



# FCC TEST REPORT

**REPORT NO.:** RF940321L07A

**MODEL NO.:** PN18

**RECEIVED:** Aug. 26, 2005

**TESTED:** Sep. 30 to Oct. 01, 2005

**ISSUED:** Oct. 13, 2005

**APPLICANT:** SHUTTLE INC.

**ADDRESS:** 5F, NO. 30, LANE 76, REI KUANG RD., NEI-HU DIST., TAIPEI, TAIWAN

**ISSUED BY:** Advance Data Technology Corporation

**LAB LOCATION:** No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien, Taiwan, R.O.C.

This test report consists of 37 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CNLA, A2LA or any government agencies. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.



0536  
ILAC MRA



No. 2177-01



## Table of Contents

1	CERTIFICATION.....	3
2	SUMMARY OF TEST RESULTS.....	4
3	GENERAL INFORMATION .....	5
3.1	GENERAL DESCRIPTION OF EUT.....	5
3.2	DESCRIPTION OF TEST MODES.....	6
3.3	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:.....	7
3.4	GENERAL DESCRIPTION OF APPLIED STANDARDS.....	8
3.5	DESCRIPTION OF SUPPORT UNITS.....	9
3.6	CONFIGURATION OF SYSTEM UNDER TEST .....	9
4	TEST TYPES AND RESULTS.....	10
4.1	RADIATED EMISSION MEASUREMENT .....	10
4.1.1	LIMITS OF RADIATED EMISSION MEASUREMENT .....	10
4.1.2	TEST INSTRUMENTS .....	11
4.1.3	TEST PROCEDURES.....	12
4.1.4	TEST SETUP.....	13
4.1.5	EUT OPERATING CONDITIONS.....	13
4.1.6	TEST RESULTS .....	14
4.1.7	TEST RESULTS – DSSS.....	15
4.1.8	TEST RESULTS – OFDM .....	18
4.2	MAXIMUM PEAK OUTPUT POWER .....	21
4.2.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT.....	21
4.2.2	TEST INSTRUMENTS .....	21
4.2.3	TEST PROCEDURES.....	22
4.2.4	TEST SETUP.....	22
4.2.5	EUT OPERATING CONDITIONS.....	22
4.2.6	TEST RESULTS - DSSS.....	23
4.2.7	TEST RESULTS - OFDM.....	24
4.3	BAND EDGES MEASUREMENT.....	25
4.3.1	LIMITS OF BAND EDGES MEASUREMENT.....	25
4.3.2	TEST INSTRUMENTS .....	25
4.3.3	TEST PROCEDURE.....	25
4.3.4	EUT OPERATING CONDITION .....	25
4.3.5	TEST RESULTS – DSSS.....	26
4.3.6	TEST RESULTS – OFDM .....	30
4.4	ANTENNA REQUIREMENT.....	34
4.4.1	STANDARD APPLICABLE.....	34
4.4.2	ANTENNA CONNECTED CONSTRUCTION.....	34
5	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	35
6	INFORMATION ON THE TESTING LABORATORIES .....	37



## 1 CERTIFICATION

**PRODUCT :** XPC 802.11 b/g Wireless Kit  
**BRAND NAME :** Shuttle  
**MODEL NO. :** PN18  
**TESTED:** Sep. 30 to Oct. 01, 2005  
**APPLICANT :** SHUTTLE INC.  
**TEST ITEM:** ENGINEERING SAMPLE  
**STANDARDS :** 47 CFR Part 15, Subpart C (Section 15.247),  
ANSI C63.4-2003

The above equipment (Model: PN18) has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY :** Midoli Peng , **DATE:** Oct. 13, 2005  
( Midoli Peng )

**TECHNICAL ACCEPTANCE :** Hank Chung , **DATE:** Oct. 13, 2005  
Responsible for RF ( Hank Chung )

**APPROVED BY :** May Chen , **DATE:** Oct. 13, 2005  
( May Chen, Deputy Manager )



## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

<b>APPLIED STANDARD: 47 CFR Part 15, Subpart C</b>			
<b>Standard Section</b>	<b>Test Type and Limit</b>	<b>Result</b>	<b>REMARK</b>
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit
15.247(c)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -1.5dB at 4924.00MHz
15.247(c)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit

NOTE: This report is prepared for FCC class II permissive change. Only radiated emission, Maximum Peak Output Power and Band Edge Measurement were presented in this test report.

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	XPC 802.11 b/g Wireless Kit
<b>MODEL NO.</b>	PN18
<b>POWER SUPPLY</b>	DC 5V from host equipment
<b>MODULATION TYPE</b>	BPSK, QPSK, CCK, 16QAM, 64QAM
<b>RADIO TECHNOLOGY</b>	DSSS, OFDM
<b>TRANSFER RATE</b>	1/2/5.5/6/9/11/12/18/24/36/48/54Mbps
<b>FREQUENCY RANGE</b>	2412MHz ~ 2462MHz
<b>NUMBER OF CHANNEL</b>	11
<b>OUTPUT POWER</b>	18.06 dBm
<b>ANTENNA TYPE</b>	Please see note 1
<b>DATA CABLE</b>	USB Cable 0.1m (Shielded, W/O Core)
<b>I/O PORTS</b>	USB Port *1
<b>ASSOCIATED DEVICES</b>	Module *1 Antenna *2 (Dipole*1,Pifa*1) Antenna cable *1 (16.3cm , For Dipole use) USB Cable *1

#### NOTE:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.:RF940321L07 design is as the following:

<b>Antennas of Report No.:RF940321L07</b>			
No.	Antenna Type	Gain (dBi)	Antenna Connector
1	Dipole Antenna	2	SMA( RP-SMA)
<b>◆ Add two new antennas</b>			
No.	Antenna Type	Gain (dBi)	Antenna Connector
1	Dipole Antenna	2	RP-SMA(M)
2	PIFA Antenna	3	I-PEX

2. There is one antenna provided to this EUT, and following two different types could be chosen:

No.	Antenna Type	Gain (dBi)	Antenna Connector
1	Dipole Antenna	2	RP-SMA(M)
2	PIFA Antenna	3	I-PEX

From the above antenna, the **PIFA Antenna** was selected as representative model for the test and its data was recorded in this report.



3. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

Operated in 2400 ~ 2483.5MHz band:

For 802.11b/g: Eleven channels are provided to this EUT.

Channel	Frequency	Channel	Frequency
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		



**3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:**

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	X	X	X	X	NA

Where RE≥1G: Radiated Emission above 1GHz RE<1G RE: Radiated Emission below 1GHz  
 APCM: Antenna Port Conducted Measurement

**Radiated Emission Test (Below 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11g	1 to 11	11	OFDM	BPSK	6

**Radiated Emission Test (Above 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	CCK	11
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6

**Bandedge Measurement:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	1, 11	DSSS	CCK	11
802.11g	1 to 11	1, 11	OFDM	BPSK	6

**Antenna Port Conducted Measurement:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	CCK	11
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6



### **3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a XPC 802.11 b/g Wireless Kit. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**47 CFR Part 15, Subpart C. (15.247)**  
**ANSI C63.4 : 2003**

All tests have been performed and recorded as per the above standards.

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of 47 CFR Part 15, Subpart B, Class B (DoC). The test report has been issued separately.





