4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB 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	FSEK30	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.

4.6.3 TEST PROCEDURE

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 was 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 30 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:

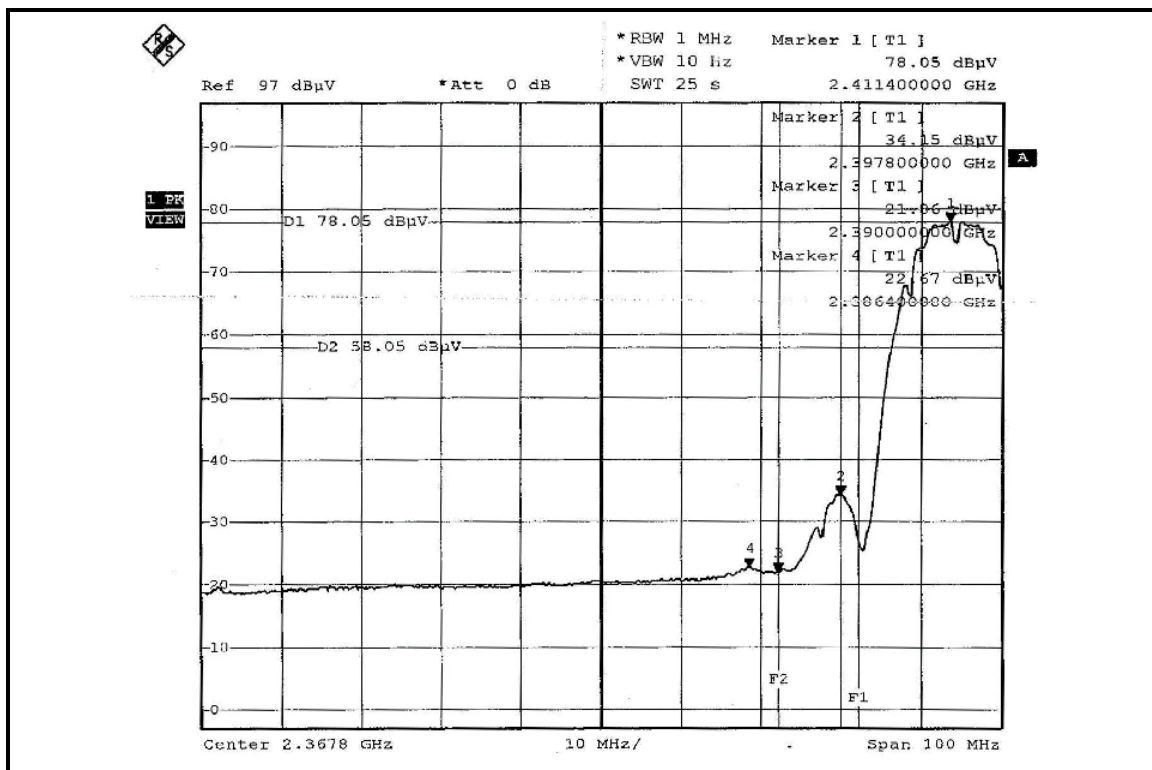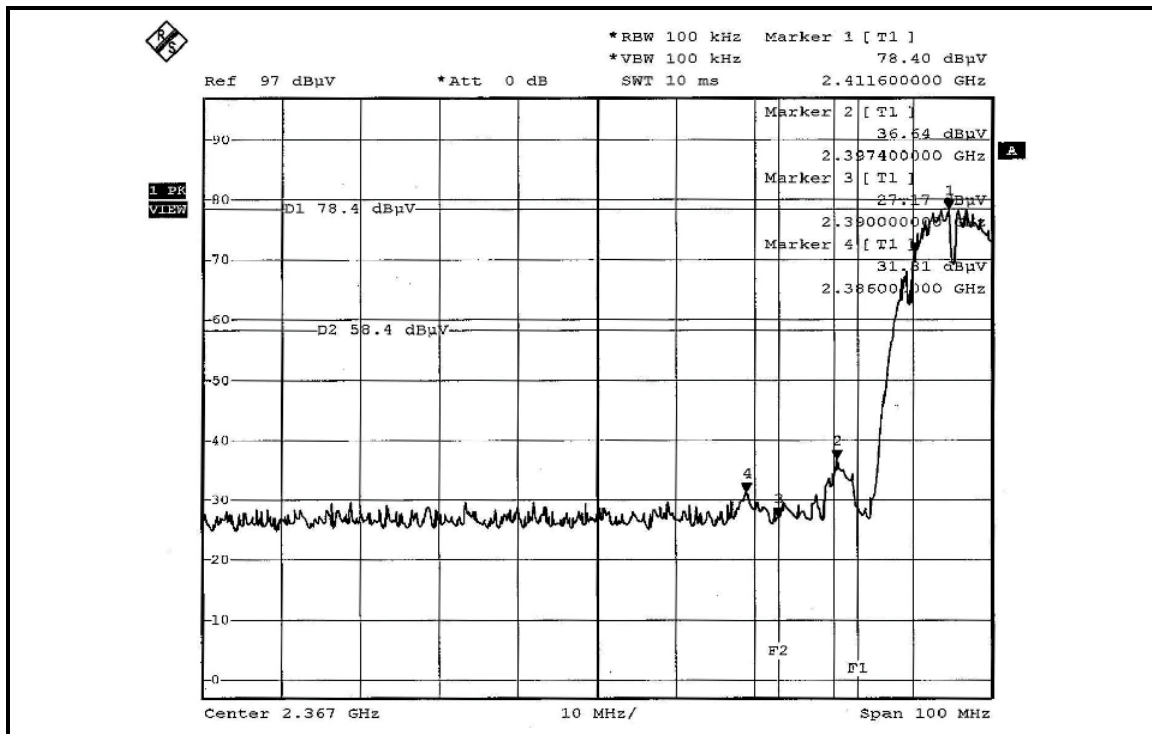**NOTE 1:**

