

# FCC TEST REPORT (15.407)

**REPORT NO.:** RF930705L07C

**MODEL NO.:** DWL-7230AP, DWL-7200AP

**RECEIVED:** May 12, 2006

**TESTED:** May 15 to 25, 2006

**ISSUED:** May 26, 2006

**APPLICANT:** D-LINK CORPORATION

**ADDRESS:** No.289, Shinhu 3rd Rd., Neihu District,  
Taipie City 114, Taiwan, R.O.C.

**ISSUED BY:** Advance Data Technology Corporation

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

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No. 2177-01

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## 1. CERTIFICATION

**PRODUCT:** Wireless Access Point  
**BRAND NAME:** D-Link  
**MODEL NO.:** DWL-7230AP, DWL-7200AP  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**TESTED:** May 15 to 25, 2006  
**APPLICANT:** D-LINK CORPORATION  
**STANDARDS:** FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.4-2003

The above equipment (Model: DWL-7230AP) 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 :** Carol Liao , **DATE:** May 26, 2006  
( Carol Liao )

**TECHNICAL ACCEPTANCE :** Hank Chung , **DATE:** May 26, 2006  
Responsible for RF ( Hank Chung )

**APPROVED BY :** May Chen , **DATE:** May 26, 2006  
(May Chen, Deputy Manager )

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

<b>APPLIED STANDARD: FCC Part 15, Subpart E (Section 15.407)</b>			
<b>Standard Section</b>	<b>Test Type</b>	<b>Result</b>	<b>Remark</b>
15.407(b/1/2/3) (b)(5)	Electric Field Strength Spurious Emissions, 30MHz ~ 40000MHz	PASS	Meet the requirement of limit. Minimum passing margin is -0.8dB at 124.99MHz and 10640.00MHz
15.407(a/1/2/3)	Peak Transmit Power	PASS	Meet the requirement of limit.

**NOTE:**

1. The EUT was operating in 2.412 ~ 2.462GHz, 5.150 ~ 5.350GHz and 5.725 ~ 5.825GHz frequencies band. This report was recorded the RF parameters including 5.150 ~ 5.350GHz. For the 2.412 ~ 2.462GHz and 5.725 ~ 5.825GHz RF parameters was recorded in another test report.
2. 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>EUT</b>	Wireless Access Point
<b>MODEL NO.</b>	DWL-7230AP, DWL-7200AP
<b>FCC ID</b>	KA2-DWL7200APA1
<b>POWER SUPPLY</b>	48VDC from Power adapter or POE
<b>MODULATION TYPE</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>MODULATION TECHNOLOGY</b>	DSSS, OFDM
<b>TRANSFER RATE</b>	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11a: 54/48/36/24/18/12/9/6Mbps (Turbo mode: up to 108Mbps *see Note 1)
<b>FREQUENCY RANGE</b>	802.11b & 802.11g: 2412 ~ 2462MHz 802.11a: 5.15 ~ 5.35GHz and 5.725 ~ 5.850GHz
<b>NUMBER OF CHANNEL</b>	802.11b & 802.11g: 11 (1 for 802.11g Turbo mode) 802.11a: 13 (5 for 802.11a Turbo mode)
<b>CHANNEL SPACING</b>	802.11b & 802.11g: 5MHz 802.11a: 20MHz for Normal mode / 40MHz for Turbo mode
<b>OUTPUT POWER</b>	802.11b: 40.738mW 802.11g: 48.978mW 802.11a: 39.537mW
<b>DATA CABLE</b>	NA
<b>ANTENNA TYPE</b>	Please see note 3
<b>I/O PORTS</b>	See Note 5
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:**

1. This EUT is capable of providing data rates of up to 108Mbps in Turbo Mode depending upon reception quality.
2. The EUT is a Wireless Access Point, which contains two radios capable of simultaneous 802.11b/g (2.4GHz) and 802.11a (5GHz) operations.