### 3.5 DESCRIPTION OF SUPPORT UNITS

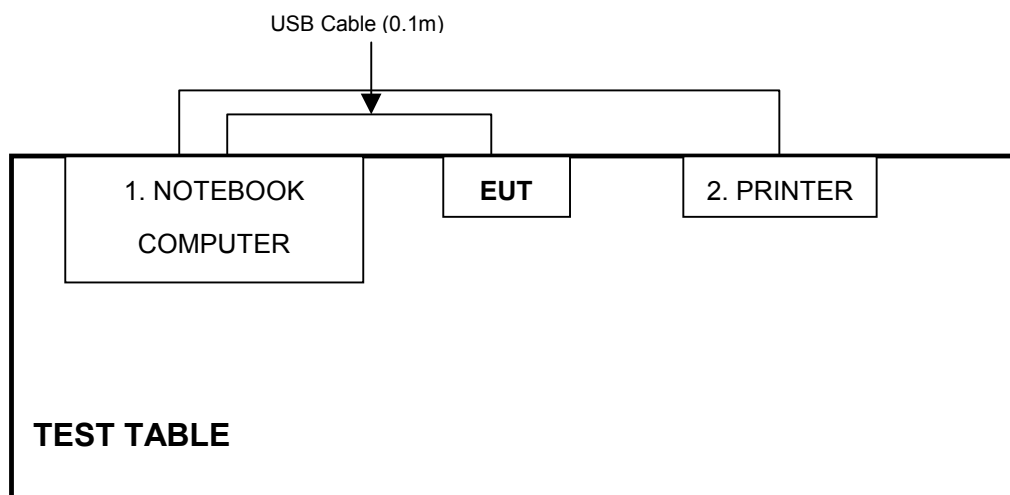
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook Computer	ASUS	A2400H	49NG038481	NA
2	PRINTER	HP	C2642A	MY79F1C3MZ	B94C2642X

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core.

**NOTE:** All power cords of the above support units are non-shielded (1.8m).

### 3.6 CONFIGURATION OF SYSTEM UNDER TEST



**NOTE:** 1. Please refer to the photos of test configuration in Item 5 also.



## 4 TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 07, 2006
HP Pre_Amplifier	8449B	3008A01922	Oct. 02, 2006
ROHDE & SCHWARZ Test Receiver	ESCS30	100287	Dec. 08, 2005
CHASE Broadband Antenna	VULB9168	138	Dec. 21, 2005
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 11, 2005
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 30, 2006
SCHWARZBECK Biconical Antenna	VHBA9123	459	Jun. 26, 2006
SCHWARZBECK Periodic Antenna	UPA6108	1148	Jun. 26, 2006
RF Switches (ARNITSU)	CS-201	1565157	NA
RF CABLE (Chaintek) 1GHz-20GHz	SF102	22054-2	Nov. 15, 2005
RF Cable(RICHTEC)	9913-30M	STCCAB-30M- 1GHz-021	Jul. 16, 2006
Software	ADT_Radiated_V 5.14	NA	NA
CHANCE MOST Antenna Tower	AT-100	0203	NA
CHANCE MOST Turn Table	TT-100	0203	NA

Note: 1. The calibration interval of the above test instruments is 12 months (36 months for Periodic Antenna) and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in ADT Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 4824-3.
7. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated emissions (30MHz-1GHz)	2.98 dB
Radiated emissions (1GHz ~18GHz)	2.21 dB
Radiated emissions (18GHz ~20GHz)	1.88 dB



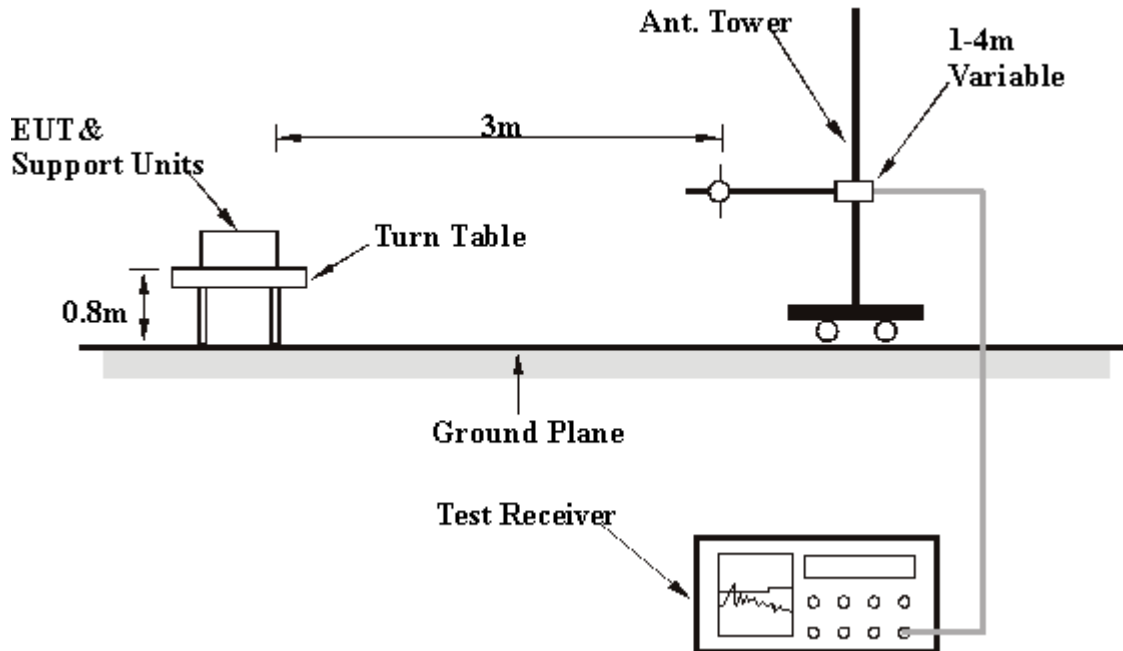
#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. 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. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

#### 4.1.4 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.1.5 EUT OPERATING CONDITIONS

- a. Connect the EUT with the support unit 1 (Notebook computer) via USB Cable.
- b. The support unit 1 (personal computer) ran a test program “ZD1212D V.2.0.0.0” to enable EUT under transmission condition continuously at specific channel frequency.
- c. Notebook computer sends "H" messages to printer, and the printer prints them on paper.



## 4.1.6 TEST RESULTS

<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 11	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25 deg. C, 73%RH, 968 hPa	<b>TESTED BY</b>	Eric Lee

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	133.00	29.40 QP	43.50	-14.10	1.54 H	23	16.90	12.50
2	180.23	35.10 QP	43.50	-8.40	1.60 H	356	22.50	12.60
3	199.99	33.30 QP	43.50	-10.20	1.45 H	52	22.10	11.20
4	253.66	43.20 QP	46.00	-2.80	1.00 H	50	29.90	13.30
5	268.13	40.70 QP	46.00	-5.30	1.11 H	65	26.10	14.60
6	299.90	36.60 QP	46.00	-9.40	1.63 H	326	20.30	16.30
7	406.38	33.90 QP	46.00	-12.10	1.11 H	236	15.30	18.60
8	526.90	35.50 QP	46.00	-10.50	1.86 H	98	13.90	21.60
9	600.00	35.00 QP	46.00	-11.00	1.15 H	32	11.50	23.50
10	800.01	35.60 QP	46.00	-10.40	1.52 H	249	9.00	26.60

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	79.97	22.00 QP	40.00	-18.00	1.47 V	87	12.10	9.90
2	125.09	28.20 QP	43.50	-15.30	1.23 V	65	16.30	11.90
3	200.00	29.40 QP	43.50	-14.10	1.36 V	65	18.20	11.20
4	233.10	36.80 QP	46.00	-9.20	1.11 V	25	24.20	12.60
5	249.90	38.20 QP	46.00	-7.80	1.85 V	24	24.90	13.30
6	264.00	33.10 QP	46.00	-12.90	1.23 V	65	19.10	14.00
7	300.36	30.50 QP	46.00	-15.50	1.11 V	25	14.20	16.30
8	436.36	32.50 QP	46.00	-13.50	1.43 V	210	13.20	19.30
9	589.36	38.50 QP	46.00	-7.50	1.02 V	36	15.20	23.30
10	600.00	33.80 QP	46.00	-12.20	1.33 V	9	10.30	23.50

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.