The band edge emission plot of DSSS technique on the next page shows 47.09dBc between carrier maximum power and local maximum emission in restrict band (2.38600GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 110.85dBuV/m (Peak), so the maximum field strength in restrict band is 110.85-47.09=63.76dBuV/m which is under 74dBuV/m limit.
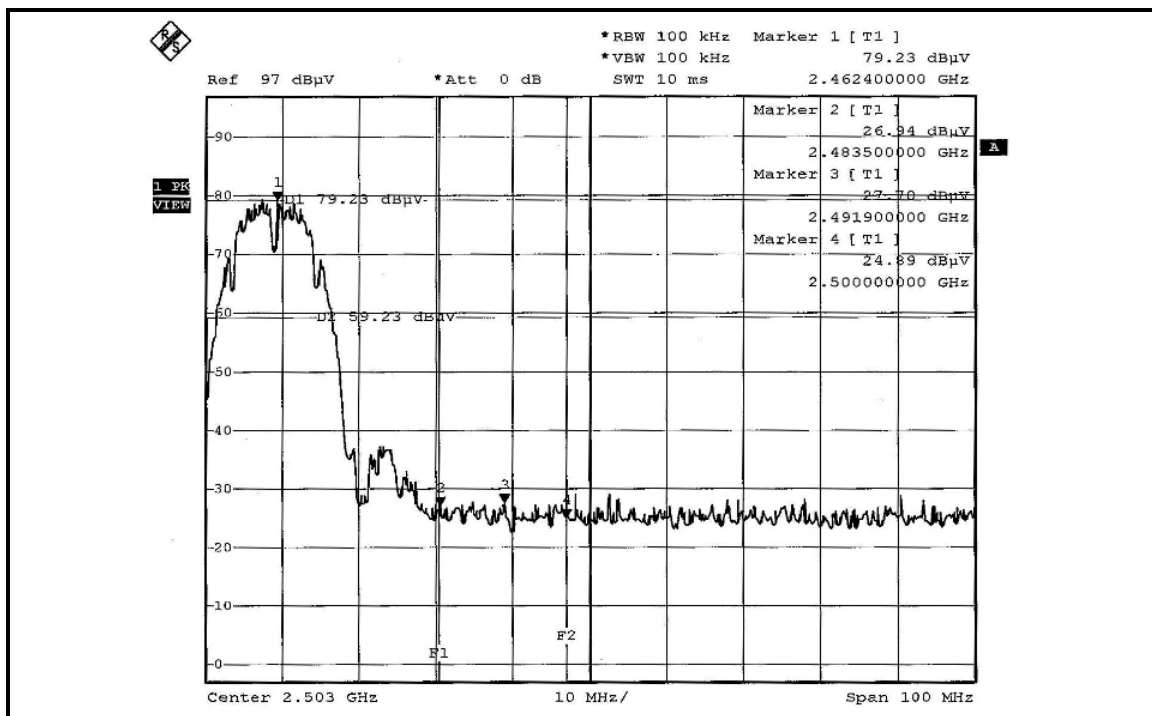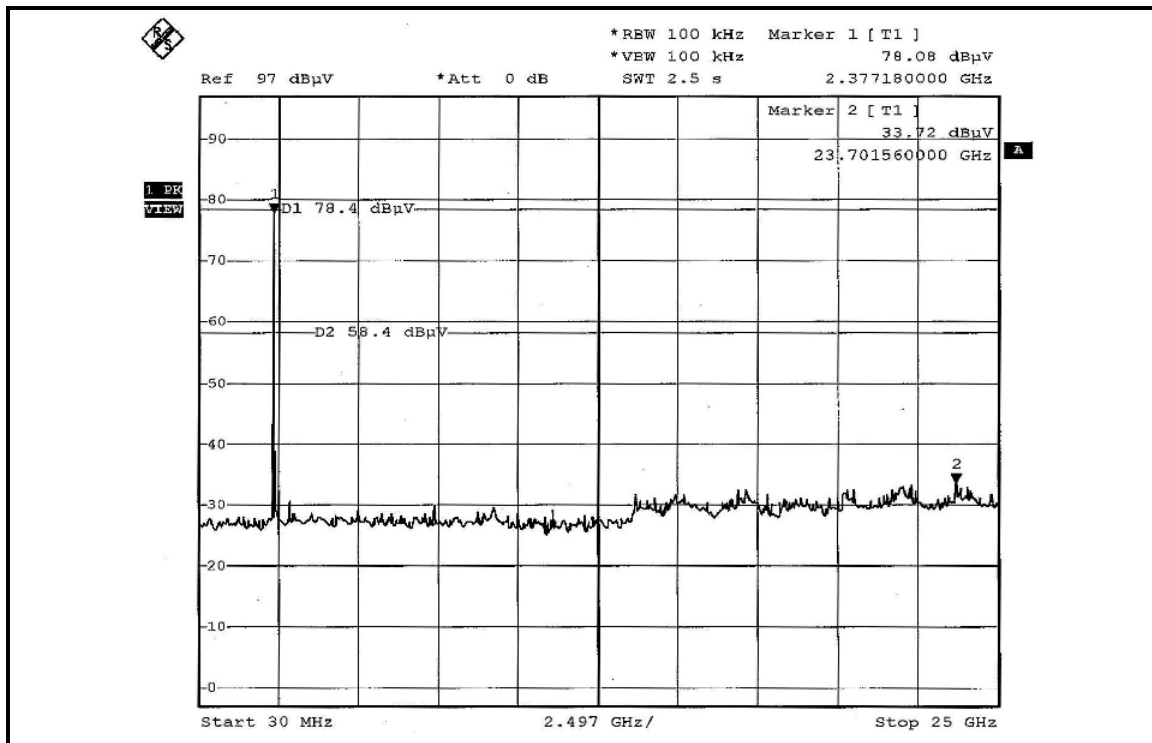
The band edge emission plot of DSSS technique on the next page shows 55.38dBc between carrier maximum power and local maximum emission in restrict band (2.38640GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 107.28dBuV/m (Average), so the maximum field strength in restrict band is 107.28-55.38=51.90dBuV/m which is under 54dBuV/m limit.
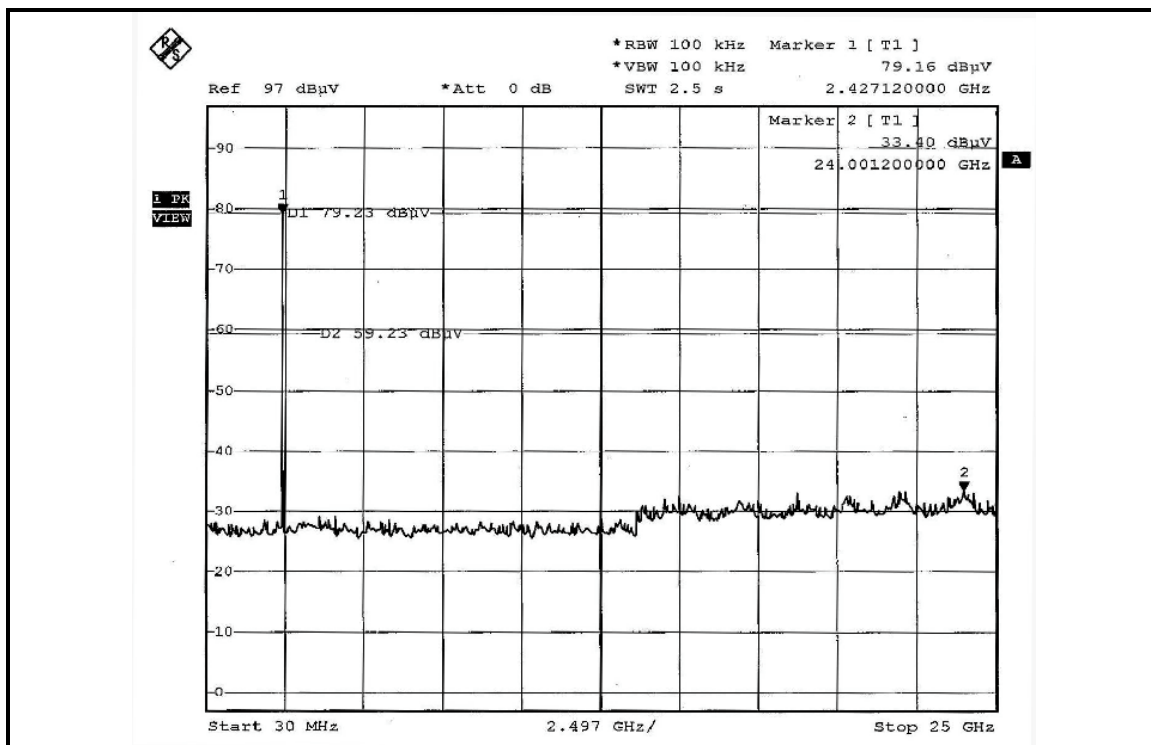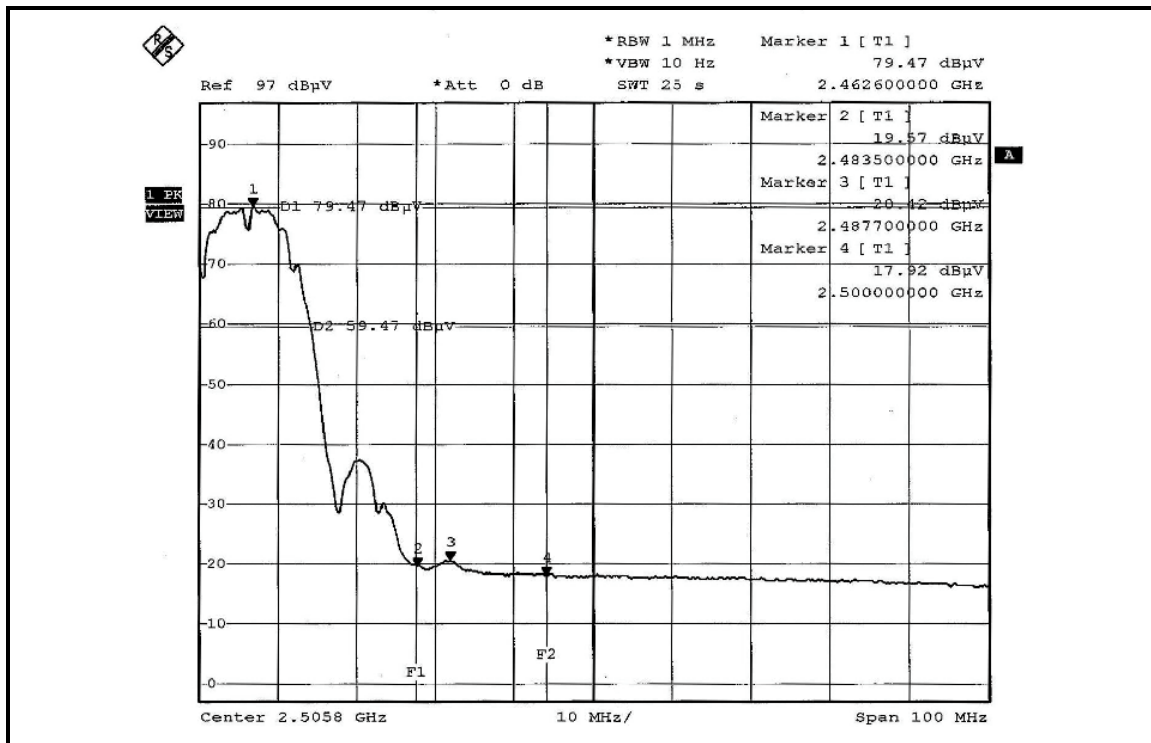
NOTE 2:

The band edge emission plot of DSSS technique on the next second page shows 51.53dBc between carrier maximum power and local maximum emission in restrict band (2.49190GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 110.28dBuV/m (Peak), so the maximum field strength in restrict band is 110.28-51.53=58.75dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of DSSS technique on the next third page shows 59.05dBc between carrier maximum power and local maximum emission in restrict band (2.48770GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 106.60dBuV/m (Average), so the maximum field strength in restrict band is 106.60-59.05=47.55dBuV/m which is under 54dBuV/m limit.

802.11g OFDM MODULATION:

NOTE 1:

