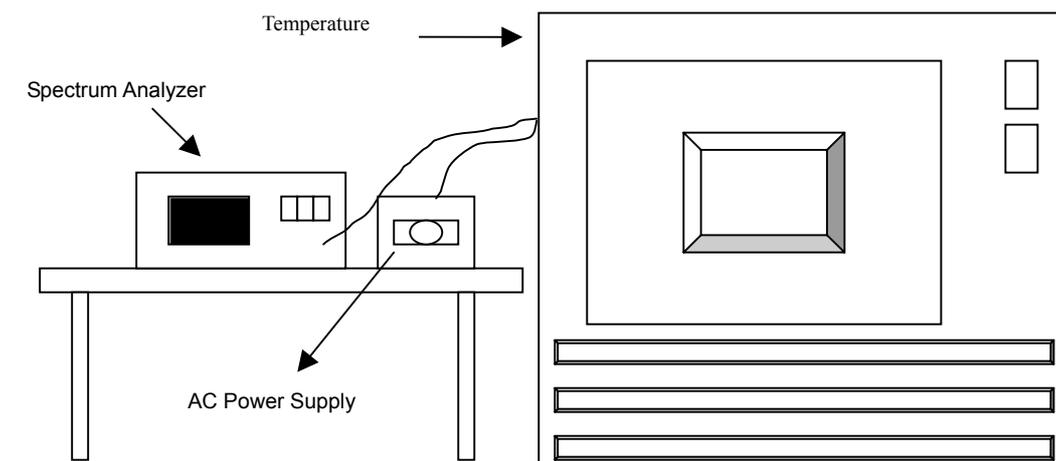
### 4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 TEST SETUP



#### 4.6.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



#### 4.6.7 TEST RESULTS

Operating frequency: 5320MHz						Limit : $\pm 0.015\%$			
Temp. (°C)	Power supply (Vac)	0 minute		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	138	5320.07580	0.0014248	5320.07580	0.0014248	5320.07620	0.0014323	5320.07640	0.0014361
	120	5320.07630	0.0014342	5320.07630	0.0014342	5320.07590	0.0014267	5320.07600	0.0014286
	102	5320.07570	0.0014229	5320.07570	0.0014229	5320.07650	0.0014380	5320.07700	0.0014474
40	138	5320.06390	0.0012011	5320.06390	0.0012011	5320.06450	0.0012124	5320.06480	0.0012180
	120	5320.06400	0.0012030	5320.06400	0.0012030	5320.06440	0.0012105	5320.06470	0.0012162
	102	5320.06340	0.0011917	5320.06340	0.0011917	5320.06310	0.0011861	5320.06350	0.0011936
30	138	5320.04924	0.0009256	5320.04924	0.0009256	5320.04926	0.0009259	5320.04929	0.0009265
	120	5320.04887	0.0009186	5320.04887	0.0009186	5320.04902	0.0009214	5320.04908	0.0009226
	102	5320.04913	0.0009235	5320.04913	0.0009235	5320.04926	0.0009259	5320.04924	0.0009256
20	138	5320.02026	0.0003808	5320.02026	0.0003808	5320.02090	0.0003929	5320.02030	0.0003816
	120	5320.02930	0.0005508	5320.02930	0.0005508	5320.02980	0.0005602	5320.02910	0.0005470
	102	5320.02920	0.0005489	5320.02920	0.0005489	5320.02930	0.0005508	5320.02900	0.0005451
10	138	5319.97910	-0.0003929	5319.97150	-0.0005357	5319.97180	-0.0005301	5319.97140	-0.0005376
	120	5319.97020	-0.0005602	5319.97070	-0.0005508	5319.97090	-0.0005470	5319.97100	-0.0005451
	102	5319.97100	-0.0005451	5319.97120	-0.0005414	5319.97130	-0.0005395	5319.97150	-0.0005357
0	138	5319.95260	-0.0008910	5319.95290	-0.0008853	5319.95270	-0.0008891	5319.95250	-0.0008929
	120	5319.95310	-0.0008816	5319.95350	-0.0008741	5319.95330	-0.0008778	5319.95320	-0.0008797
	102	5319.95280	-0.0008872	5319.95300	-0.0008835	5319.95320	-0.0008797	5319.95350	-0.0008741
-10	138	5319.94470	-0.0010395	5319.94420	-0.0010489	5319.94490	-0.0010357	5319.94610	-0.0010132
	120	5319.94520	-0.0010301	5319.94540	-0.0010263	5319.94530	-0.0010282	5319.94550	-0.0010244
	102	5319.94400	-0.0010526	5319.94410	-0.0010508	5319.94430	-0.0010470	5319.94460	-0.0010414
-20	138	5319.93120	-0.0012932	5319.93160	-0.0012857	5319.93090	-0.0012989	5319.93110	-0.0012951
	120	5319.93890	-0.0011485	5319.93880	-0.0011504	5319.93920	-0.0011429	5319.93900	-0.0011466
	102	5319.93930	-0.0011410	5319.93900	-0.0011466	5319.93890	-0.0011485	5319.93950	-0.0011372
-30	138	5319.92020	-0.0015000	5319.92100	-0.0014850	5319.92060	-0.0014925	5319.92070	-0.0014906
	120	5319.92140	-0.0014774	5319.92130	-0.0014793	5319.92100	-0.0014850	5319.92120	-0.0014812
	102	5319.92870	-0.0013402	5319.92890	-0.0013365	5319.92920	-0.0013308	5319.92930	-0.0013289



## 4.7 BAND EDGES MEASUREMENT

### 4.7.1 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
SPECTRUM ANALYZER	FSEK 30	100049	Aug. 14, 2006

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

### 4.7.2 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 1MHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 4.7.3 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

### 4.7.4 TEST RESULTS

For signals in the restricted bands above and below the 5.15 to 5.35GHz, 5.725 to 5.825GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak filed strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