## 4.1.7 TEST RESULTS – DSSS

<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 1	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	53.00 PK	74.00	-21.00	1.24 H	341	19.30	33.70
1	2390.00	44.30 AV	54.00	-9.70	1.24 H	341	10.60	33.70
2	*2412.00	109.20 PK			1.24 H	341	79.40	29.80
2	*2412.00	103.20 AV			1.24 H	341	73.40	29.80
3	4824.00	55.60 PK	74.00	-18.40	1.13 H	58	20.50	35.10
3	4824.00	45.00 AV	54.00	-9.00	1.13 H	58	9.90	35.10
4	7236.00	48.50 PK	74.00	-25.50	1.01 H	326	8.00	40.50
4	7236.00	37.70 AV	54.00	-16.30	1.01 H	326	-2.80	40.50

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	47.30 PK	74.00	-26.70	1.60 V	349	13.60	33.70
1	2390.00	37.70 AV	54.00	-16.30	1.60 V	349	4.00	33.70
2	*2412.00	103.50 PK			1.60 V	349	73.70	29.80
2	*2412.00	96.60 AV			1.60 V	349	66.80	29.80
3	4824.00	55.90 PK	74.00	-18.10	1.28 V	348	20.80	35.10
3	4824.00	51.70 AV	54.00	-2.30	1.28 V	348	16.60	35.10
4	7236.00	49.70 PK	74.00	-24.30	1.24 V	297	9.20	40.50
4	7236.00	38.10 AV	54.00	-15.90	1.24 V	297	-2.40	40.50

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. " \* " : Fundamental frequency



<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 6	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	109.40 PK			1.18 H	342	79.50	29.90
1	*2437.00	103.50 AV			1.18 H	342	73.60	29.90
2	4874.00	56.20 PK	74.00	-17.80	1.11 H	47	20.90	35.30
2	4874.00	45.70 AV	54.00	-8.30	1.11 H	47	10.40	35.30
3	7311.00	48.90 PK	74.00	-25.10	1.00 H	349	8.20	40.70
3	7311.00	37.70 AV	54.00	-16.30	1.00 H	349	-3.00	40.70

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	104.70 PK			1.55 V	351	74.80	29.90
1	*2437.00	97.70 AV			1.55 V	351	67.80	29.90
2	4874.00	55.40 PK	74.00	-18.60	1.26 V	346	20.10	35.30
2	4874.00	52.30 AV	54.00	-1.70	1.26 V	346	17.00	35.30
3	7311.00	49.70 PK	74.00	-24.30	1.21 V	306	9.00	40.70
3	7311.00	38.20 AV	54.00	-15.80	1.21 V	306	-2.50	40.70

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. “ \* “ : Fundamental frequency





<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 11	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.70 PK			1.12 H	345	79.70	30.00
1	*2462.00	103.70 AV			1.12 H	345	73.70	30.00
2	2483.50	53.30 PK	74.00	-20.70	1.12 H	345	23.20	30.10
2	2483.50	42.50 AV	54.00	-11.50	1.12 H	345	12.40	30.10
3	4924.00	56.60 PK	74.00	-17.40	1.09 H	63	21.00	35.50
3	4924.00	46.30 AV	54.00	-7.70	1.09 H	63	10.70	35.50
4	7386.00	50.00 PK	74.00	-24.00	1.00 H	357	9.20	40.80
4	7386.00	38.70 AV	54.00	-15.30	1.00 H	357	-2.10	40.80

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	104.20 PK			1.52 V	352	74.20	30.00
1	*2462.00	97.30 AV			1.52 V	352	67.30	30.00
2	2483.50	47.80 PK	74.00	-26.20	1.52 V	352	17.70	30.10
2	2483.50	36.10 AV	54.00	-17.90	1.52 V	352	6.00	30.10
3	4924.00	55.50 PK	74.00	-18.50	1.25 V	353	19.90	35.50
<b>3</b>	<b>4924.00</b>	<b>52.50 AV</b>	<b>54.00</b>	<b>-1.50</b>	<b>1.25 V</b>	<b>353</b>	<b>16.90</b>	<b>35.50</b>
4	7386.00	50.60 PK	74.00	-23.40	1.18 V	322	9.80	40.80
4	7386.00	39.00 AV	54.00	-15.00	1.18 V	322	-1.80	40.80

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. “ \* ” : Fundamental frequency



## 4.1.8 TEST RESULTS – OFDM

<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 1	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	60.00 PK	74.00	-14.00	1.26 H	342	26.30	33.70
1	2390.00	47.50 AV	54.00	-6.50	1.26 H	342	13.80	33.70
2	*2412.00	105.20 PK			1.26 H	342	75.40	29.80
2	*2412.00	97.70 AV			1.26 H	342	67.90	29.80
3	4824.00	53.00 PK	74.00	-21.00	1.21 H	76	17.90	35.10
3	4824.00	43.50 AV	54.00	-10.50	1.21 H	76	8.40	35.10
4	7236.00	47.70 PK	74.00	-26.30	1.04 H	319	7.20	40.50
4	7236.00	36.50 AV	54.00	-17.50	1.04 H	319	-4.00	40.50

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	53.00 PK	74.00	-21.00	1.59 V	347	19.30	33.70
1	2390.00	40.20 AV	54.00	-13.80	1.59 V	347	6.50	33.70
2	*2412.00	98.20 PK			1.59 V	347	68.40	29.80
2	*2412.00	90.40 AV			1.59 V	347	60.60	29.80
3	4824.00	55.20 PK	74.00	-18.80	1.27 V	343	20.10	35.10
3	4824.00	51.20 AV	54.00	-2.80	1.27 V	343	16.10	35.10
4	7236.00	48.40 PK	74.00	-25.60	1.22 V	284	7.90	40.50
4	7236.00	37.00 AV	54.00	-17.00	1.22 V	284	-3.50	40.50

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. “ \* “ : Fundamental frequency



<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 6	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	105.50 PK			1.19 H	341	75.60	29.90
1	*2437.00	98.10 AV			1.19 H	341	68.20	29.90
2	4874.00	53.40 PK	74.00	-20.60	1.13 H	64	18.10	35.30
2	4874.00	43.80 AV	54.00	-10.20	1.13 H	64	8.50	35.30
3	7311.00	48.20 PK	74.00	-25.80	1.00 H	337	7.50	40.70
3	7311.00	36.90 AV	54.00	-17.10	1.00 H	337	-3.80	40.70

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	99.70 PK			1.54 V	352	69.80	29.90
1	*2437.00	91.70 AV			1.54 V	352	61.80	29.90
2	4874.00	55.00 PK	74.00	-19.00	1.26 V	353	19.70	35.30
2	4874.00	52.00 AV	54.00	-2.00	1.26 V	353	16.70	35.30
3	7311.00	48.90 PK	74.00	-25.10	1.21 V	312	8.20	40.70
3	7311.00	37.40 AV	54.00	-16.60	1.21 V	312	-3.30	40.70