The band edge emission plot of OFDM technique on the next page shows 45.82dBc between carrier maximum power and local maximum emission in restrict band (2.38720GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 111.45dBuV/m (Peak), so the maximum field strength in restrict band is 111.45-45.82=65.63dBuV/m which is under 74dBuV/m limit.
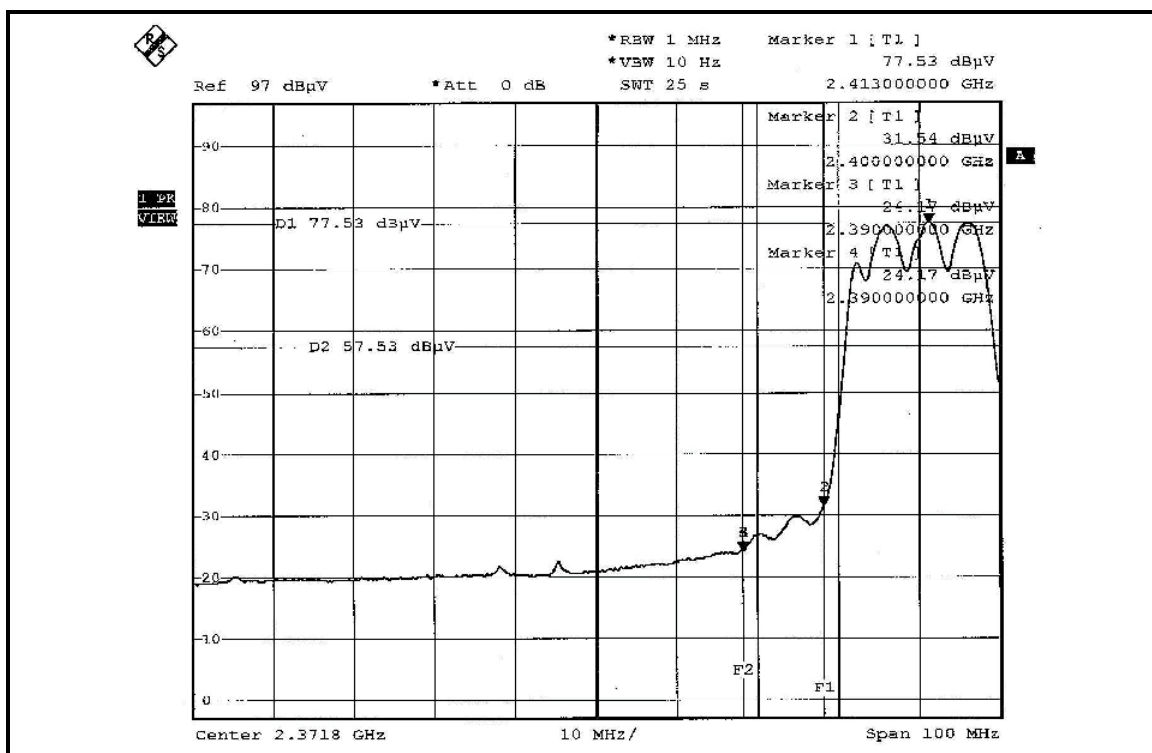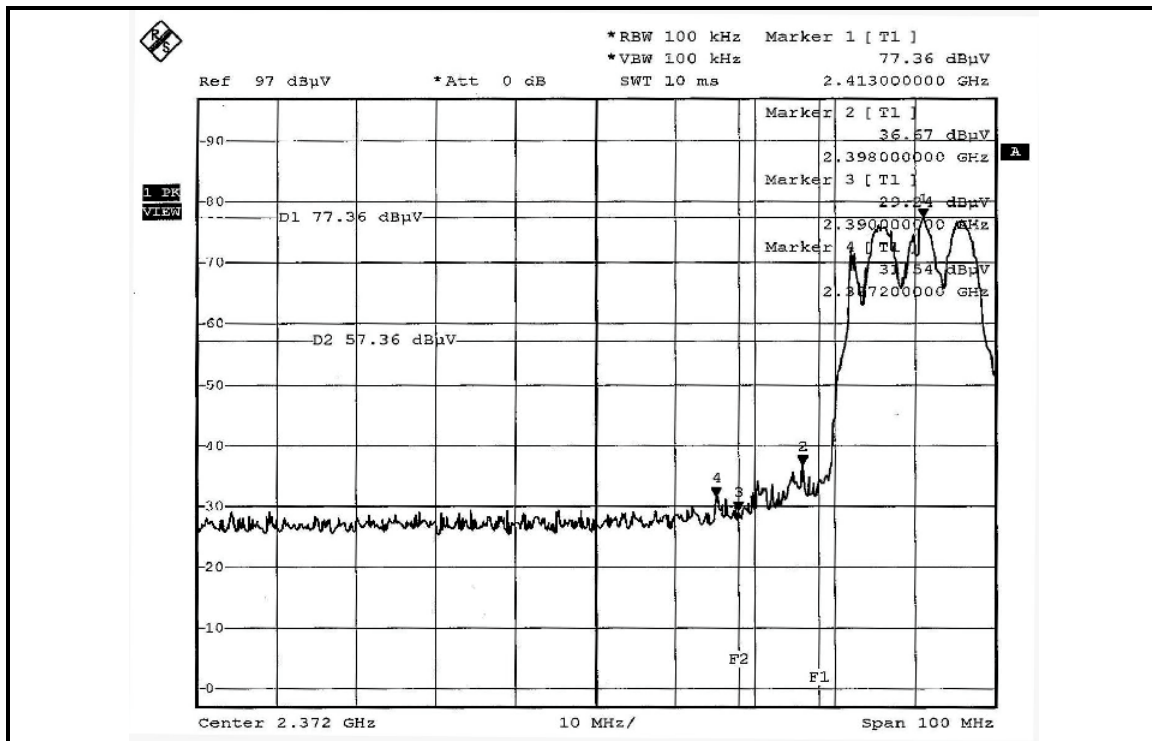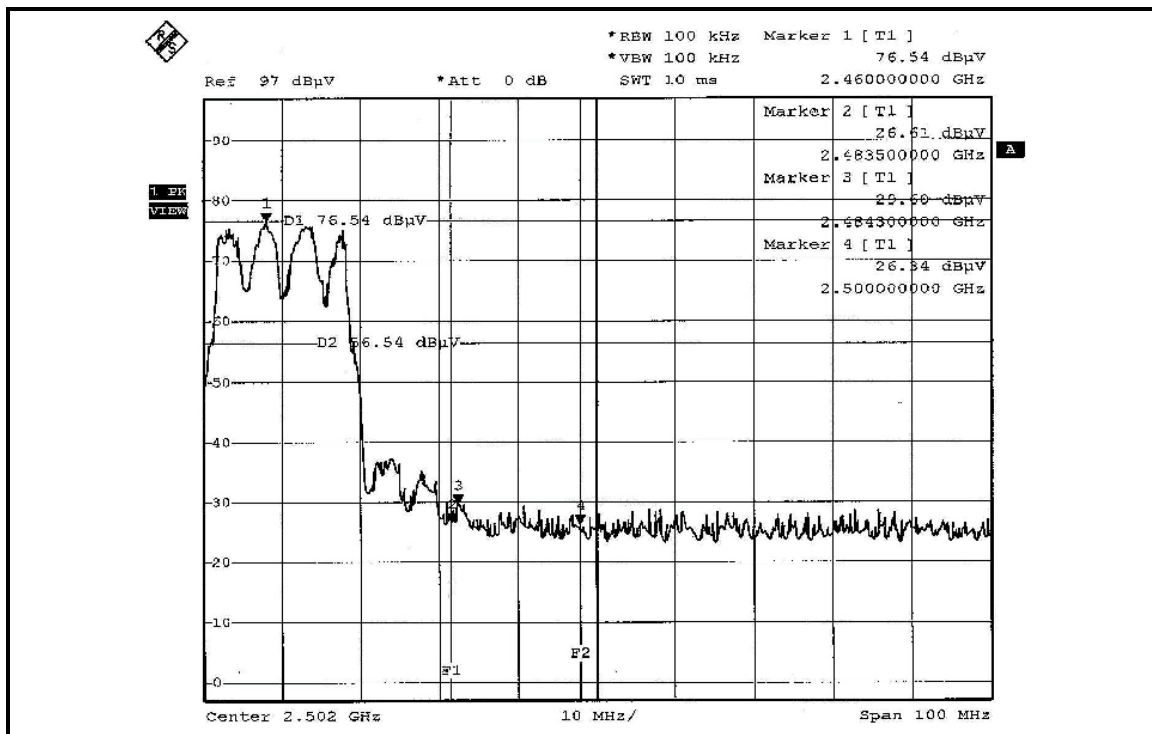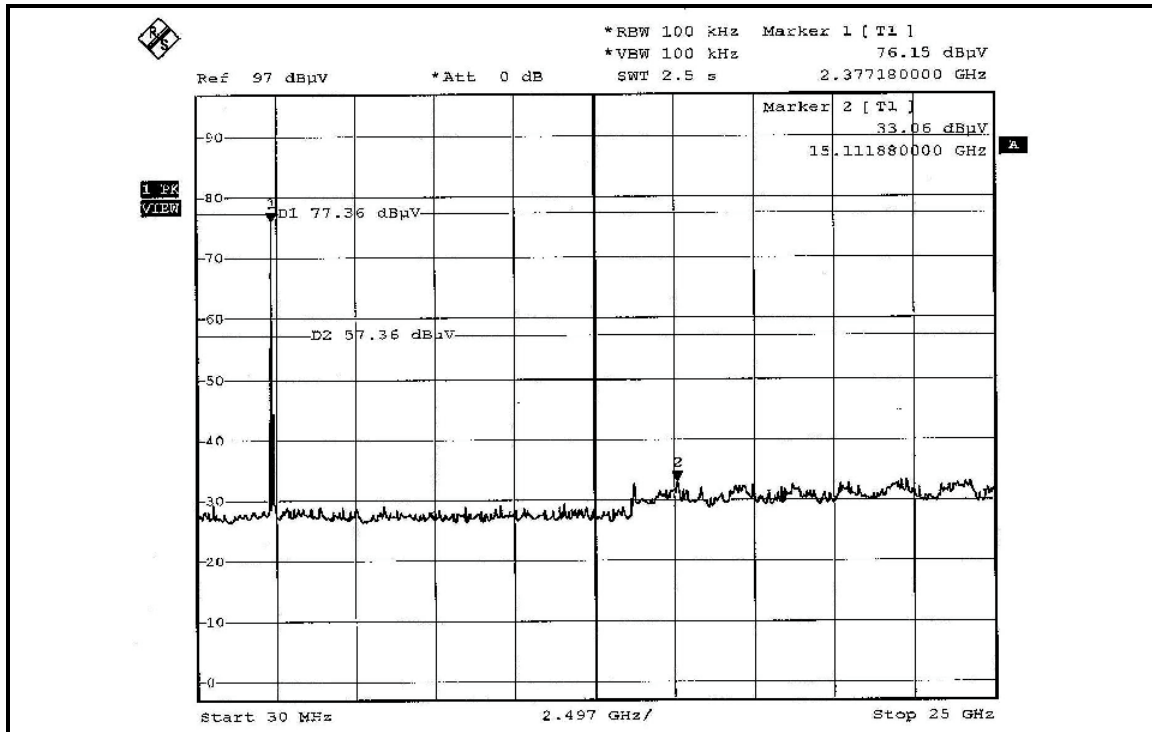
The band edge emission plot of OFDM technique on the next page shows 53.36dBc between carrier maximum power and local maximum emission in restrict band (2.39000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 102.45dBuV/m (Average), so the maximum field strength in restrict band is 102.45-53.36=49.09dBuV/m which is under 54dBuV/m limit.
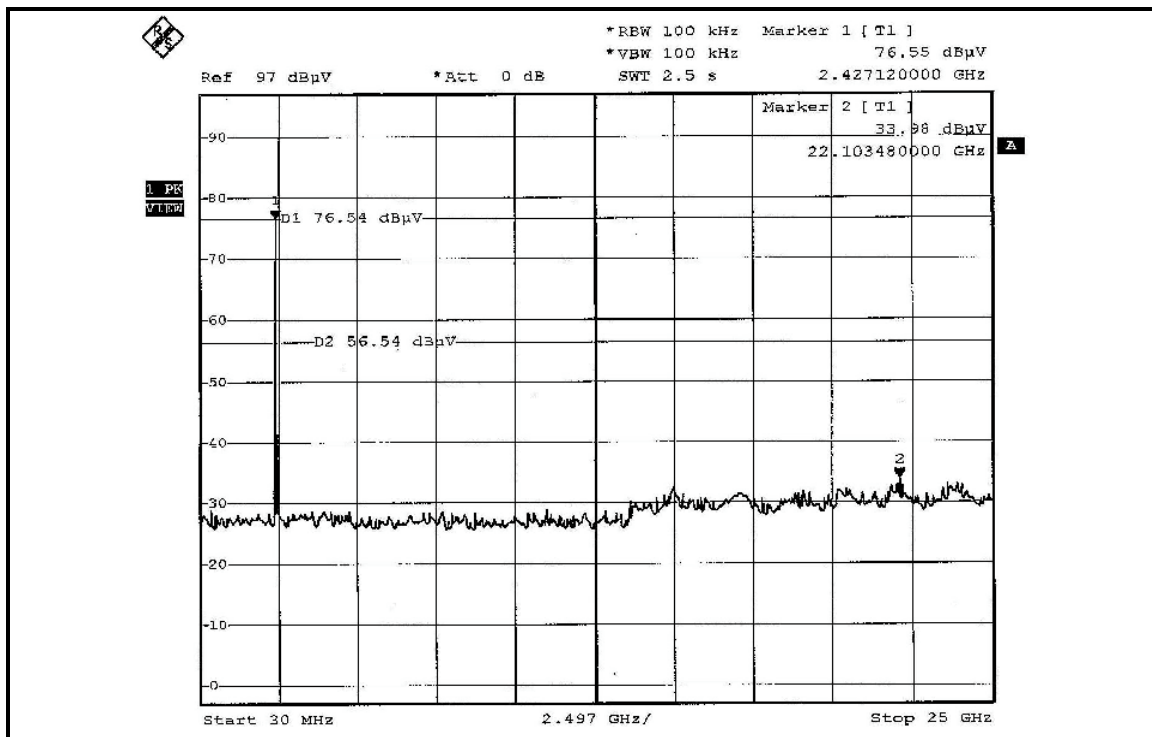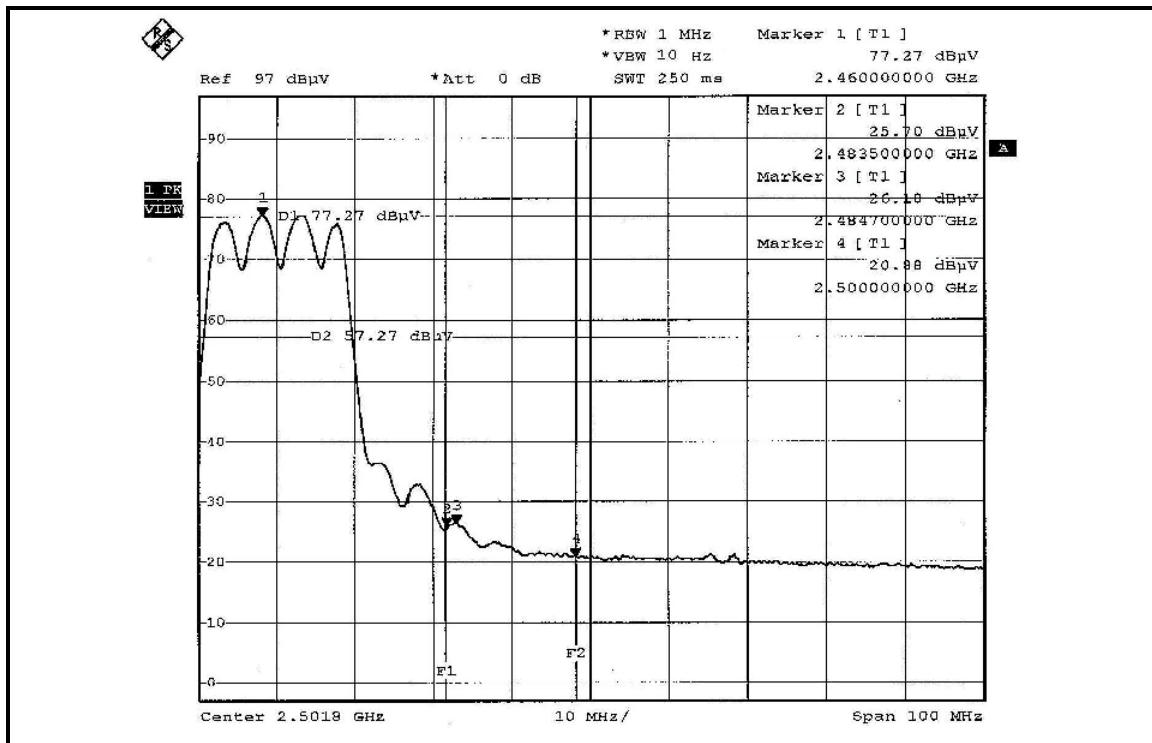
NOTE 2:

The band edge emission plot of OFDM technique on the next second page shows 46.94dBc between carrier maximum power and local maximum emission in restrict band (2.48430GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 110.61dBuV/m (Peak), so the maximum field strength in restrict band is 110.61-46.94=63.67dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 51.09dBc between carrier maximum power and local maximum emission in restrict band (2.48470GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 101.22dBuV/m (Average), so the maximum field strength in restrict band is 101.22-51.09=50.13dBuV/m which is under 54dBuV/m limit.