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

## 802.11a OFDM MODULATION FOR ANTENNA ITEM 3 (5.0dBi gain)

### Channel 1 (5180MHz)

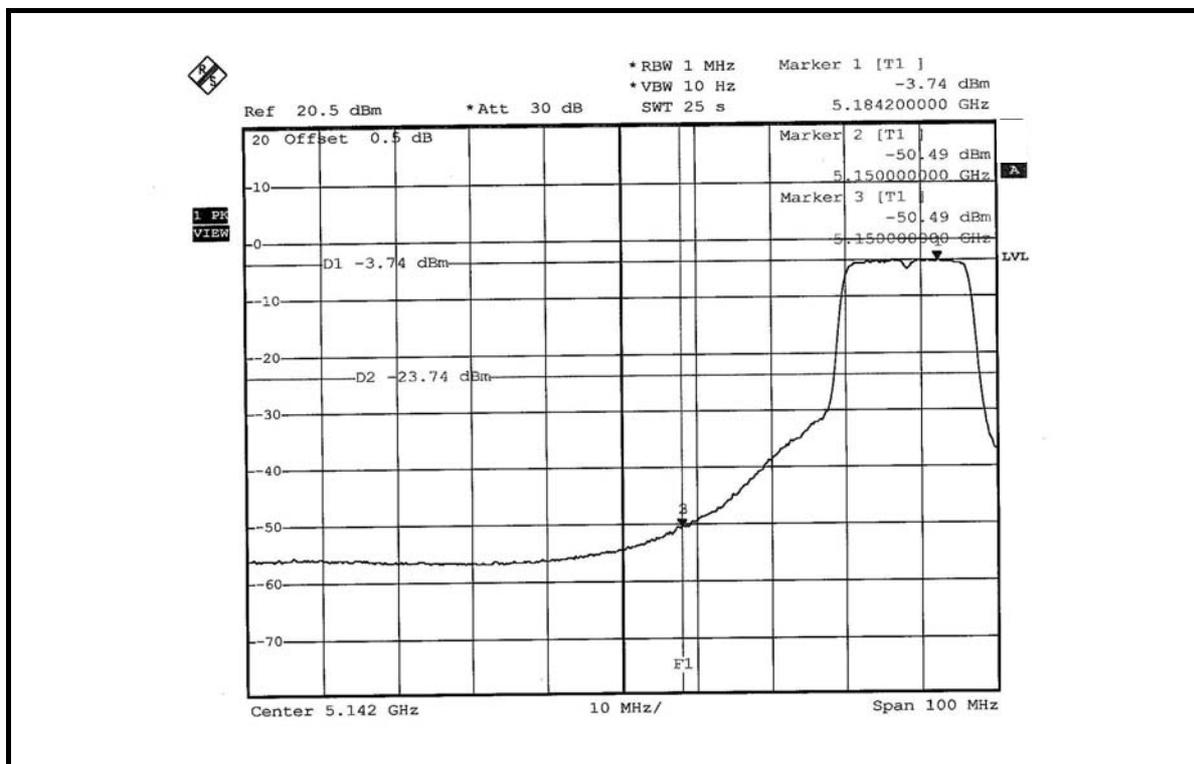
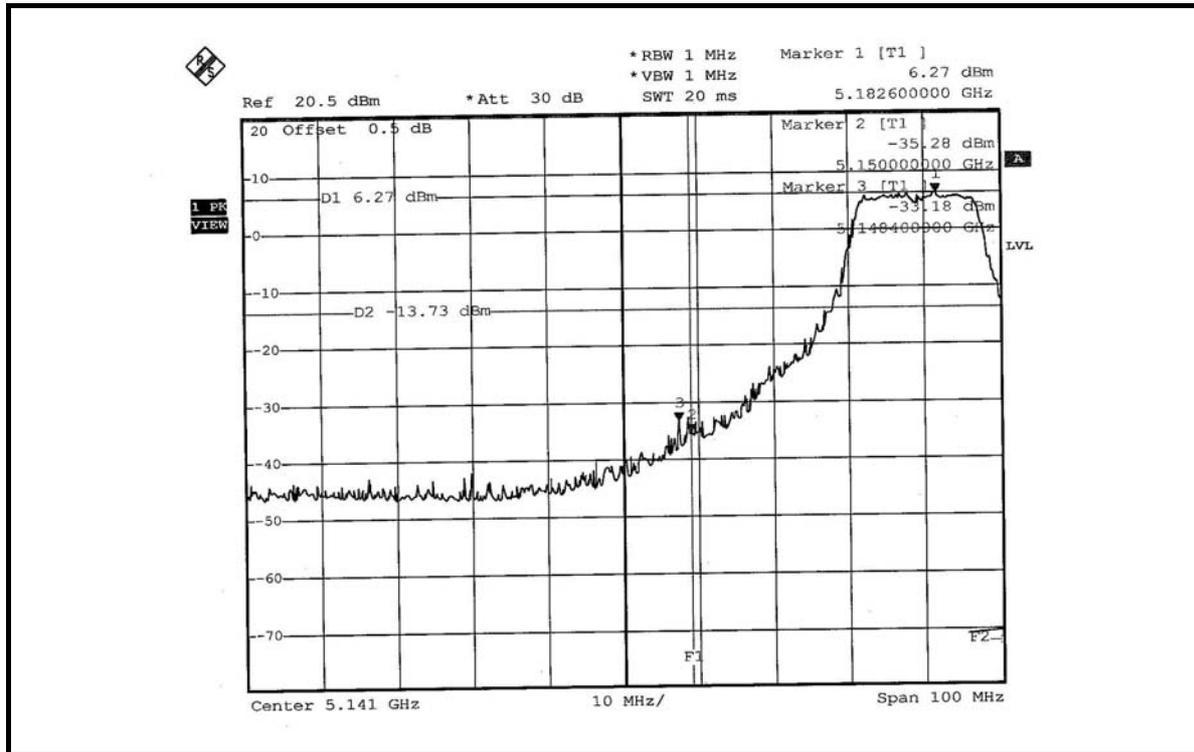
The band edge emission plot on the next page shows 39.45dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 107.25dBuV/m (Peak), so the maximum field strength in restrict band is  $107.25-39.45=67.80$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next page shows 46.75dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 96.32dBuV/m (Average), so the maximum field strength in restrict band is  $96.32-46.75=49.57$ dBuV/m which is under 54dBuV/m limit.

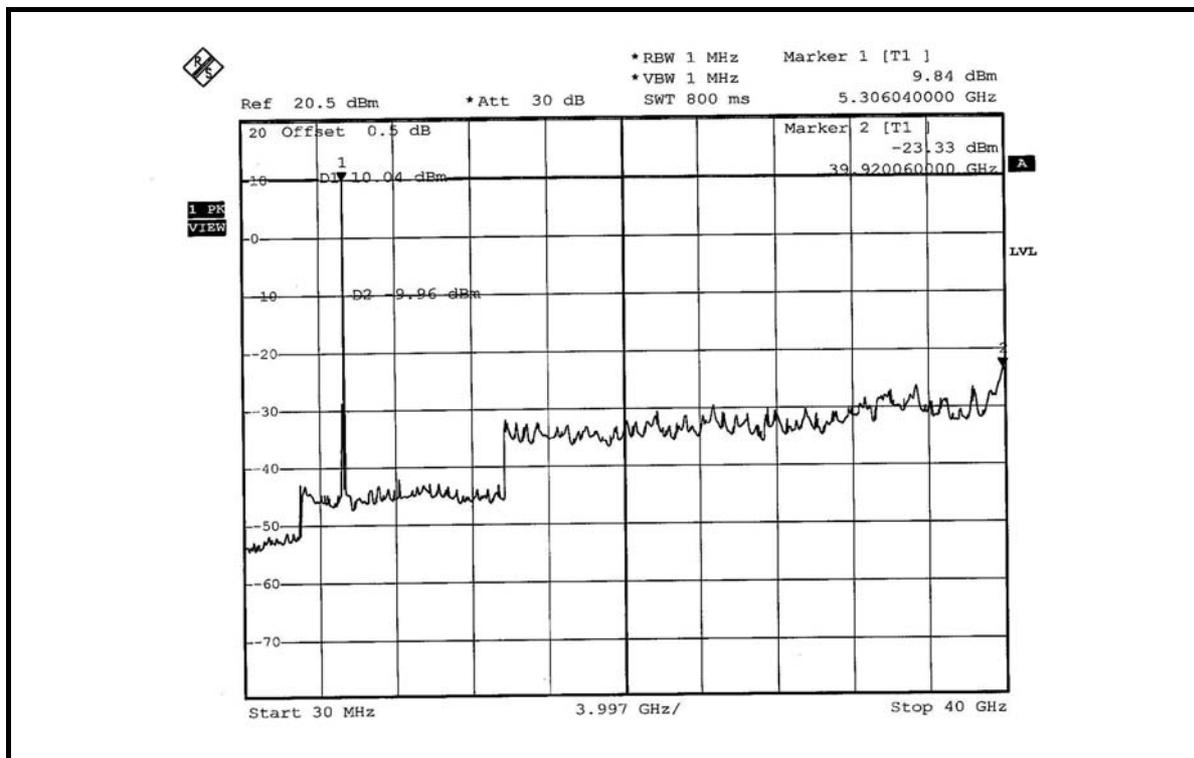
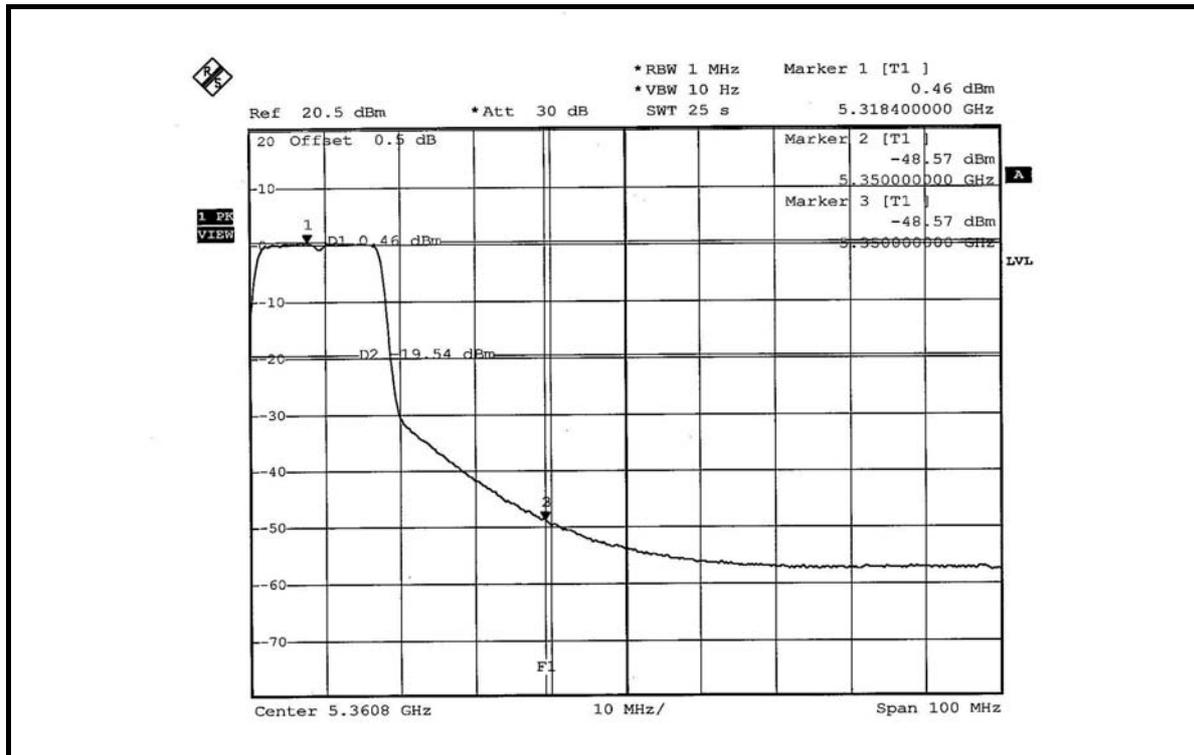
### Channel 8 (5320MHz)