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. " \* " : Fundamental frequency



<b>EUT</b>	XPC 802.11 b/g Wireless Kit	<b>MODEL</b>	PN18
<b>MODE</b>	Channel 11	<b>FREQUENCY RANGE</b>	1000~25000MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 67%RH, 968 hPa	<b>TESTED BY</b>	Rex Huang

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	105.90 PK			1.14 H	344	75.90	30.00
1	*2462.00	98.40 AV			1.14 H	344	68.40	30.00
2	2483.50	60.80 PK	74.00	-13.20	1.14 H	344	30.70	30.10
2	2483.50	47.70 AV	54.00	-6.30	1.14 H	344	17.60	30.10
3	4924.00	53.90 PK	74.00	-20.10	1.16 H	67	18.30	35.50
3	4924.00	44.30 AV	54.00	-9.70	1.16 H	67	8.70	35.50
4	7386.00	48.00 PK	74.00	-26.00	1.00 H	352	7.20	40.80
4	7386.00	37.00 AV	54.00	-17.00	1.00 H	352	-3.80	40.80

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	99.20 PK			1.53 V	353	69.20	30.00
1	*2462.00	91.30 AV			1.53 V	353	61.30	30.00
2	2483.50	54.10 PK	74.00	-19.90	1.53 V	353	24.00	30.10
2	2483.50	40.60 AV	54.00	-13.40	1.53 V	353	10.50	30.10
3	4924.00	54.90 PK	74.00	-19.10	1.27 V	347	19.30	35.50
3	4924.00	52.10 AV	54.00	-1.90	1.27 V	347	16.50	35.50
4	7386.00	49.00 PK	74.00	-25.00	1.19 V	324	8.20	40.80
4	7386.00	37.30 AV	54.00	-16.70	1.19 V	324	-3.50	40.80

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.
  5. The limit value is defined as per 15.247
  6. “ \* “ : Fundamental frequency



## 4.2 MAXIMUM PEAK OUTPUT POWER

### 4.2.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

### 4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2005
Agilent SIGNAL GENERATOR	E8257C	MY43320668	Dec. 07, 2005
TEKTRONIX OSCILLOSCOPE	TDS380	B016335	Jun. 22, 2006
NARDA DETECTOR	4503A	FSCM99899	NA

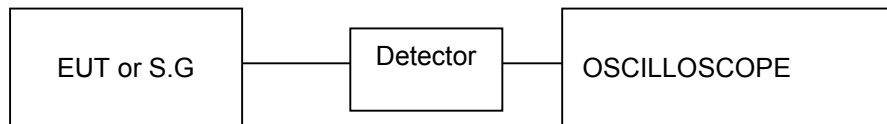
**NOTE:**

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

#### 4.2.3 TEST PROCEDURES

1. A detector was used on the output port of the EUT. An oscilloscope was used to read the peak response of the detector.
2. Replaced the EUT by the signal generator. The center frequency of the S.G was adjusted to the center frequency of the measured channel.
3. Adjusted the power to have the same peak reading on oscilloscope. Record the power level.

#### 4.2.4 TEST SETUP



#### 4.2.5 EUT OPERATING CONDITIONS

Same as Item 4.3.5



## 4.2.6 TEST RESULTS - DSSS

<b>EUT</b>	XPC 802.11 b/g Wireless Kit		
<b>MODEL</b>	PN18	<b>ENVIRONMENTAL CONDITIONS</b>	26 deg. C, 64%RH, 968 hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Rex Huang

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>PEAK POWER OUTPUT (dBm)</b>	<b>PEAK POWER LIMIT (dBm)</b>	<b>PASS/FAIL</b>
1	2412	17.84	30	PASS
6	2437	18.06	30	PASS
11	2462	18.02	30	PASS



## 4.2.7 TEST RESULTS - OFDM

<b>EUT</b>	XPC 802.11 b/g Wireless Kit		
<b>MODEL</b>	PN18	<b>ENVIRONMENTAL CONDITIONS</b>	26 deg. C, 64%RH, 968 hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Rex Huang

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>PEAK POWER OUTPUT (dBm)</b>	<b>PEAK POWER LIMIT (dBm)</b>	<b>PASS/FAIL</b>
1	2412	18.07	30	PASS
6	2437	18.05	30	PASS
11	2462	18.01	30	PASS





### 4.3 BAND EDGES MEASUREMENT

#### 4.3.1 LIMITS OF BAND EDGES MEASUREMENT

Below  $-20\text{dB}$  of the highest emission level of operating band (in 1MHz Resolution Bandwidth).

#### 4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2005

**NOTE:**

- 1.The measurement uncertainty is less than  $\pm 2.6\text{dB}$ , which is calculated as per the NAMAS document NIS81. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .
- 2.The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW spectrum analyzer to 1 MHz and set VBW spectrum analyzer to 10 Hz with suitable frequency span including 1 MHz bandwidth from band edge. The band edges was measured and recorded.

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

#### 4.3.4 EUT OPERATING CONDITION

Same as Item 4.3.5



#### 4.3.5 TEST RESULTS – DSSS

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

Note - The delta method is only used up to 2 MHz away from the restricted bandage, The radiated emissions which located in other restricted frequency band, the result, please refer to 4.2.

##### **NOTE (Peak):**

The band edge emission plot of DSSS technique on the following first page show 56.67dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2 is 109.2dBuV/m, so the maximum field strength in restrict band is  $109.2-56.67=52.53$ dBuV/m which is under 74 dBuV/m limit.

The band edge emission plot of DSSS technique on the following first page shows 56.37dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2 is 109.7dBuV/m, so the maximum field strength in restrict band is  $109.7-56.37=53.33$ dBuV/m which is under 74 dBuV/m limit.

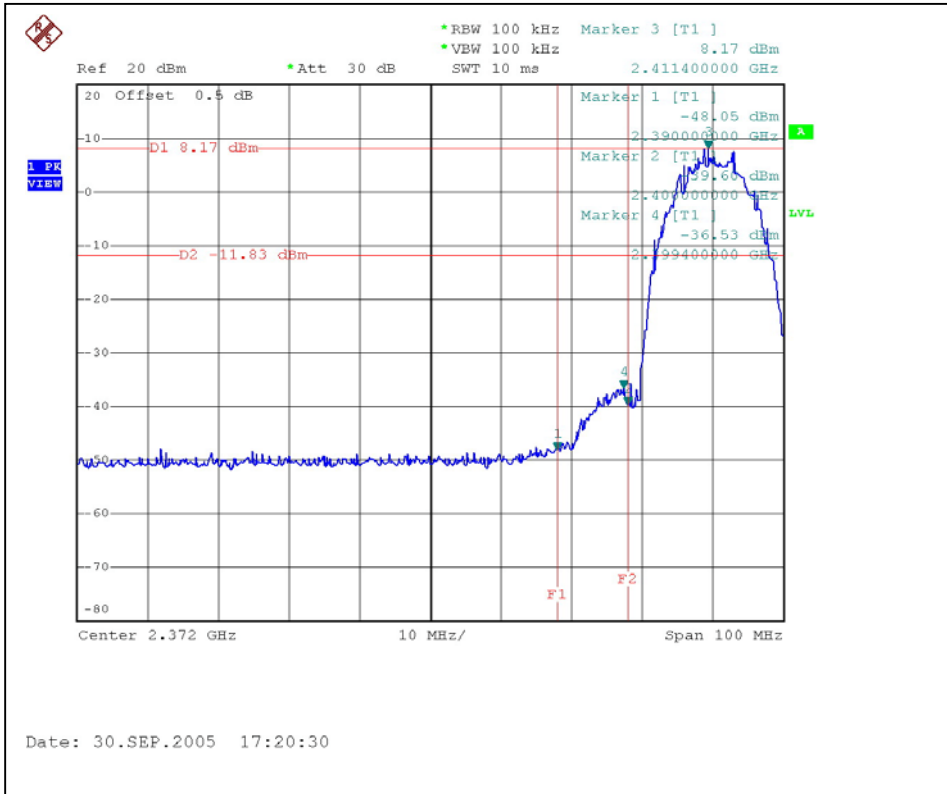
##### **NOTE (Average):**

The band edge emission plot of DSSS technique on the following second page shows 58.93dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2 is 103.2dBuV/m, so the maximum field strength in restrict band is  $103.2-58.93=44.27$ dBuV/m which is under 54 dBuV/m limit.