Top plot:
- *RBW 1 MHz Marker 1 [T1]
- *VBW 10 Hz   77.27 dBμV
- Ref 97 dBμV   *Att 0 dB   SWT 250 ms   2.460000000 GHz
- Marker 2 [T1]   25.70 dBμV   2.483500000 GHz
- Marker 3 [T1]   26.10 dBμV   2.484700000 GHz
- Marker 4 [T1]   20.88 dBμV   2.500000000 GHz
- 1 PK VIEW
- D1 77.27 dBμV
- D2 57.27 dBμV
- F1 F2
- Center 2.5018 GHz   10 MHz/   Span 100 MHz

Bottom plot:
- *RBW 100 kHz Marker 1 [T1]
- *VBW 100 kHz   76.55 dBμV
- Ref 97 dBμV   *Att 0 dB   SWT 2.5 s   2.427120000 GHz
- Marker 2 [T1]   33.98 dBμV   22.103480000 GHz
- 1 PK VIEW
- D1 76.54 dBμV
- D2 56.54 dBμV
- Start 30 MHz   2.497 GHz/   Stop 25 GHz

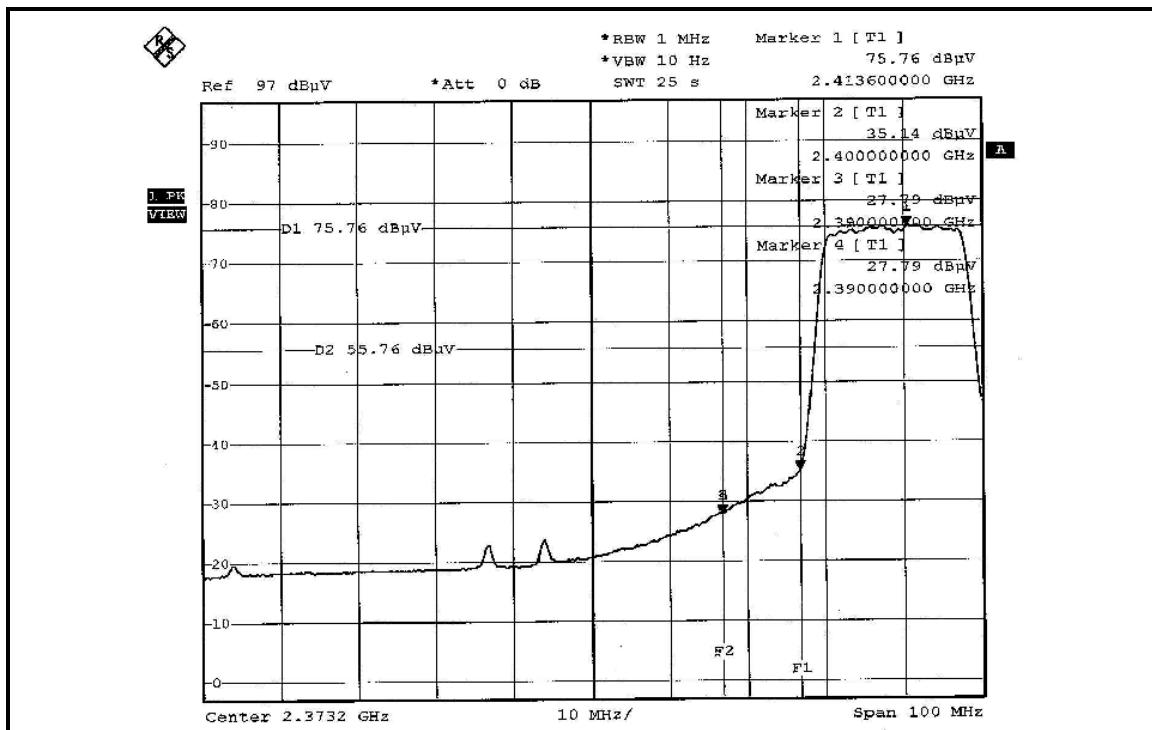**DRAFT 802.11n (20MHz) OFDM MODULATION: DUAL TX:**

NOTE 1:

The band edge emission plot of OFDM technique on the next page shows 41.47dBc between carrier maximum power and local maximum emission in restrict band (2.38860GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 110.57dBuV/m (Peak), so the maximum field strength in restrict band is 110.57-41.47=69.10dBuV/m which is under 74dBuV/m limit.
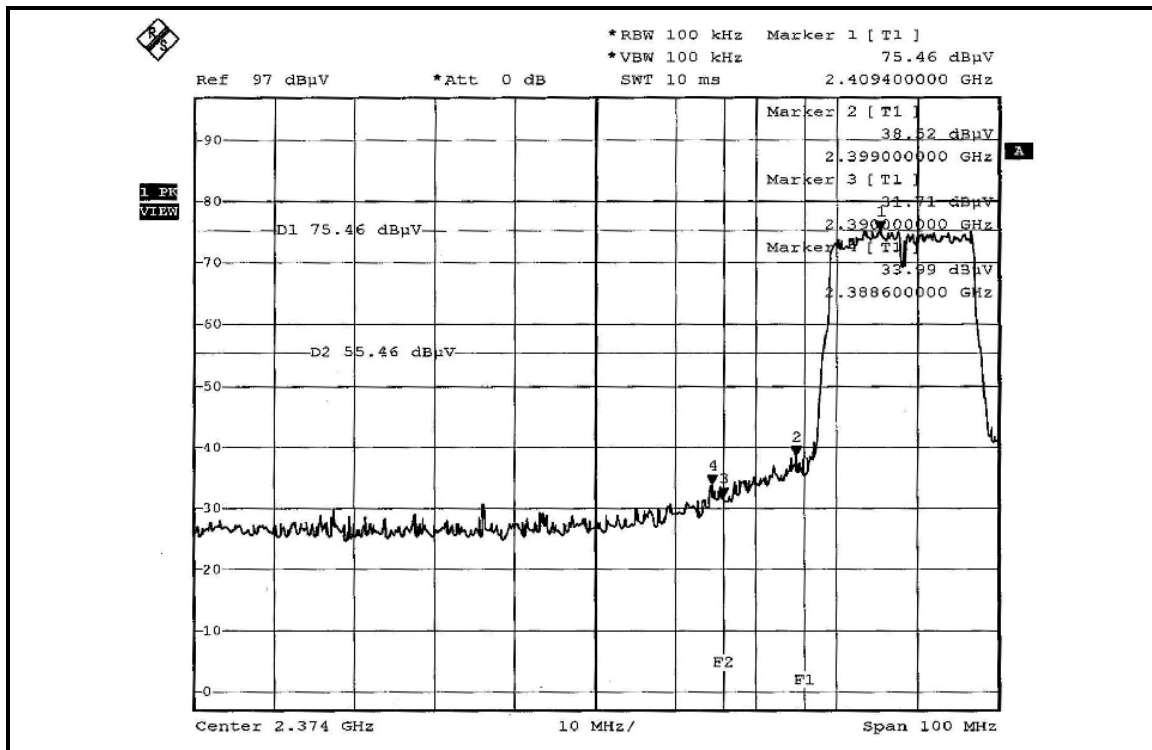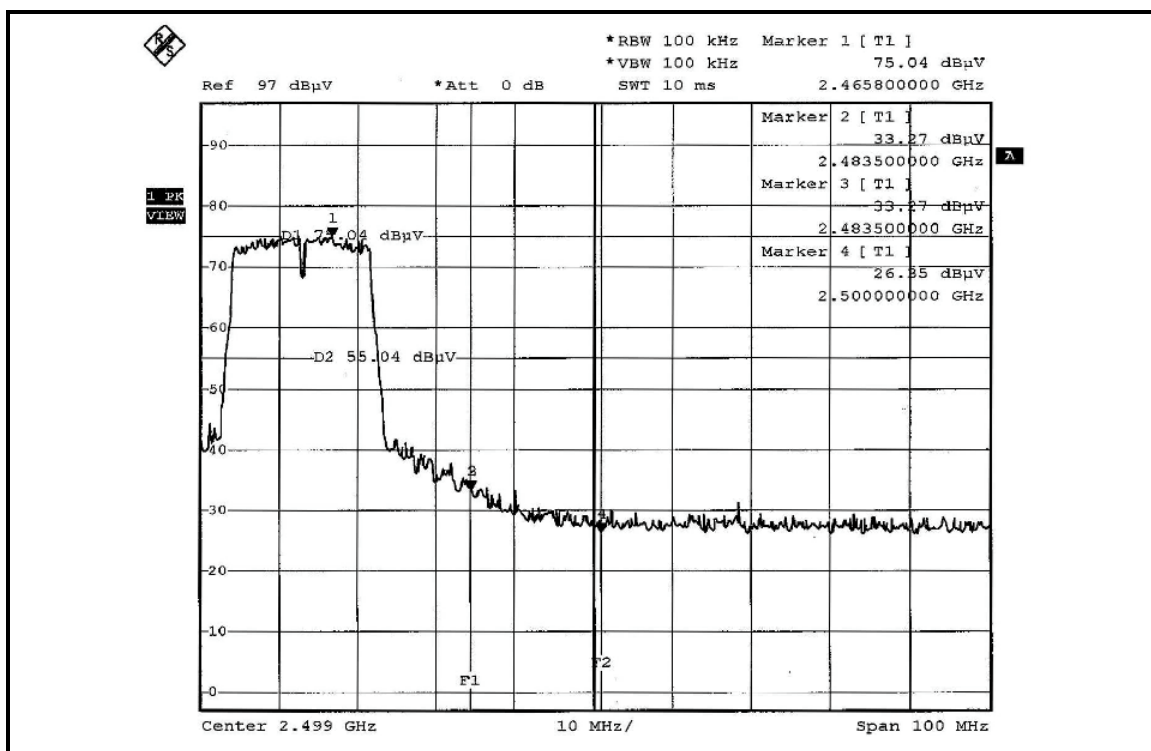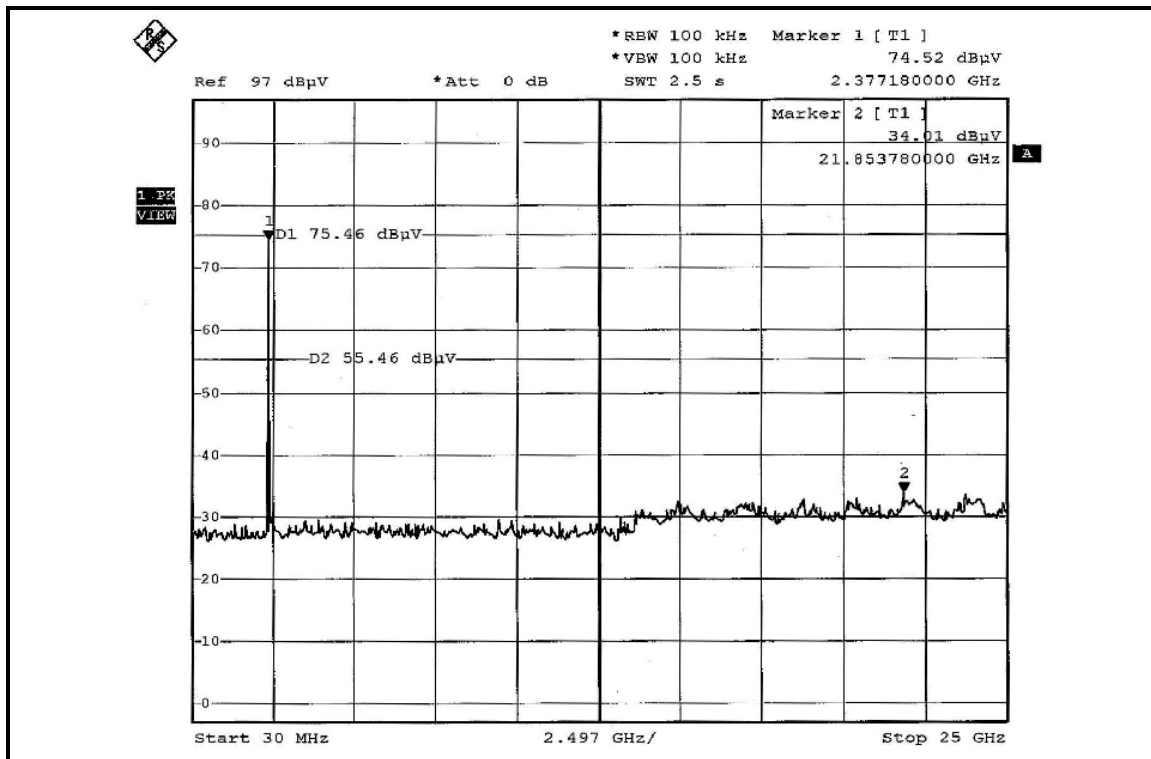
The band edge emission plot of OFDM technique on the next page shows 47.97dBc between carrier maximum power and local maximum emission in restrict band (2.39000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 99.12dBuV/m (Average), so the maximum field strength in restrict band is 99.12-47.97=51.15dBuV/m which is under 54dBuV/m limit.
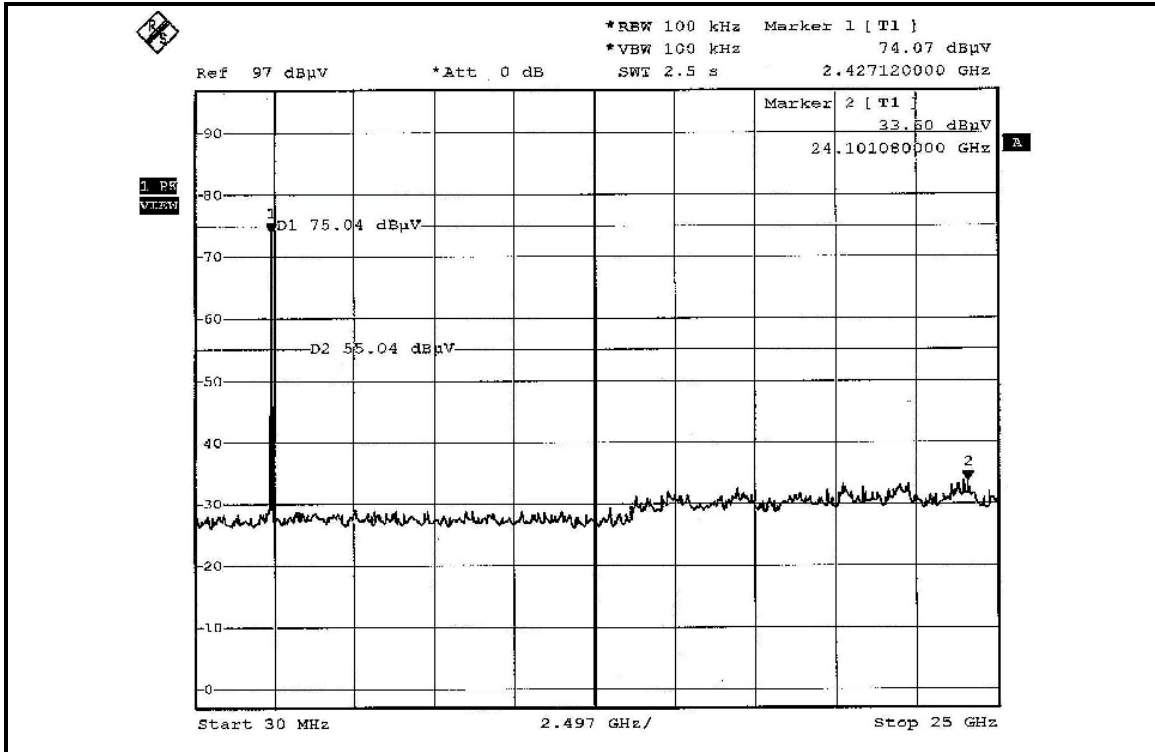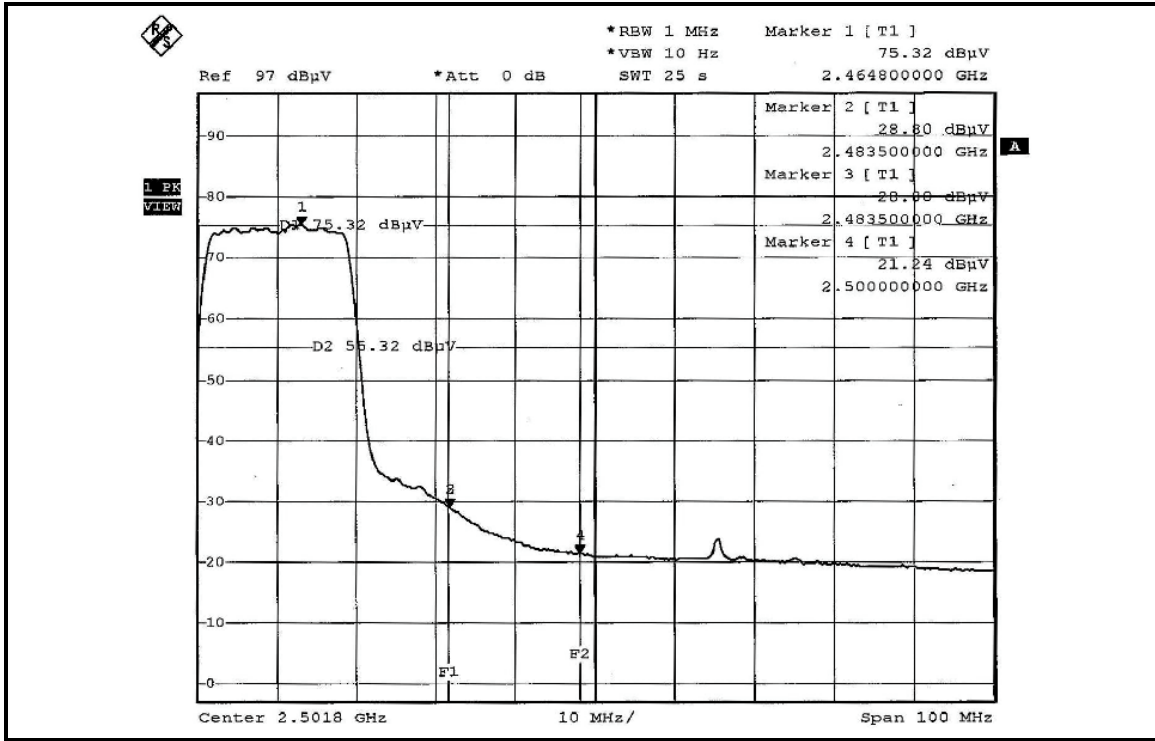
NOTE 2:

The band edge emission plot of OFDM technique on the next second page shows 41.77dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). 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 109.02-41.77=67.25dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 46.52dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 99.06dBuV/m (Average), so the maximum field strength in restrict band is 99.06-46.52=52.54dBuV/m which is under 54dBuV/m limit.

Plot 1:

*RBW 1 MHz Marker 1 [T1]
*VBW 10 Hz 75.32 dBµV
Ref 97 dBµV   *Att 0 dB   SWT 25 s   2.464800000 GHz

Marker 2 [T1]
28.80 dBµV
2.483500000 GHz
Marker 3 [T1]
28.00 dBµV
2.483500000 GHz
Marker 4 [T1]
21.24 dBµV
2.500000000 GHz

A

1 PK
VIEW

90
80
1   75.32 dBµV
70
60
D2 55.32 dBµV
50
40
30
20
10
0

F1   F2

Center 2.5018 GHz   10 MHz/   Span 100 MHz

Plot 2:

*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 74.07 dBµV
Ref 97 dBµV   *Att 0 dB   SWT 2.5 s   2.427120000 GHz

Marker 2 [T1]
33.60 dBµV
24.101080000 GHz

A

1 PK
VIEW

90
80
1 D1 75.04 dBµV
70
60
D2 55.04 dBµV
50
40
30
20
10
0

Start 30 MHz   2.497 GHz/   Stop 25 GHz

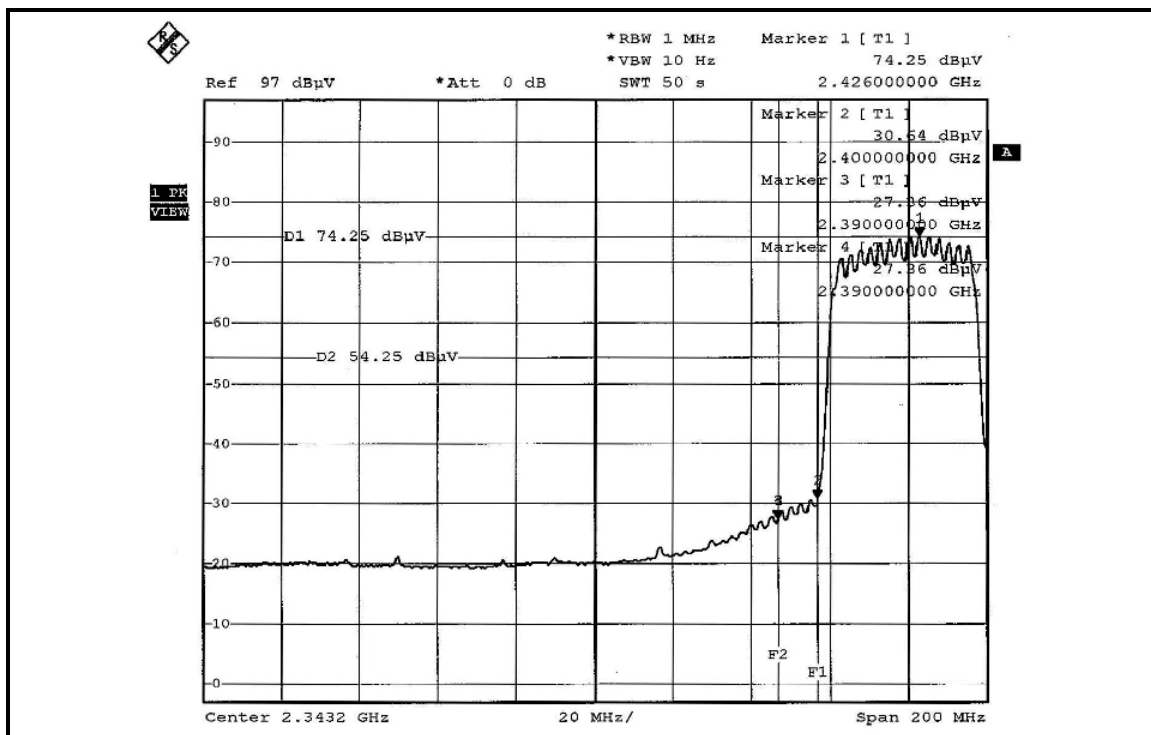**DRAFT 802.11n (40MHz) OFDM MODULATION: DUAL TX:**