The band edge emission plot on the next second shows 45.06dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 110.03dBuV/m (Peak), so the maximum field strength in restrict band is  $110.03-45.06=64.97$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next third page shows 49.03dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 99.55dBuV/m (Average), so the maximum field strength in restrict band is  $99.55-49.03=50.52$ dBuV/m which is under 54dBuV/m limit.







#### Channel 9 (5745MHz)

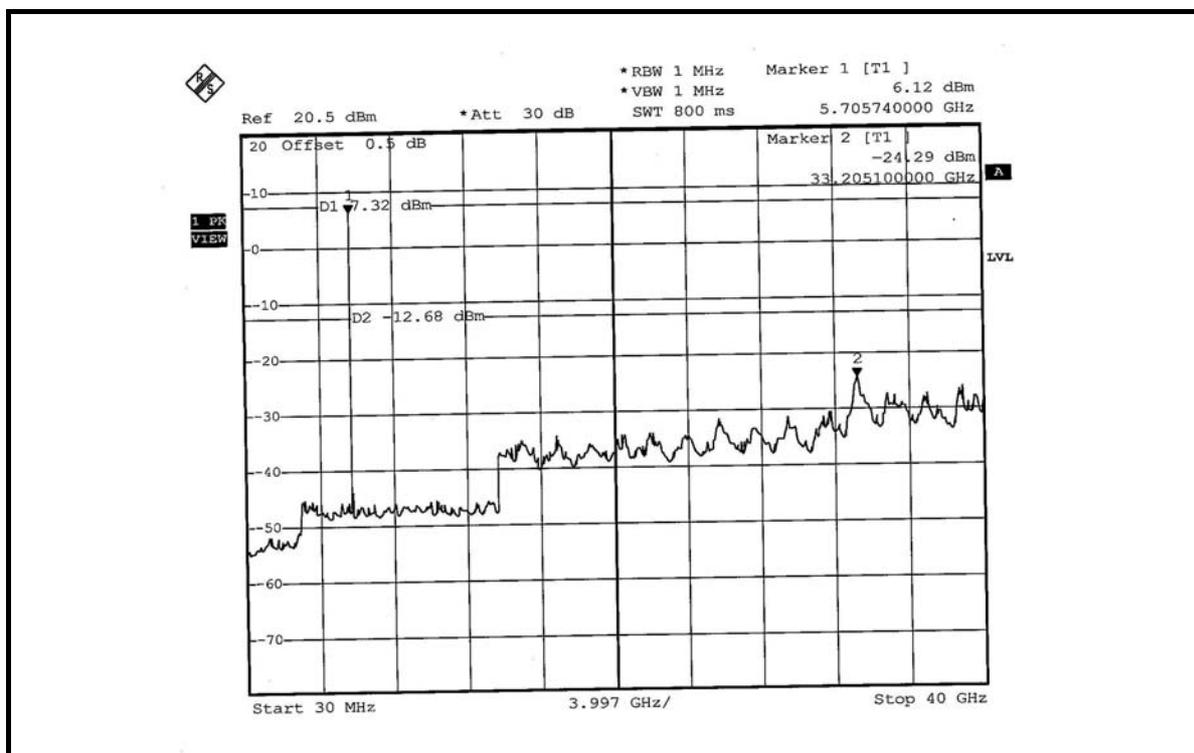
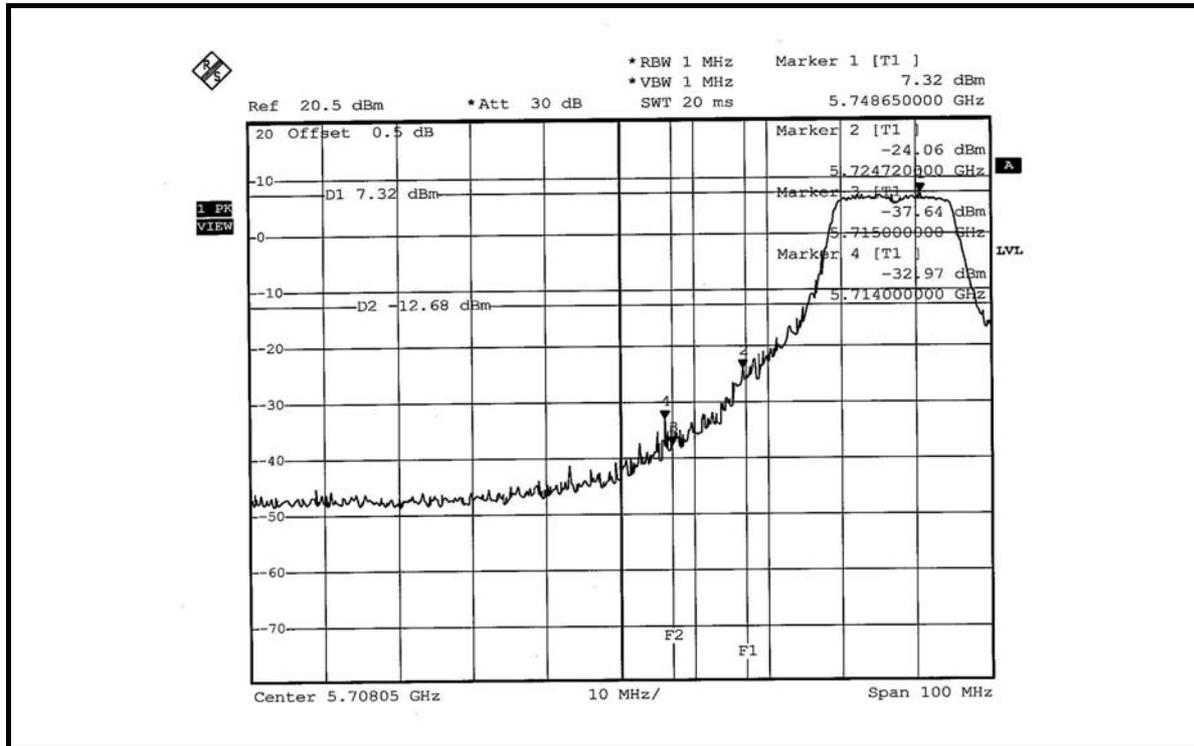
The band edge emission plot on the next page shows 31.38dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 9 is 106.45dBuV/m (Peak), so the maximum field strength in restrict band is  $106.45-31.38=75.07$ dBuV/m which is under 78.30dBuV/m limit.