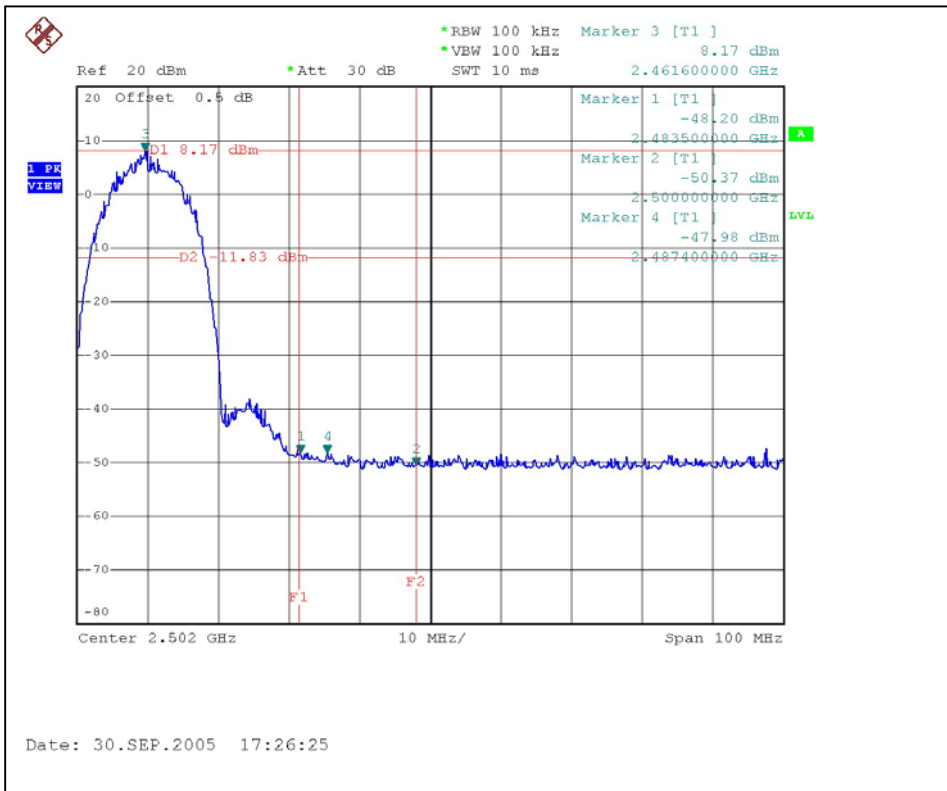
The band edge emission plot of DSSS technique on the following second page shows 61.22dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2 is 103.7dBuV/m, so the maximum field strength in restrict band is  $103.7-61.22=42.48$ dBuV/m which is under 54 dBuV/m limit.