NOTE 1:

The band edge emission plot of OFDM technique on the next page shows 43.75dBc between carrier maximum power and local maximum emission in restrict band (2.36040GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 106.43dBuV/m (Peak), so the maximum field strength in restrict band is 106.43-43.75=62.68dBuV/m which is under 74dBuV/m limit.
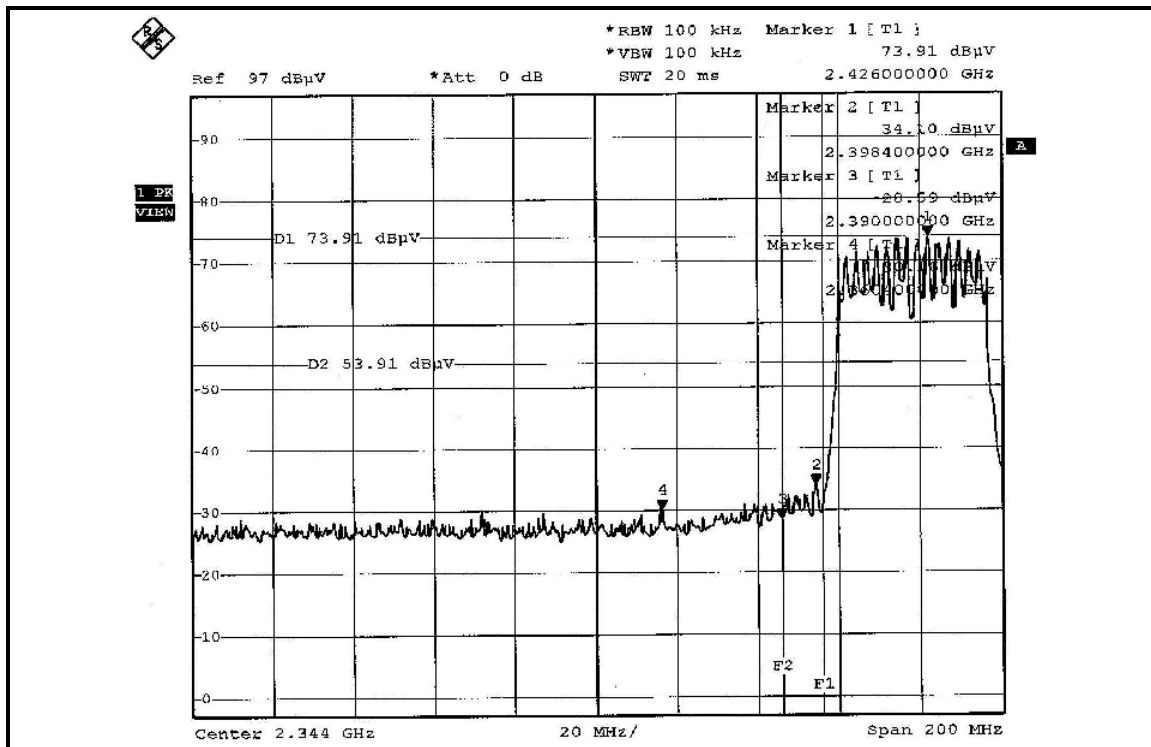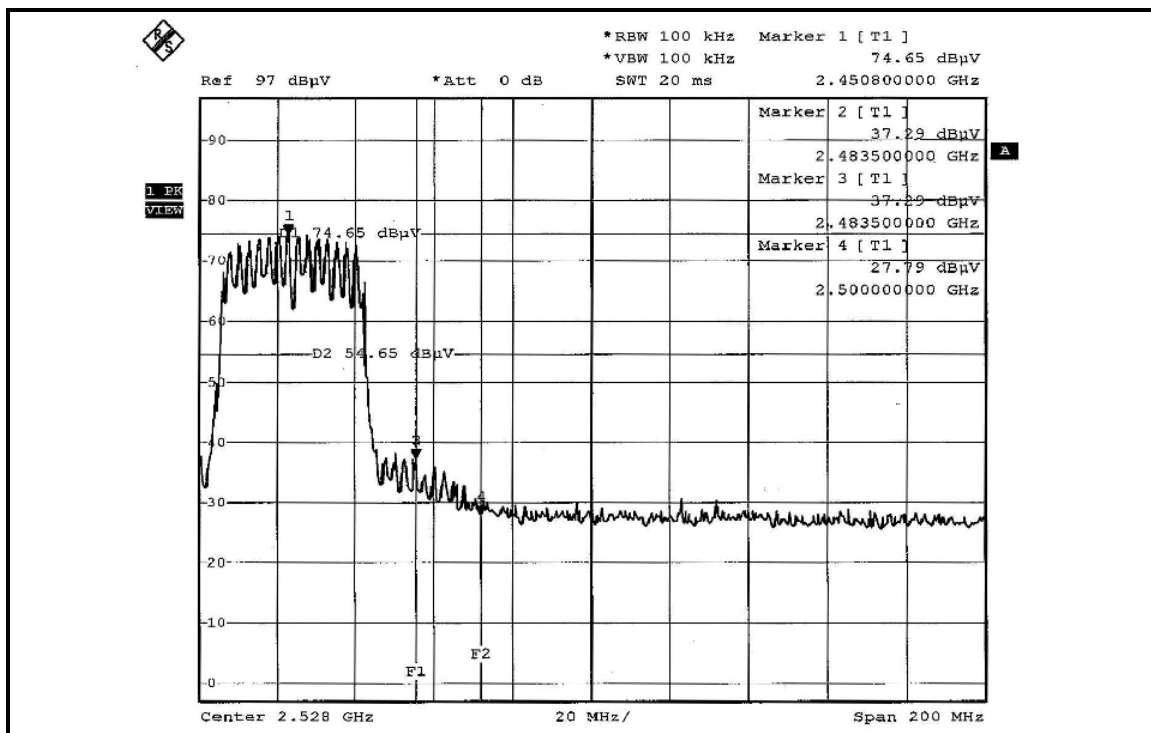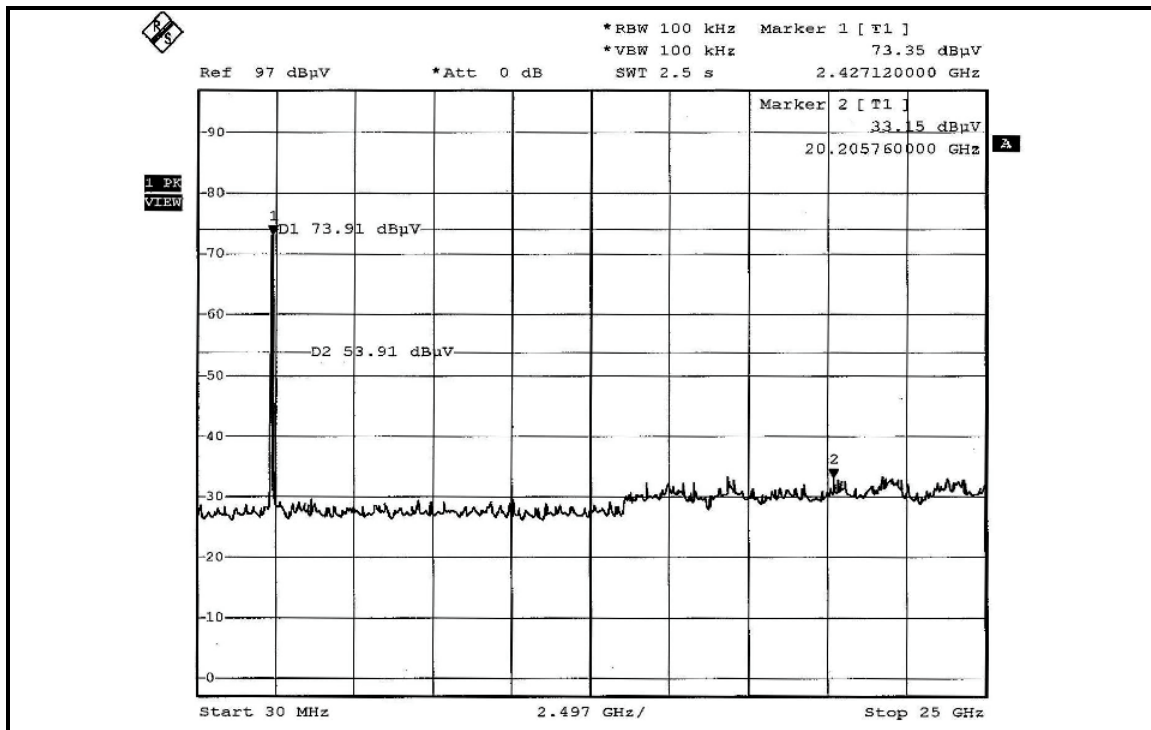
The band edge emission plot of OFDM technique on the next page shows 46.89dBc between carrier maximum power and local maximum emission in restrict band (2.39000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 95.74dBuV/m (Average), so the maximum field strength in restrict band is 95.74-46.89=48.85dBuV/m which is under 54dBuV/m limit.
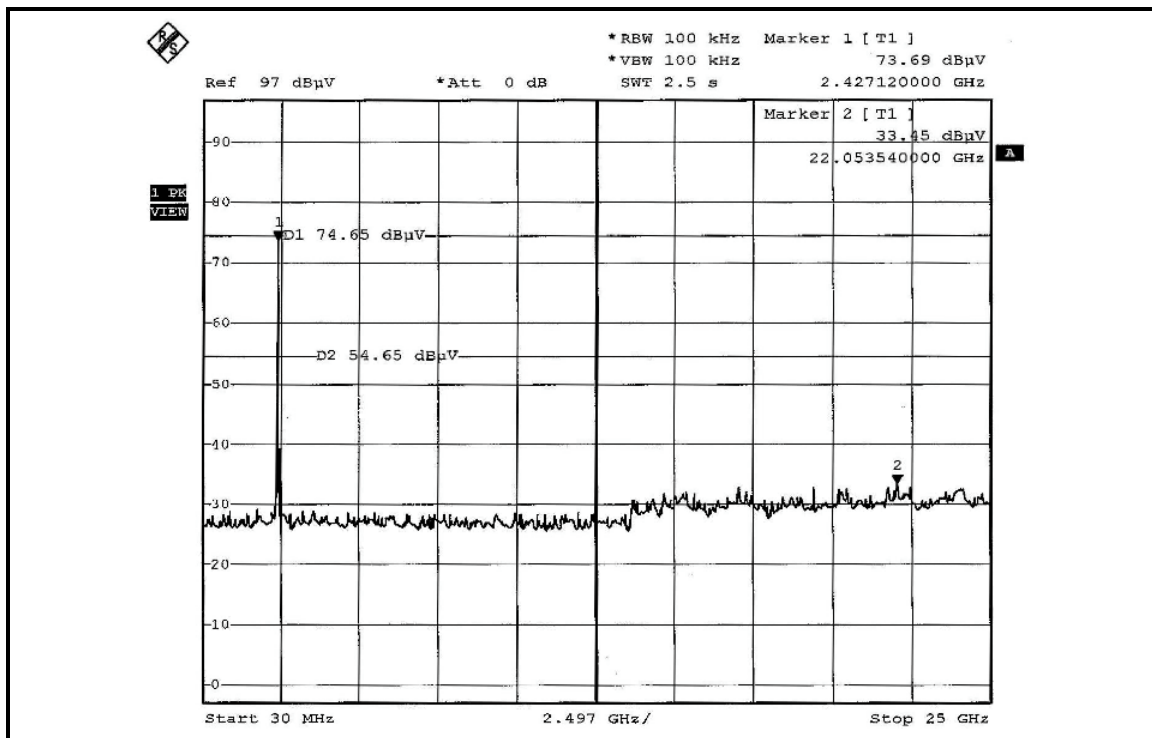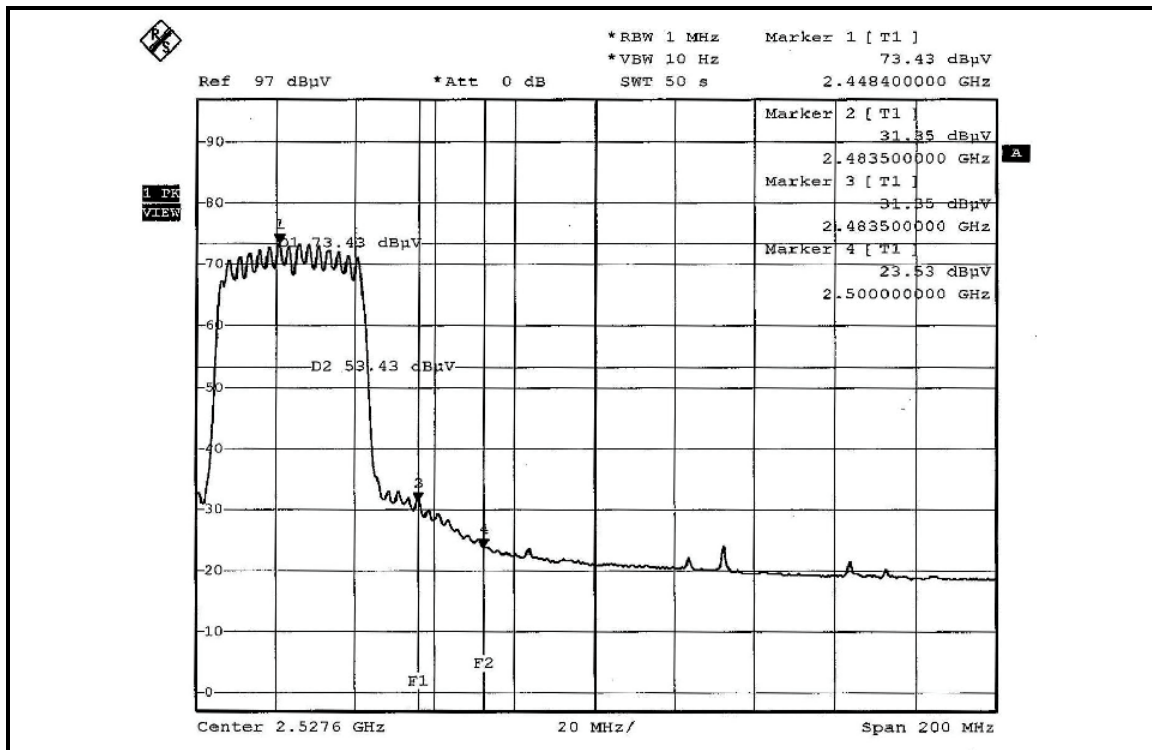
NOTE 2:

The band edge emission plot of OFDM technique on the next second page shows 37.36dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 7 at the item 4.2.7 is 105.06dBuV/m (Peak), so the maximum field strength in restrict band is 105.06-37.36=67.70dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of OFDM technique on the next third page shows 42.08dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 7 at the item 4.2.7 is 94.99dBuV/m (Average), so the maximum field strength in restrict band is 94.99-42.08=52.91dBuV/m which is under 54dBuV/m limit.

Top plot:
*RBW 100 kHz   Marker 1 [T1]
*VBW 100 kHz   73.91 dBμV
Ref 97 dBμV   *Att 0 dB   SWT 20 ms   2.426000000 GHz

Marker 2 [T1]
        34.10 dBμV
2.398400000 GHz   A
Marker 3 [T1]
        20.59 dBμV
2.390000000 GHz
Marker 4 [T1]
2.360000000 GHz

1 PK
VIEW

D1 73.91 dBμV

D2 53.91 dBμV

4   2

F2   F1

Center 2.344 GHz   20 MHz/   Span 200 MHz

Bottom plot:
*RBW 1 MHz   Marker 1 [T1]
*VBW 10 Hz   74.25 dBμV
Ref 97 dBμV   *Att 0 dB   SWT 50 s   2.426000000 GHz

Marker 2 [T1]
        30.54 dBμV
2.400000000 GHz   A
Marker 3 [T1]
        27.06 dBμV
2.390000000 GHz
Marker 4 [T1]
        27.86 dBμV
2.390000000 GHz

1 PK
VIEW

D1 74.25 dBμV

D2 54.25 dBμV

F2   F1

Center 2.3432 GHz   20 MHz/   Span 200 MHz

### 802.11b (CB mode) OFDM MODULATION: DUAL TX:

NOTE 1:

The band edge emission plot of DSSS technique on the next page shows 52.71dBc between carrier maximum power and local maximum emission in restrict band (2.30480GHz). The emission of carrier strength list in the test result of channel 3 at the item 4.2.7 is 110.20dBuV/m (Peak), so the maximum field strength in restrict band is 110.20-52.71=57.49dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of DSSS technique on the next page shows 53.91dBc 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 3 at the item 4.2.7 is 106.76dBuV/m (Average), so the maximum field strength in restrict band is 106.76-53.91=52.85dBuV/m which is under 54dBuV/m limit.

NOTE 2:

The band edge emission plot of DSSS technique on the next second page shows 46.10dBc between carrier maximum power and local maximum emission in restrict band (2.48430GHz). The emission of carrier strength list in the test result of channel 6 at the item 4.2.7 is 109.87dBuV/m (Peak), so the maximum field strength in restrict band is 109.87-46.10=63.77dBuV/m which is under 74dBuV/m limit.