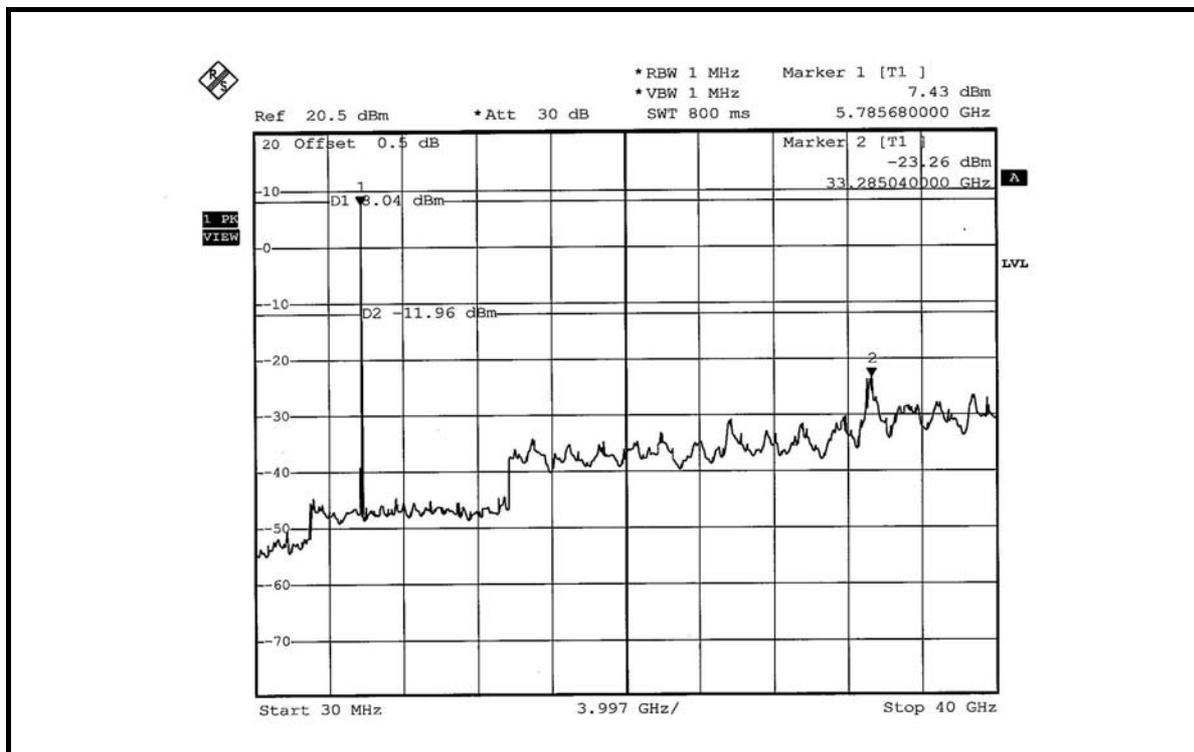
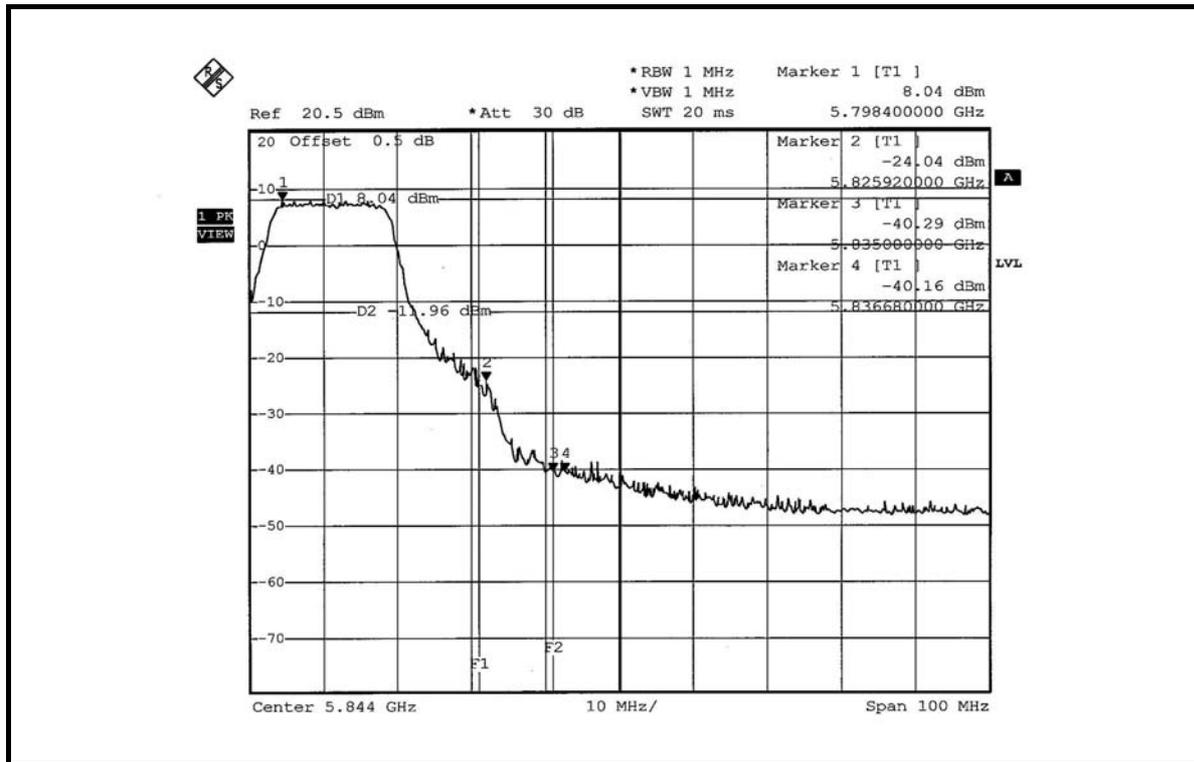
The band edge emission plot on the next page shows 40.29dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 9 is 106.45dBuV/m (Peak), so the maximum field strength in restrict band is  $106.45-40.29=66.16$ dBuV/m which is under 68.30dBuV/m limit.

#### Channel 12 (5805MHz)

The band edge emission plot on the next second page shows 32.08dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 12 is 106.49dBuV/m (Peak), so the maximum field strength in restrict band is  $106.49-32.0=74.41$ dBuV/m which is under 78.30dBuV/m limit.

The band edge emission plot on the next second page shows 48.20dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 12 is 106.49dBuV/m (Peak), so the maximum field strength in restrict band is  $106.49-48.20=58.29$ dBuV/m which is under 68.30dBuV/m limit.