CH1

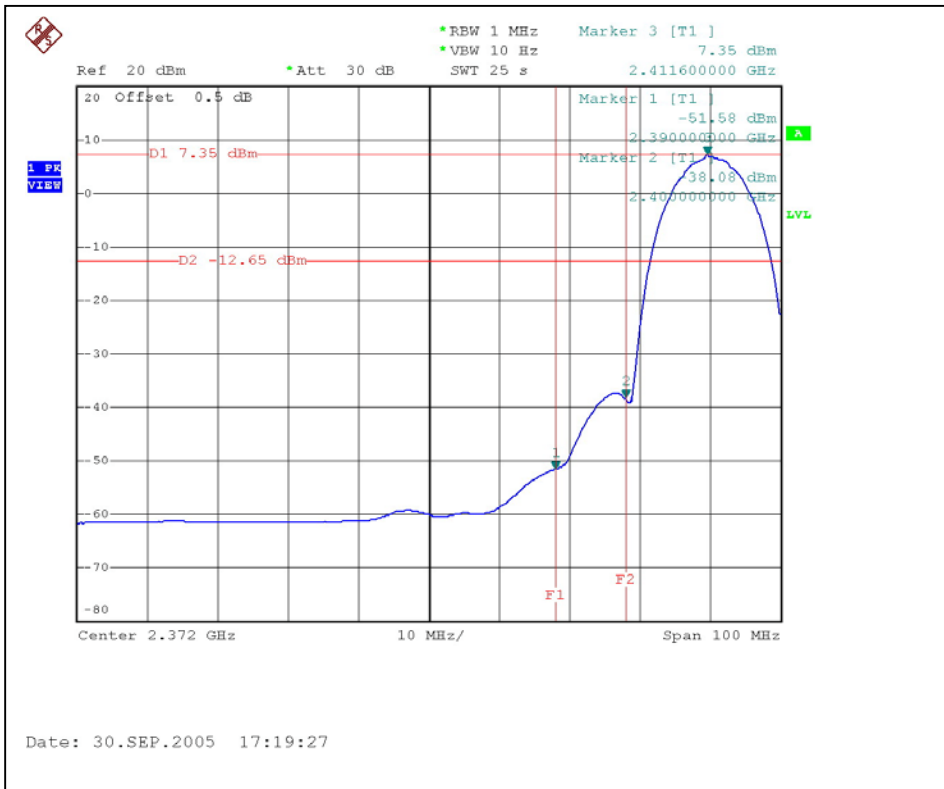


CH11

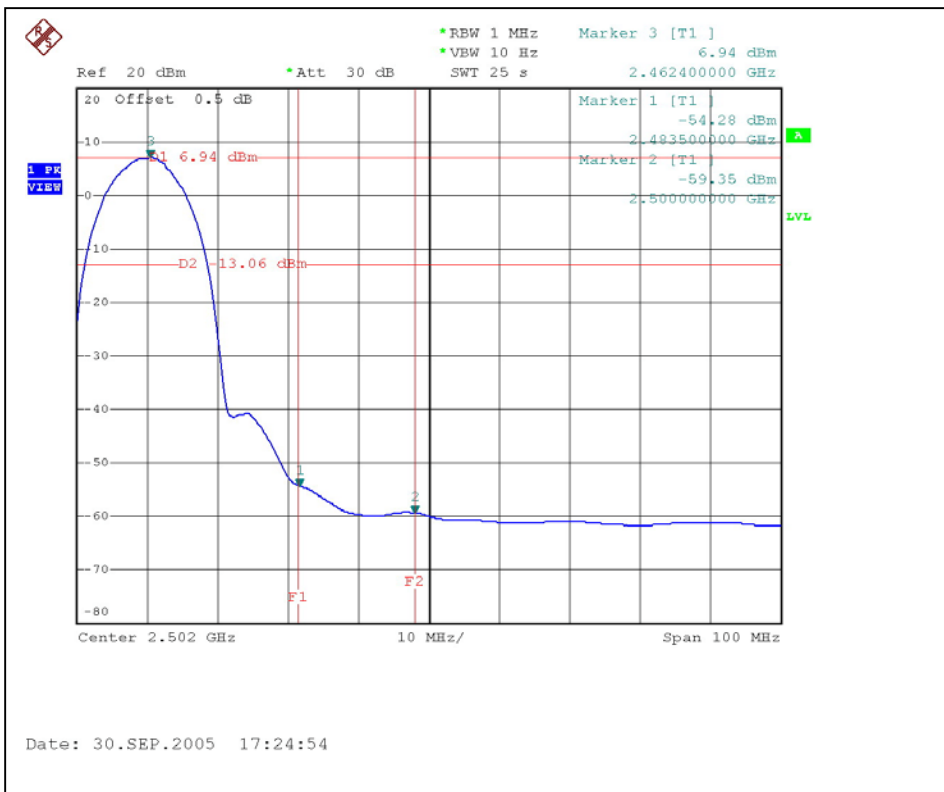




CH1

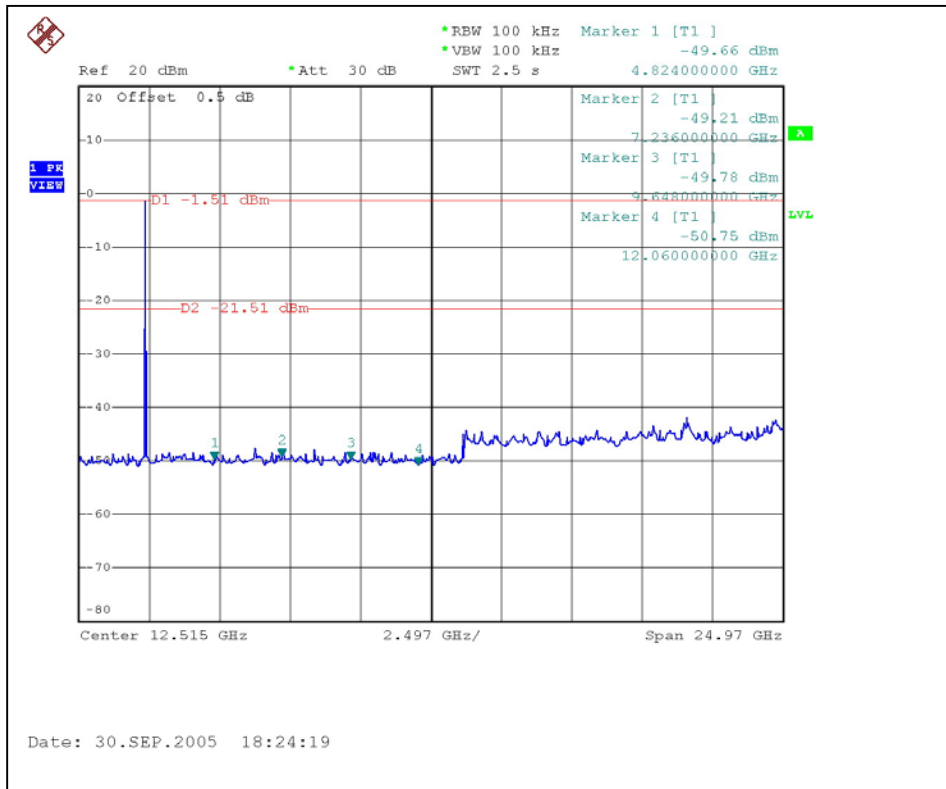


CH11

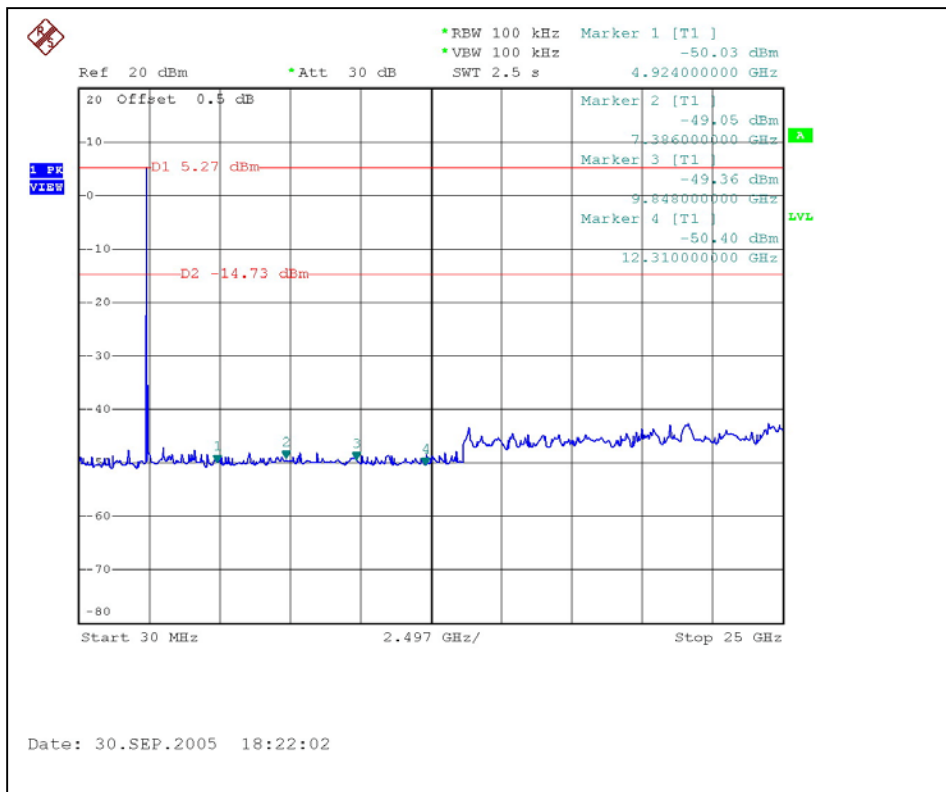




CH1



CH11





#### 4.3.6 TEST RESULTS – OFDM

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

Note - The delta method is only used up to 2 MHz away from the restricted bandage, The radiated emissions which located in other restricted frequency band, the result, please refer to 4.2.

##### **NOTE (Peak):**

The band edge emission plot of OFDM technique on the following first page show 45.23dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2 is 105.2dBuV/m, so the maximum field strength in restrict band is  $105.2-45.23=59.97$ dBuV/m which is under 74 dBuV/m limit.

The band edge emission plot of OFDM technique on the following first page shows 45.13dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2 is 105.9dBuV/m, so the maximum field strength in restrict band is  $105.9-45.13=60.77$ dBuV/m which is under 74 dBuV/m limit.