The band edge emission plot of DSSS technique on the next third page shows 53.47dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 6 at the item 4.2.7 is 106.46dBuV/m (Average), so the maximum field strength in restrict band is 106.46-53.47=52.99dBuV/m which is under 54dBuV/m limit.
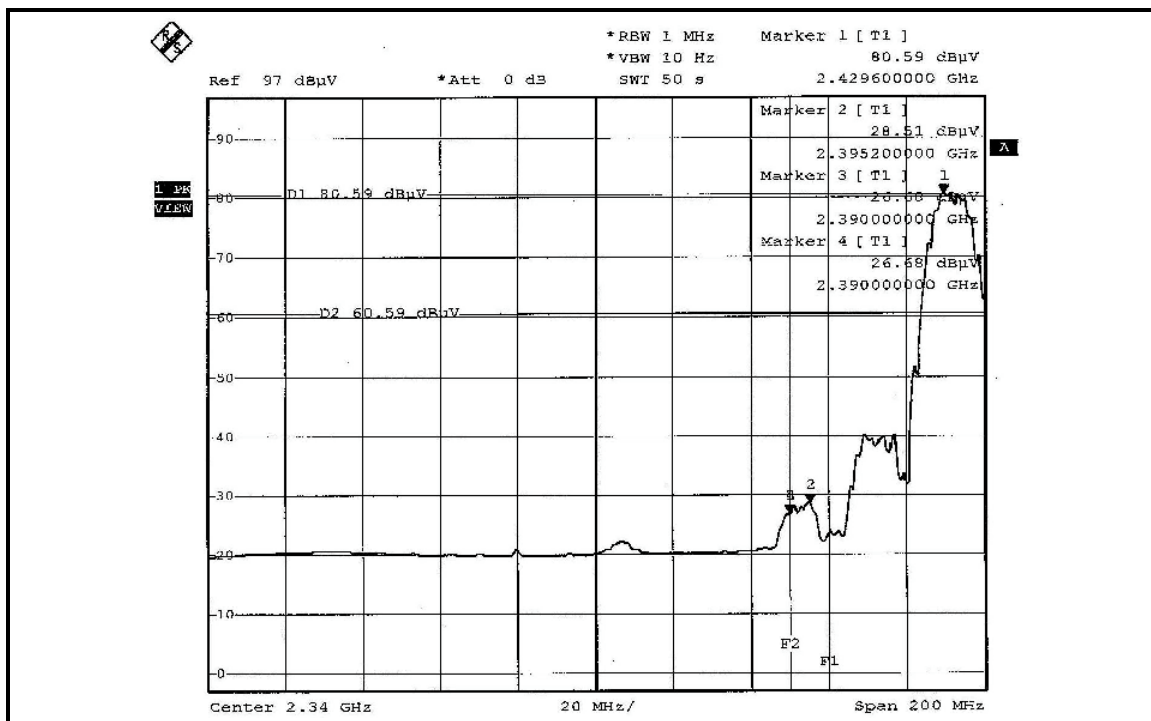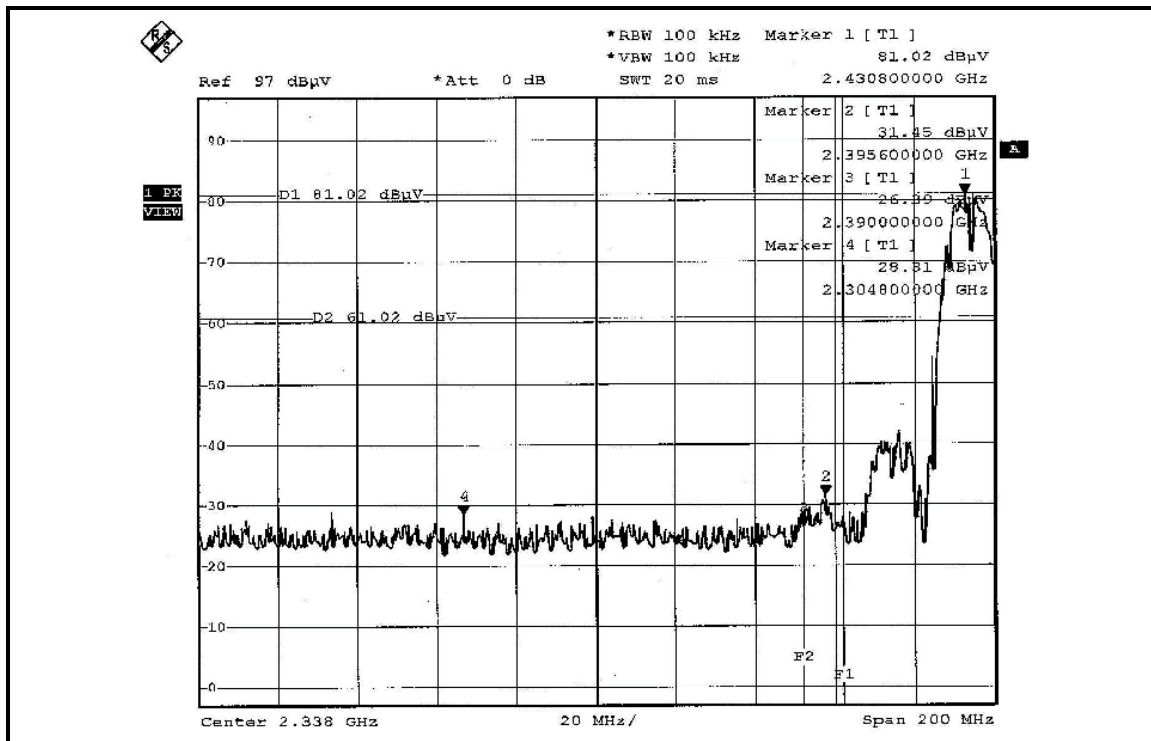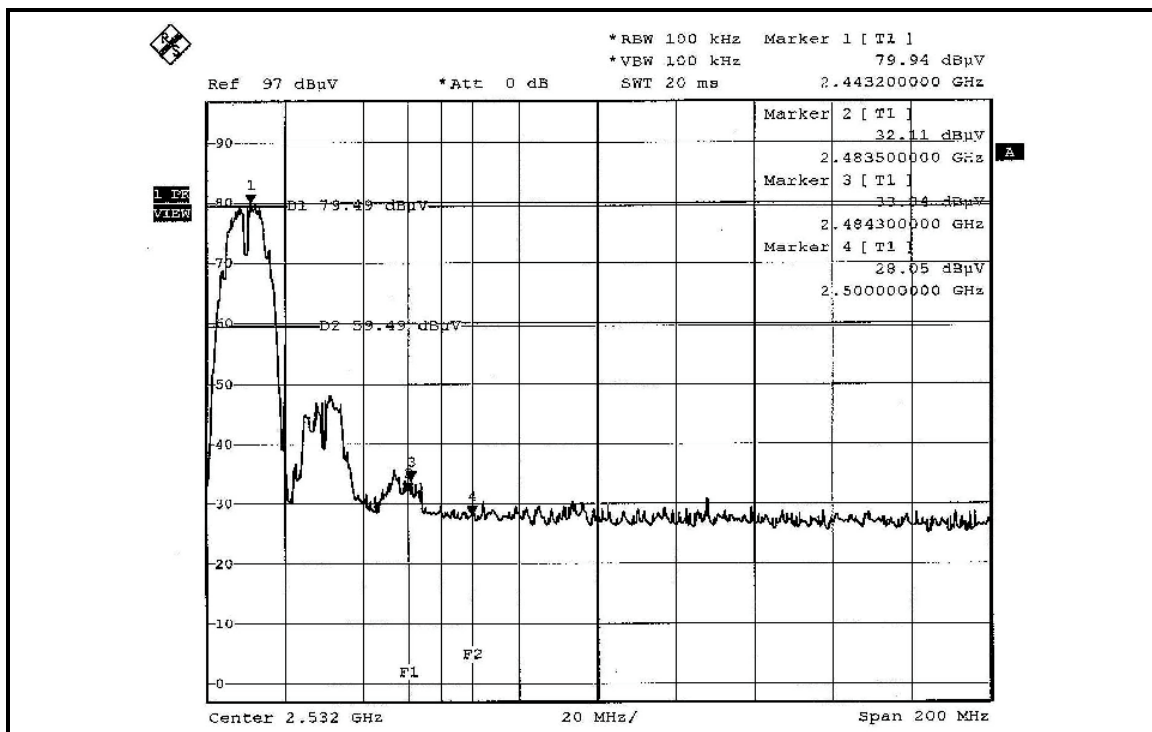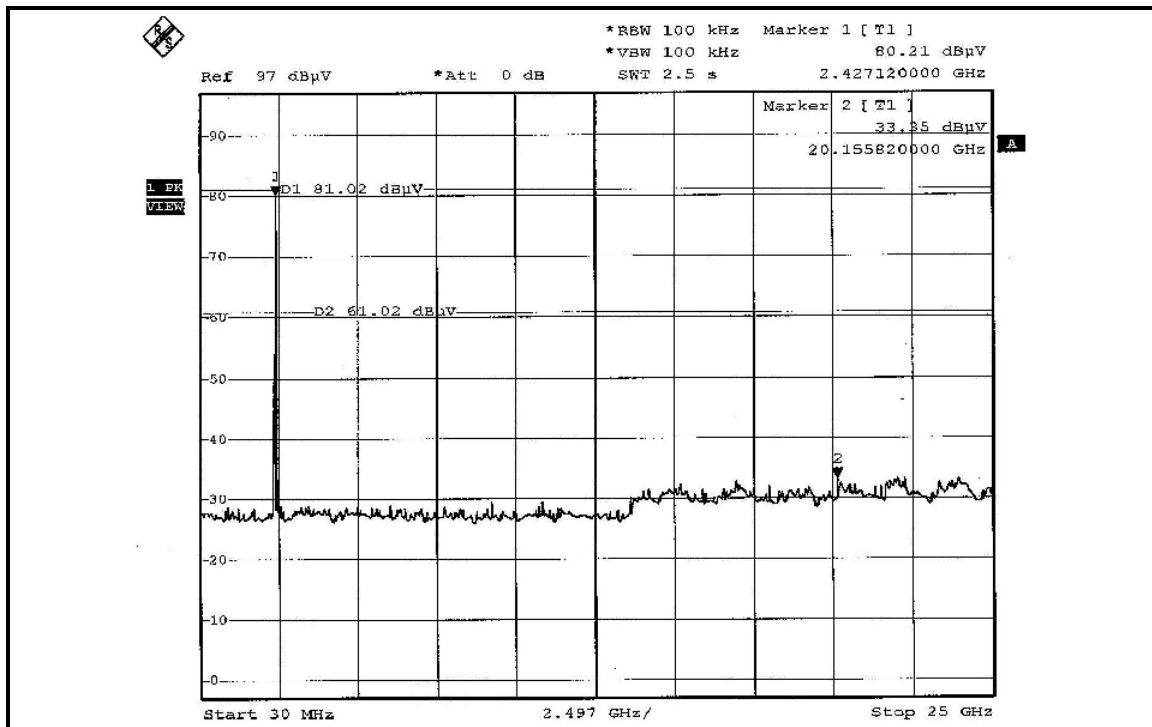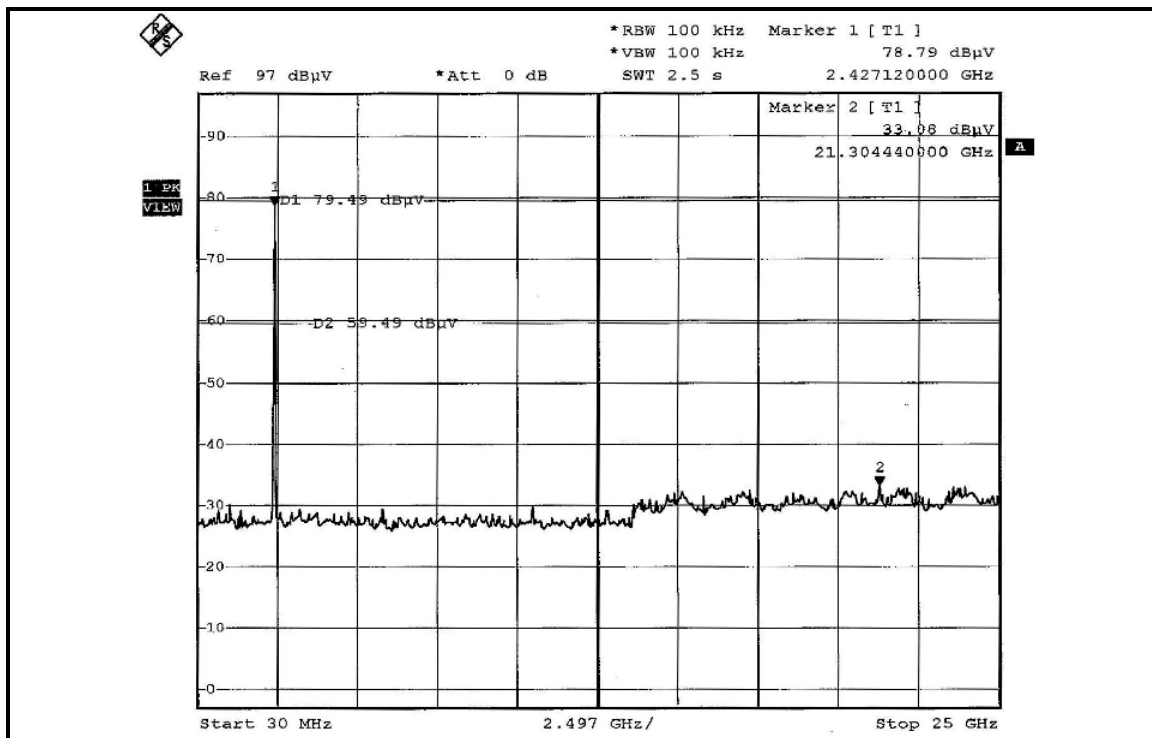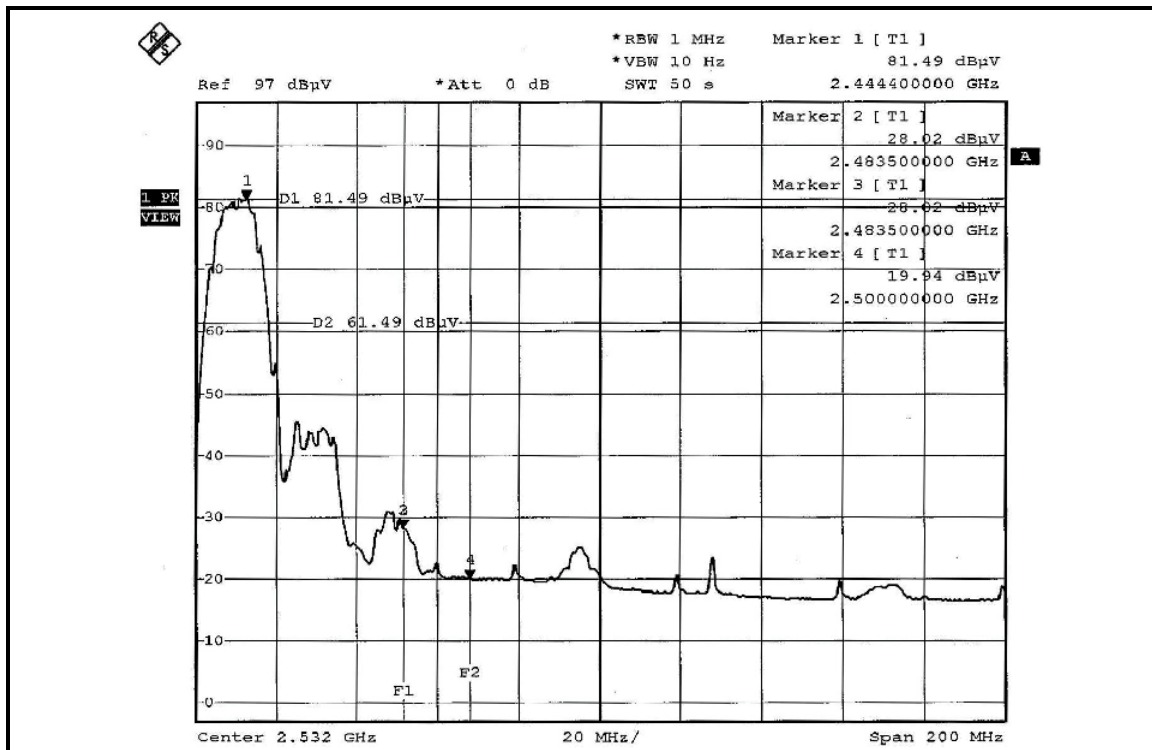
4.7 ANTENNA REQUIREMENT

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 diople antenna with UFL connector. The maximum Gain of the antenna is 2.18dBi.

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.

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

Linko RF Lab.
Tel: 886-3-3270910
Fax: 886-3-3270892

Web Site: 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.