#### FOR ANTENNA ITEM 4 (13.0dBi gain)

##### Channel 1 (5180MHz)

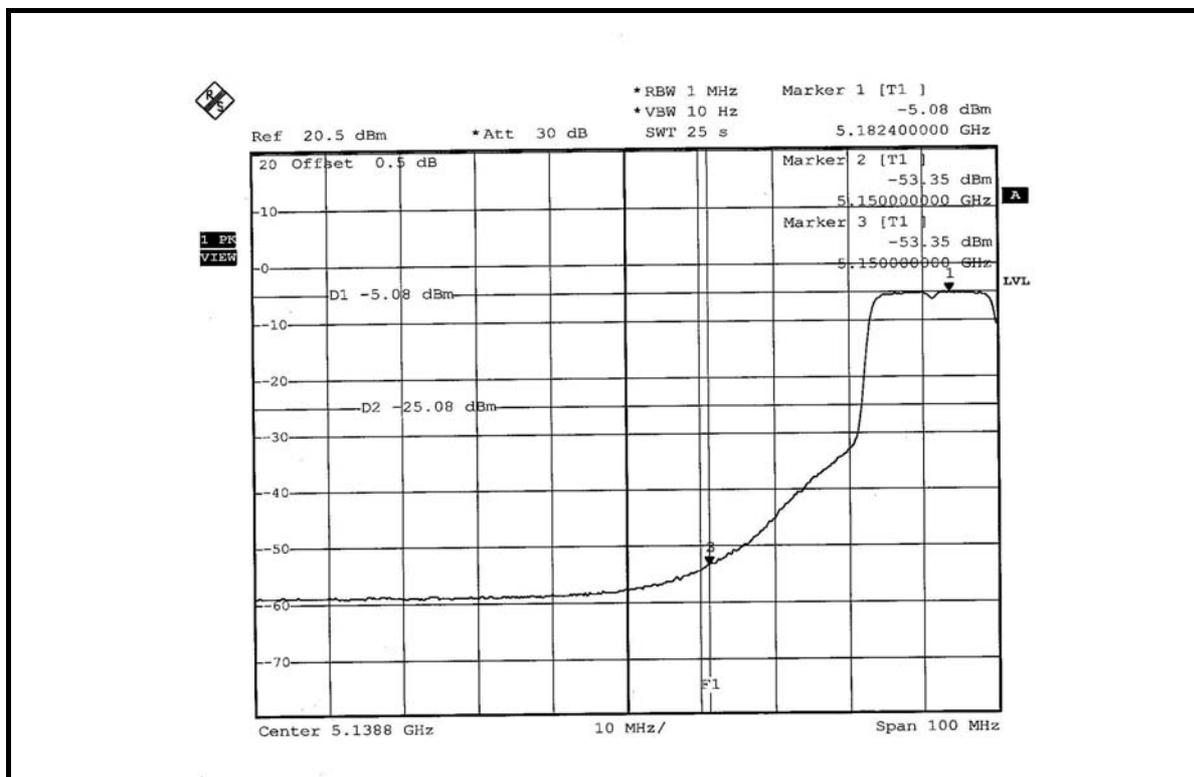
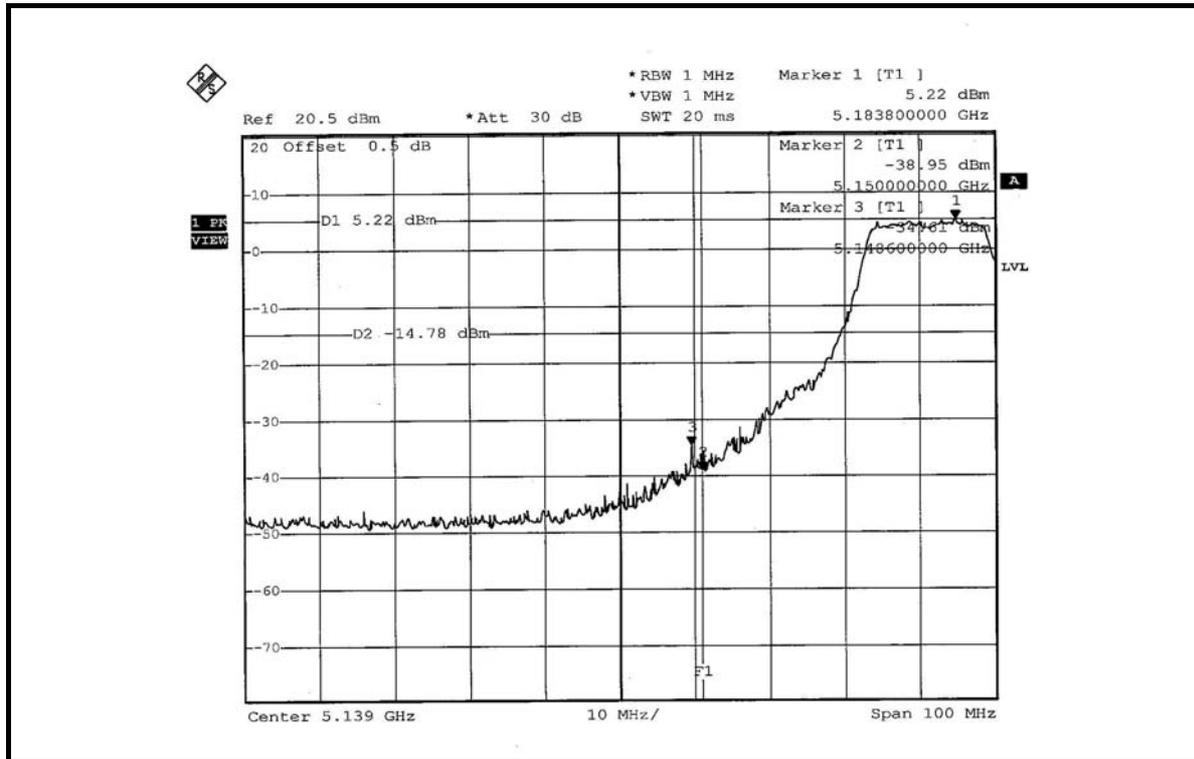
The band edge emission plot on the next page shows 39.83dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 113.02dBuV/m (Peak), so the maximum field strength in restrict band is  $113.02-39.83=73.19$ dBuV/m which is under 74dBuV/m limit.