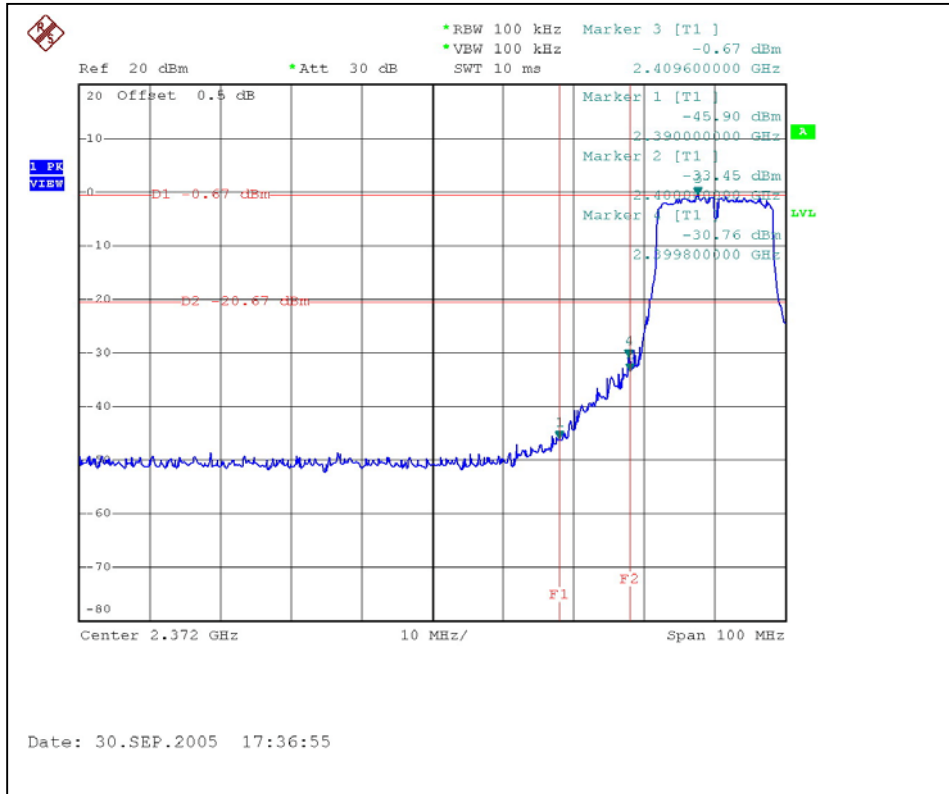
##### **NOTE (Average):**

The band edge emission plot of OFDM technique on the following second page shows 50.16dB delta between carrier maximum power and local maximum emission in restrict band (2.3900GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2 is 97.7dBuV/m, so the maximum field strength in restrict band is  $97.7-50.16=47.54$ dBuV/m which is under 54 dBuV/m limit.

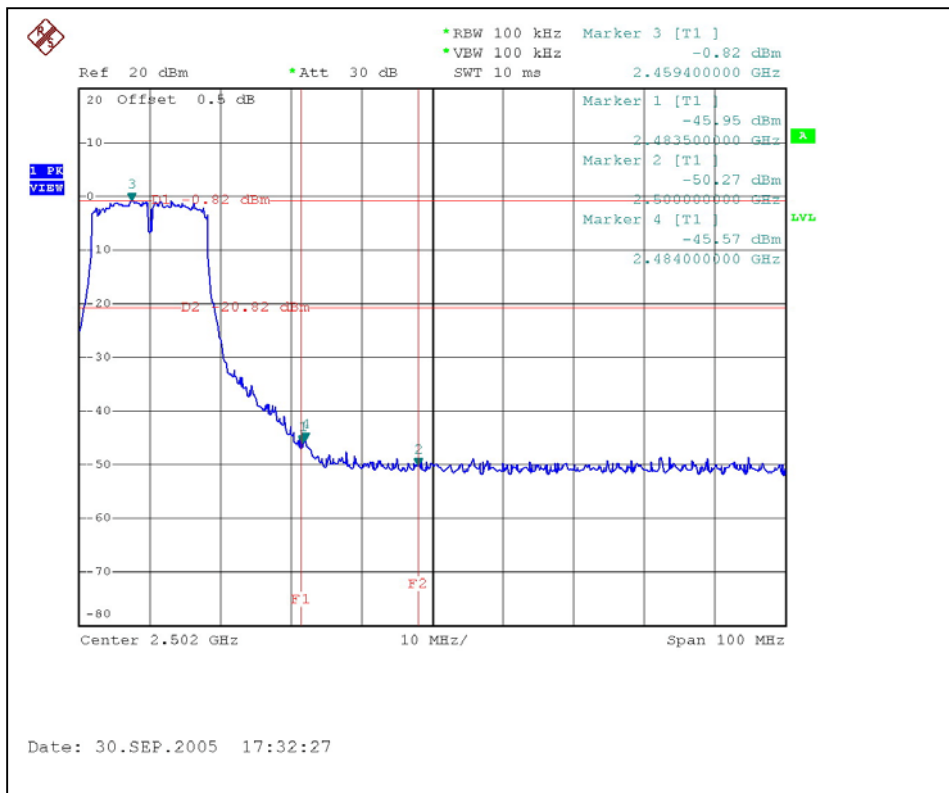
The band edge emission plot of OFDM technique on the following second page shows 50.7dB delta between carrier maximum power and local maximum emission in restrict band (2.4835GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.2 is 98.4dBuV/m, so the maximum field strength in restrict band is  $98.4-50.7=47.7$ dBuV/m which is under 54 dBuV/m limit.