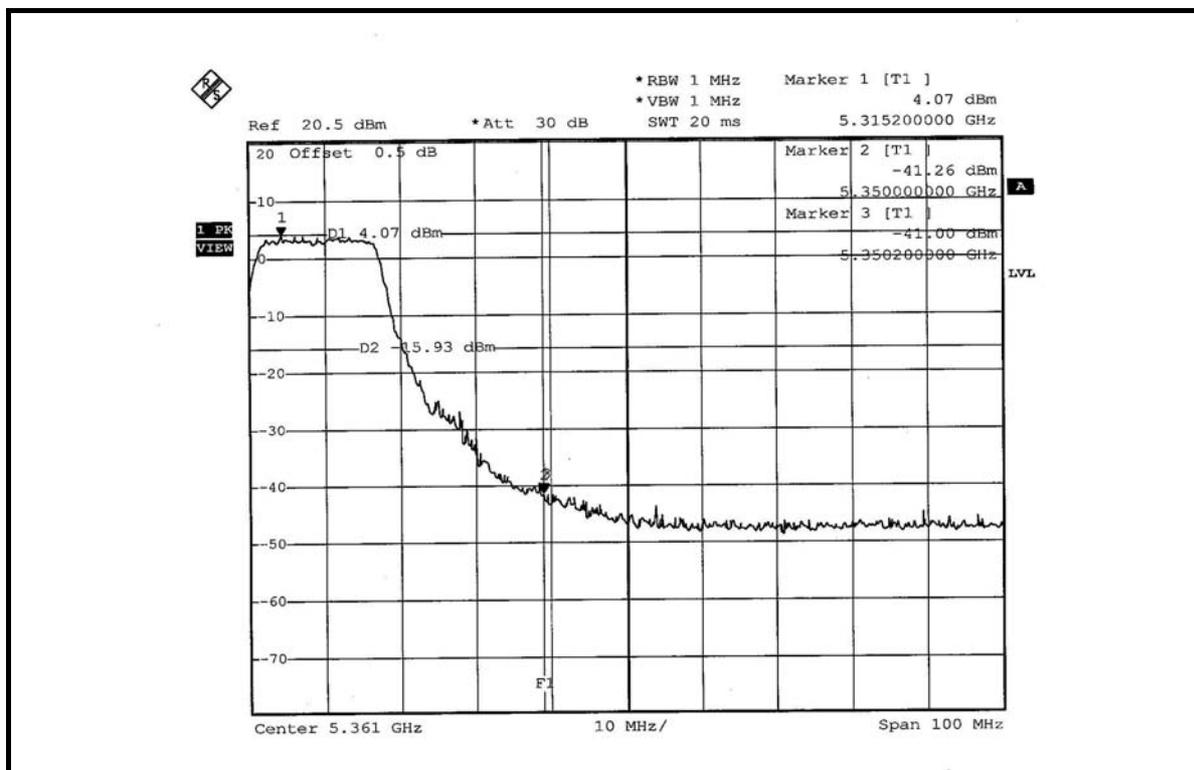
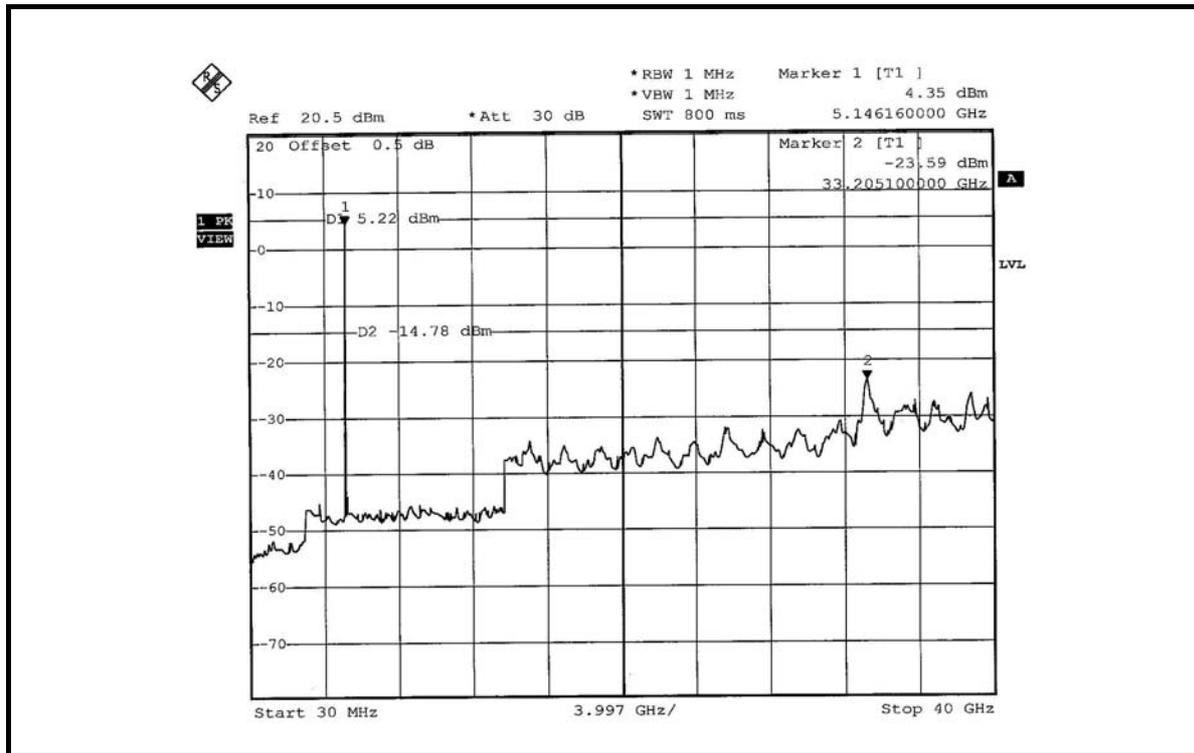
The band edge emission plot on the next page shows 48.27dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 1 is 101.24dBuV/m (Average), so the maximum field strength in restrict band is  $101.24-48.27=52.97$ dBuV/m which is under 54dBuV/m limit.

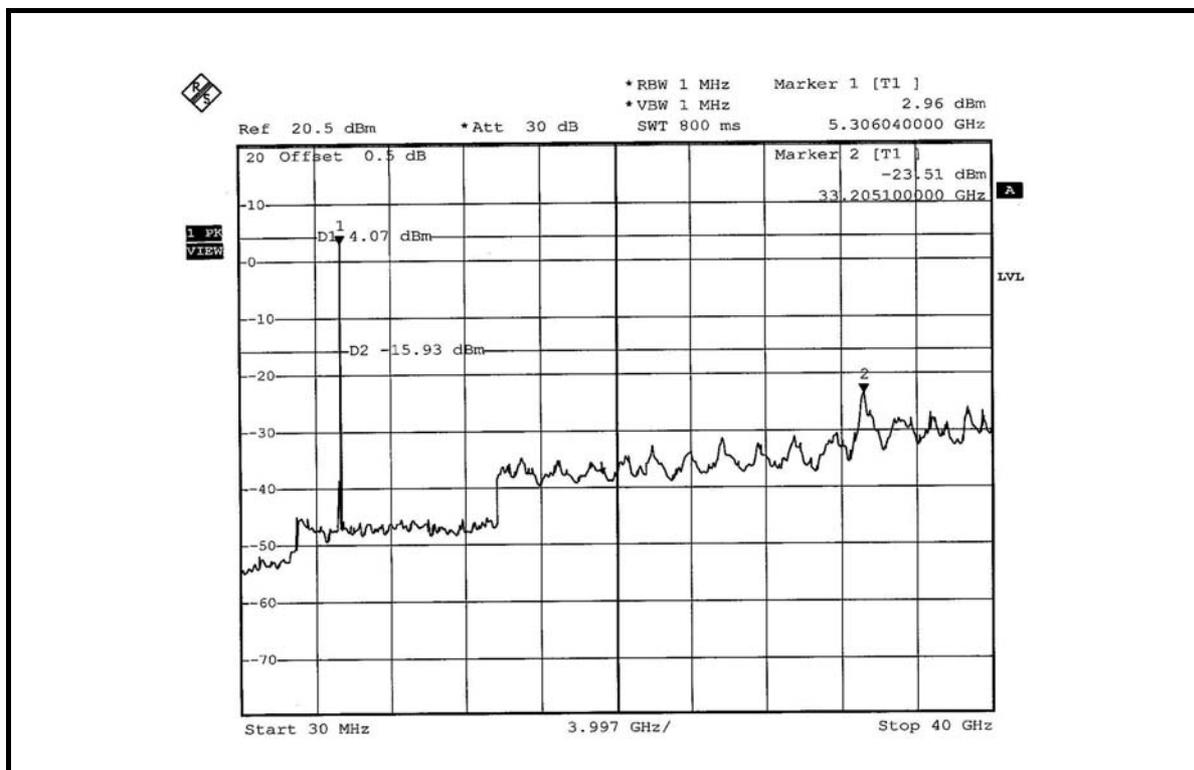
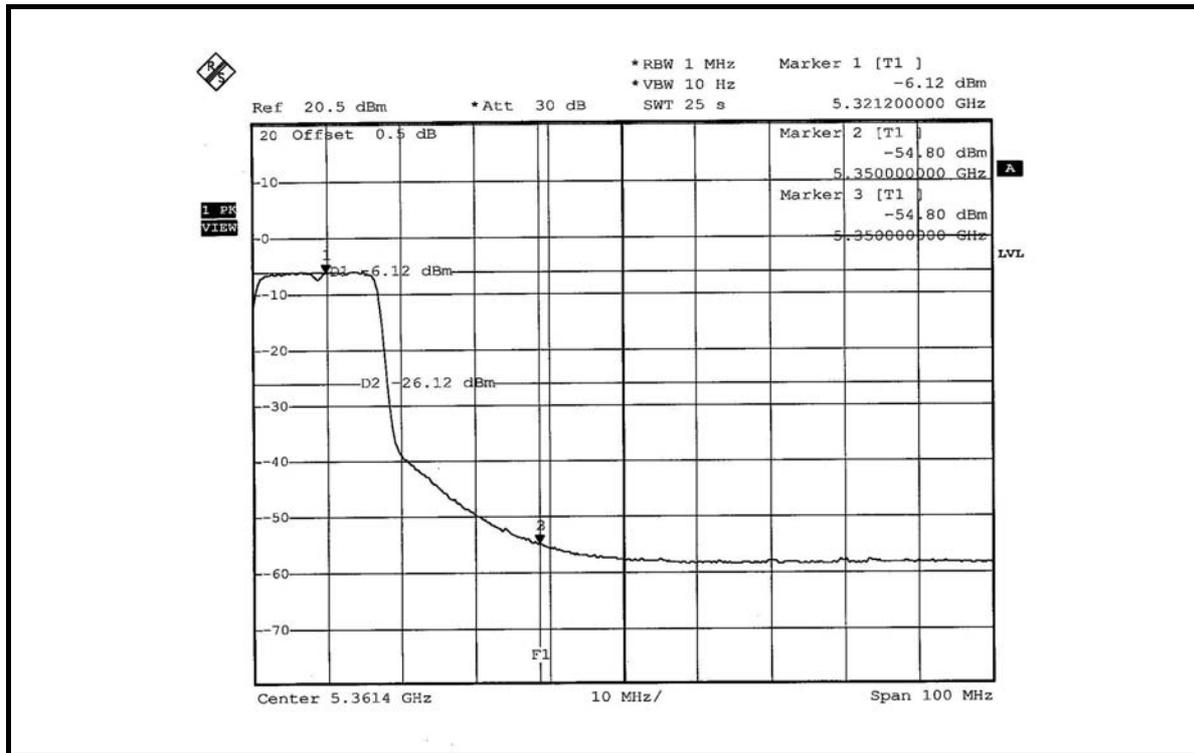
##### Channel 8 (5320MHz)