CH1

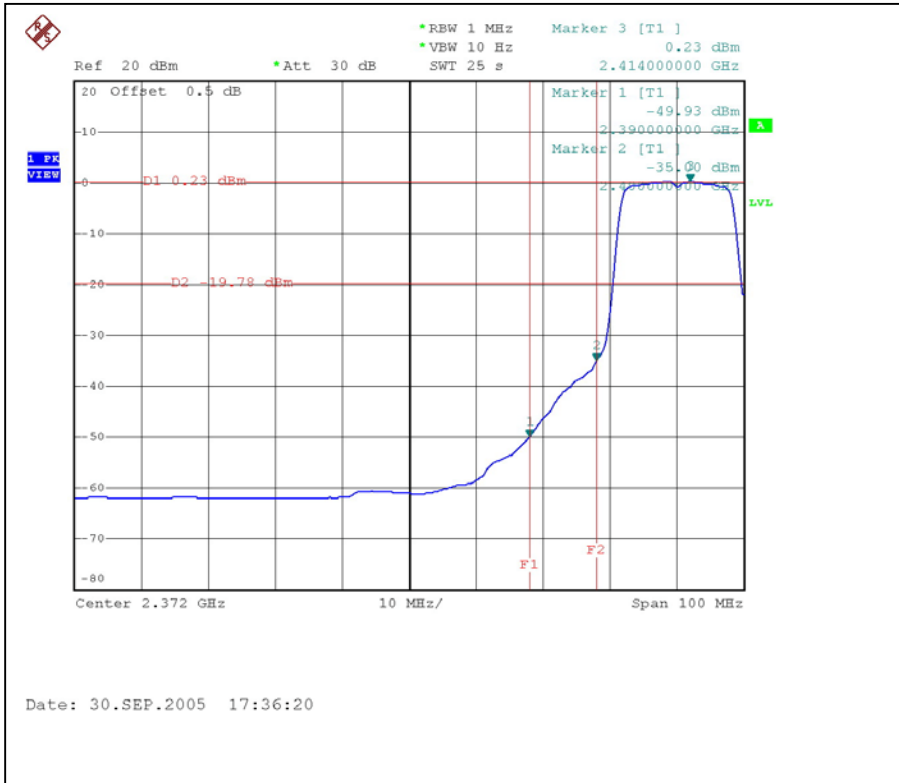


CH11

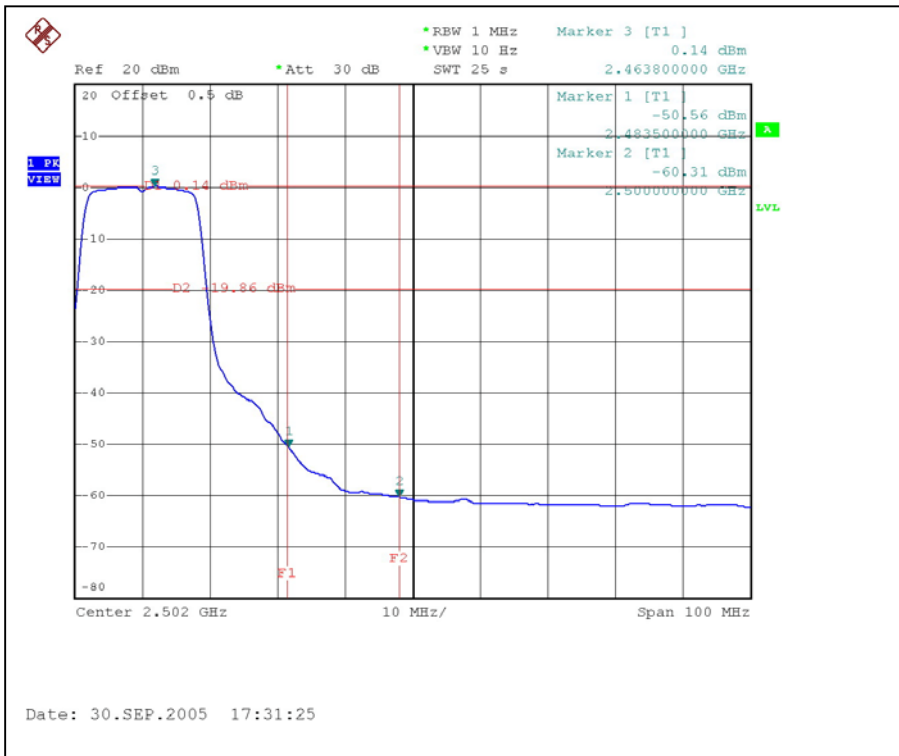




CH1



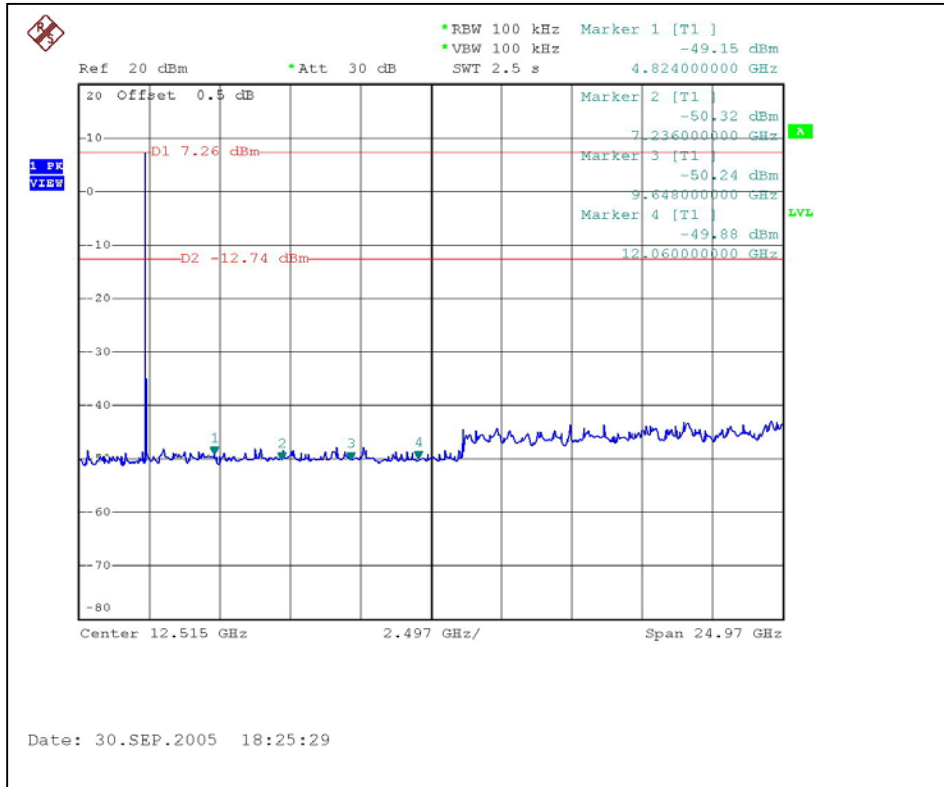
CH11



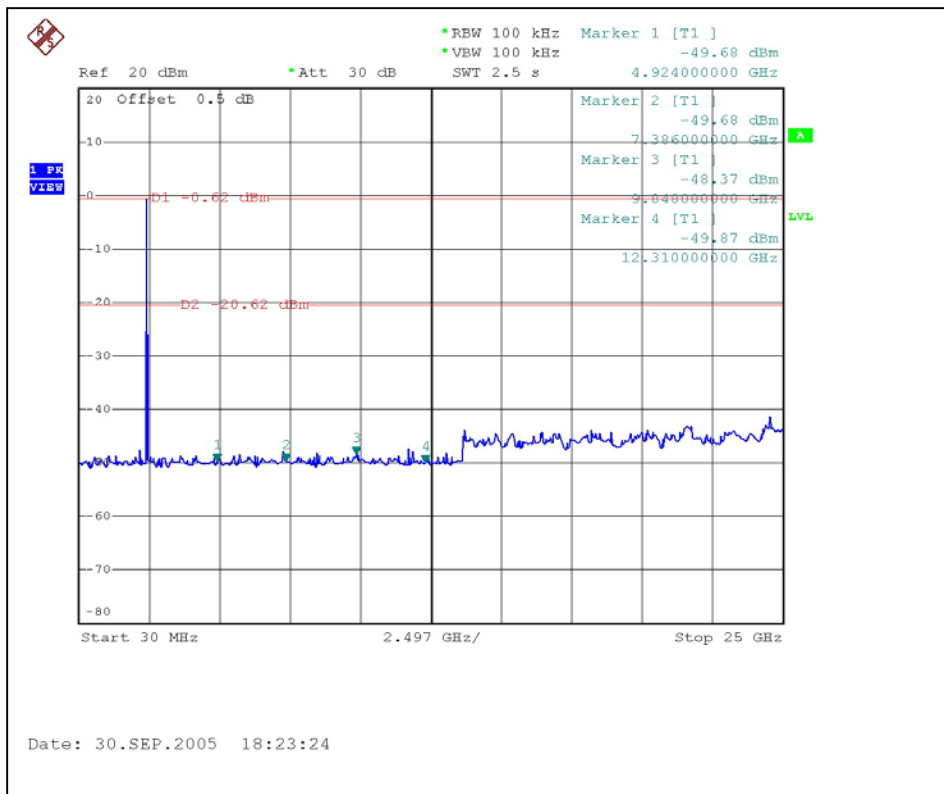




CH1



CH11





## **4.4 ANTENNA REQUIREMENT**

### **4.4.1 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.

### **4.4.2 ANTENNA CONNECTED CONSTRUCTION**

The antennas used in this product are Dipole antenna with RP-SMA(M) connector and PIFA Antenna with I-PEX connector.

Antenna 1: The maximum Gain of the antenna is 2dBi.

Antenna 2: The maximum Gain of the antenna is 3dBi.

## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

### RADIATED EMISSION TEST







## 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, NVLAP, 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: 886-2-26052943

**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

**Email:** [service@adt.com.tw](mailto:service@adt.com.tw)

**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.