The band edge emission plot on the next second shows 45.07dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 112.61dBuV/m (Peak), so the maximum field strength in restrict band is  $112.61-45.07=67.54$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next third page shows 48.68dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 8 is 101.06dBuV/m (Average), so the maximum field strength in restrict band is  $101.06-48.68=52.38$ dBuV/m which is under 54dBuV/m limit.









#### Channel 9 (5745MHz)

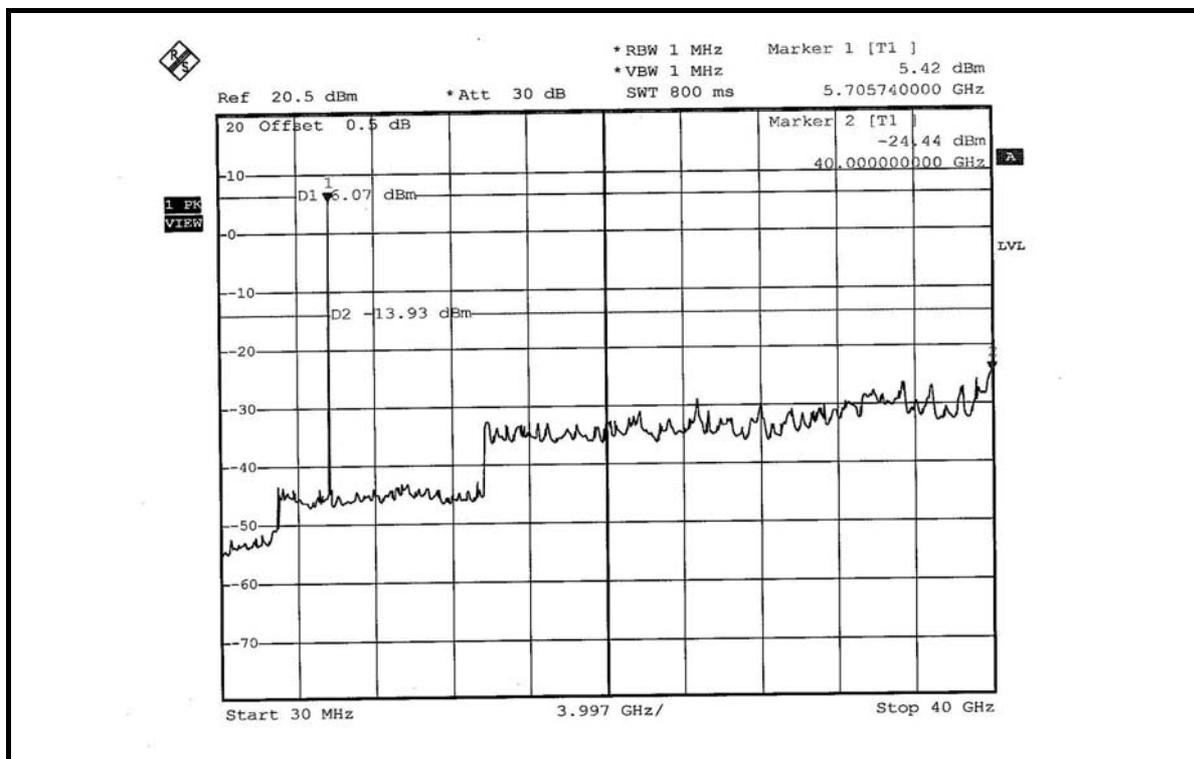
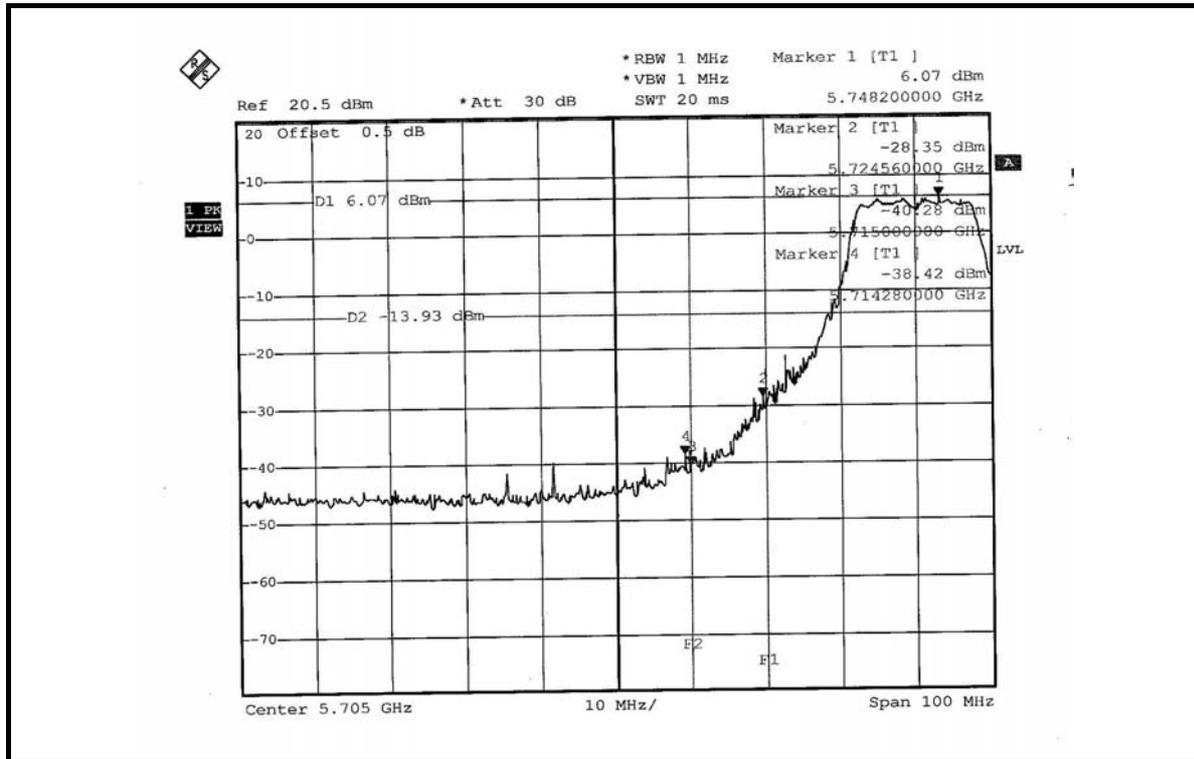
The band edge emission plot on the next page shows 34.42dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 9 is 107.67dBuV/m (Peak), so the maximum field strength in restrict band is  $107.67-34.42=73.25$ dBuV/m which is under 78.30dBuV/m limit.

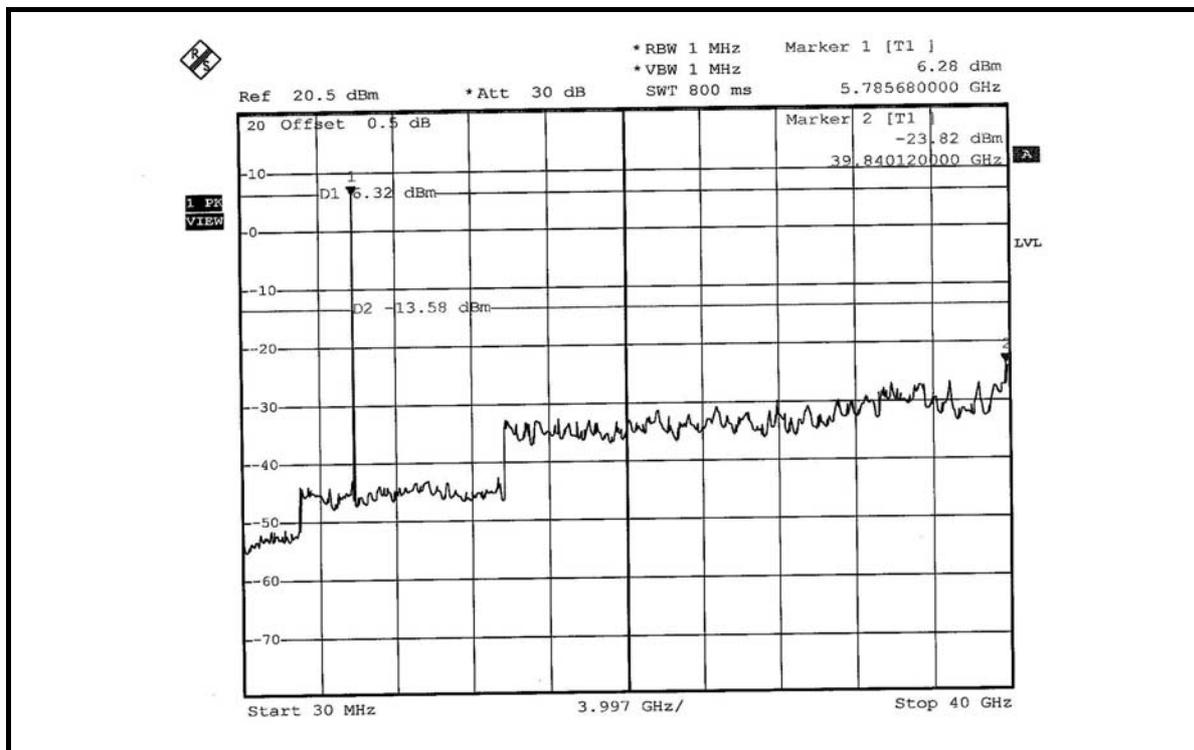
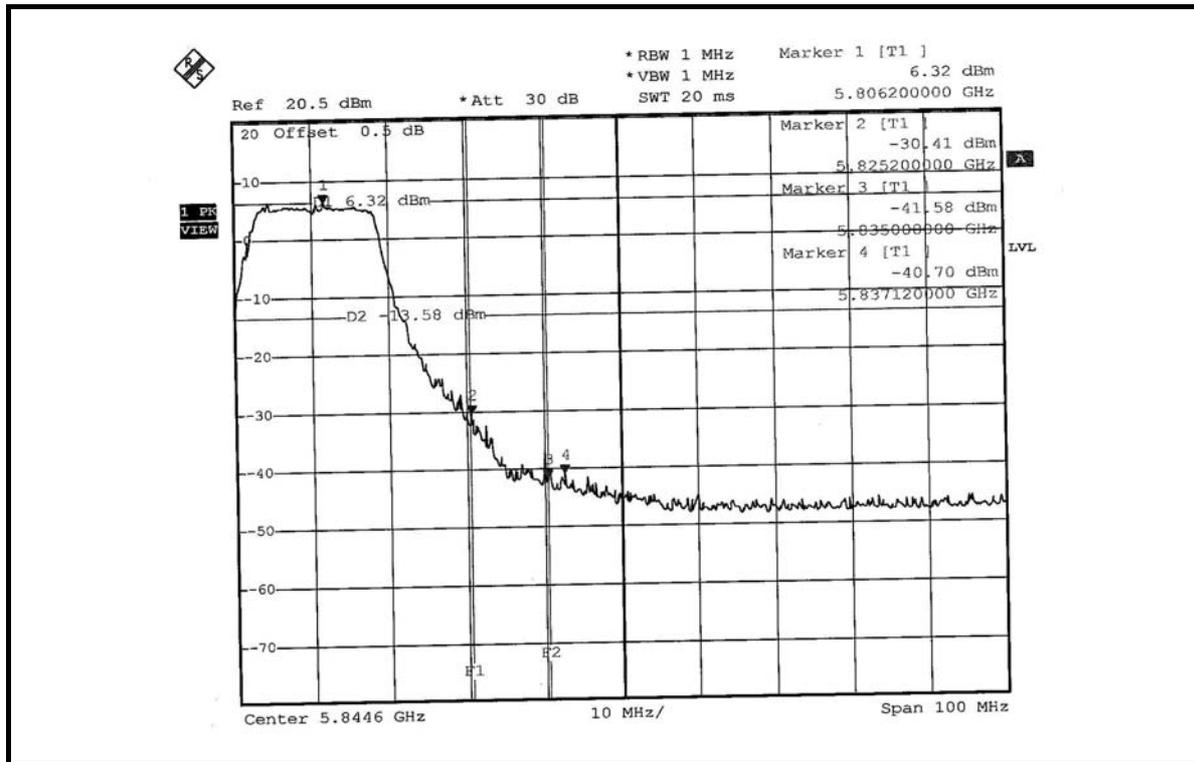
The band edge emission plot on the next page shows 44.49dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 9 is 107.67dBuV/m (Peak), so the maximum field strength in restrict band is  $107.67-44.49=63.18$ dBuV/m which is under 68.30dBuV/m limit.

#### Channel 12 (5805MHz)

The band edge emission plot on the next second page shows 36.73dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 12 is 107.87dBuV/m (Peak), so the maximum field strength in restrict band is  $107.87-36.73=71.14$ dBuV/m which is under 78.30dBuV/m limit.

The band edge emission plot on the next second page shows 47.02dBc between carrier maximum power and local maximum emission in restrict band. The emission of carrier strength list in the test result of channel 12 is 107.87dBuV/m (Peak), so the maximum field strength in restrict band is  $107.87-47.02=60.85$ dBuV/m which is under 68.30dBuV/m limit.





## 4.8 ANTENNA REQUIREMENT

### 4.8.1 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 15.407(a), 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.

### 4.8.2 ANTENNA CONNECTED CONSTRUCTION

The following antennas had been used in this product. The maximum Gain of the antenna is 13.0dBi.

Item	Antenna Type	Model	Gain (dBi)		Antenna connector
			2.4G	5G	
1	Omin collinear	ML-5299-HPA1-01	-	5.0	RP-SMA FEMALE
2	Patch	ML-5299-WPNA1-01	-	13.0	RP-SMA FEMALE



## 5. 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, DGT
<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.