3. There are two antennas provided to this EUT, please refer to the following table:

No.	Gain (dBi)	Antenna Type	Antenna Connector
1	5.0 ( for 2.4GHz & 5.0GHz )	Dipole	RP-SMA
2	-2.0(for 2.4GHz)	Printed	NA
	-1.07(for 5.15-5.35GHz)		
	3.02(for 5.725-5.85GHz)		

4. This report is prepared for FCC class II permissive change. The difference compared with the Report No.:RF930705L07 design is as the following:

- ◆ The function of printed antenna has been changed as below:

Original			
Gain (dBi)	Antenna Type	Antenna Connector	Remark
-2.0(for 2.4GHz)	Printed	NA	Rx function only
-1.07(for 5.15-5.35GHz)			
3.02(for 5.725-5.85GHz)			
New			
Gain (dBi)	Antenna Type	Antenna Connector	Remark
-2.0(for 2.4GHz)	Printed	NA	Tx and Rx function
-1.07(for 5.15-5.35GHz)			
3.02(for 5.725-5.85GHz)			

- ◆ Parts of the components (Bead, Capacitance, Diode) have been changed.

5. The EUT has two model names both have following two samples:

Model Name	Samples
DWL-7230AP, DWL-7200AP	Sample 1: With one RJ 45 port
	Sample 2: With two RJ 45ports

Above samples were pre-tested in chamber, **Sample 1**, worst case one, was chosen for final test and its data was recorded in this report.

6. The EUT has following two model names:

Brand	Model Name	Difference
D-Link	DWL-7230AP	for marketing issue
D-Link	DWL-7200AP	for marketing issue

From the above models, model: **DWL-7230AP** was selected as representative model for the test and its data were recorded in this report.

7. The EUT was powered either adapter or POE (Power Over Ethernet):

<b>Adapter :</b>	
<b>Brand:</b>	Bothand Enterprise Inc.
<b>Model No.:</b>	SA06L48-V
<b>Input power :</b>	100-240V~0.6A 50-60Hz
<b>Output power :</b>	48V / 0.4A

<b>POE:</b>	
<b>Brand:</b>	Bothand Enterprise Inc.
<b>Model No.:</b>	EBU-101-T1
<b>Input power :</b>	100-240V ~ 0.6A, 50-60Hz
<b>Output power :</b>	48V===0.4A

8. 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 5150 ~ 5250MHz, 5250MHz ~ 5350MHz bands:

Eight channels are provided to this EUT for normal mode.

Channel	Frequency
1	5180 MHz
2	5200 MHz
3	5220 MHz
4	5240 MHz
5	5260 MHz
6	5280 MHz
7	5300 MHz
8	5320 MHz

Three channels are provided to this EUT for turbo mode.

Channel	Frequency
1	5210 MHz
2	5250 MHz
3	5290 MHz

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

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

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz  
 RE≥1G: Radiated Emission above 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)
802.11a	1 to 8	8	OFDM	BPSK	6

- The EUT was tested with the following test modes:

Test Mode	Sample	POWER
Mode A	Sample 1	Wth Adapter
Mode B	Sample 1	Wth Adapter & POE

#### **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)
802.11a	1 to 8	1, 4, 5, 8	OFDM	BPSK	6
802.11a Turbo	1 to 3	1, 2, 3	OFDM	BPSK	12

- The EUT was pre-tested in chamber as the following test modes:

Test Mode	Sample	POWER
Mode A	Sample 1	Wth Adapter
Mode B	Sample 1	Wth Adapter & POE

The worse radiated emission (Above 1 GHz) was found in **Mode A.**: The EUT with adapter, worse case one, was chosen for final test.

### **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)
802.11a	1 to 8	1, 8	OFDM	BPSK	6
802.11a Turbo	1 to 3	1, 3	OFDM	BPSK	12

### **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)
802.11a	1 to 8	1, 4, 5, 8	OFDM	BPSK	6
802.11a Turbo	1 to 3	1, 2, 3	OFDM	BPSK	12



### **3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a Wireless Access Point. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

#### **FCC Part 15, Subpart E (15.407)**

#### **ANSI C63.4-2003**

All test items 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 FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



### 3.4 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.

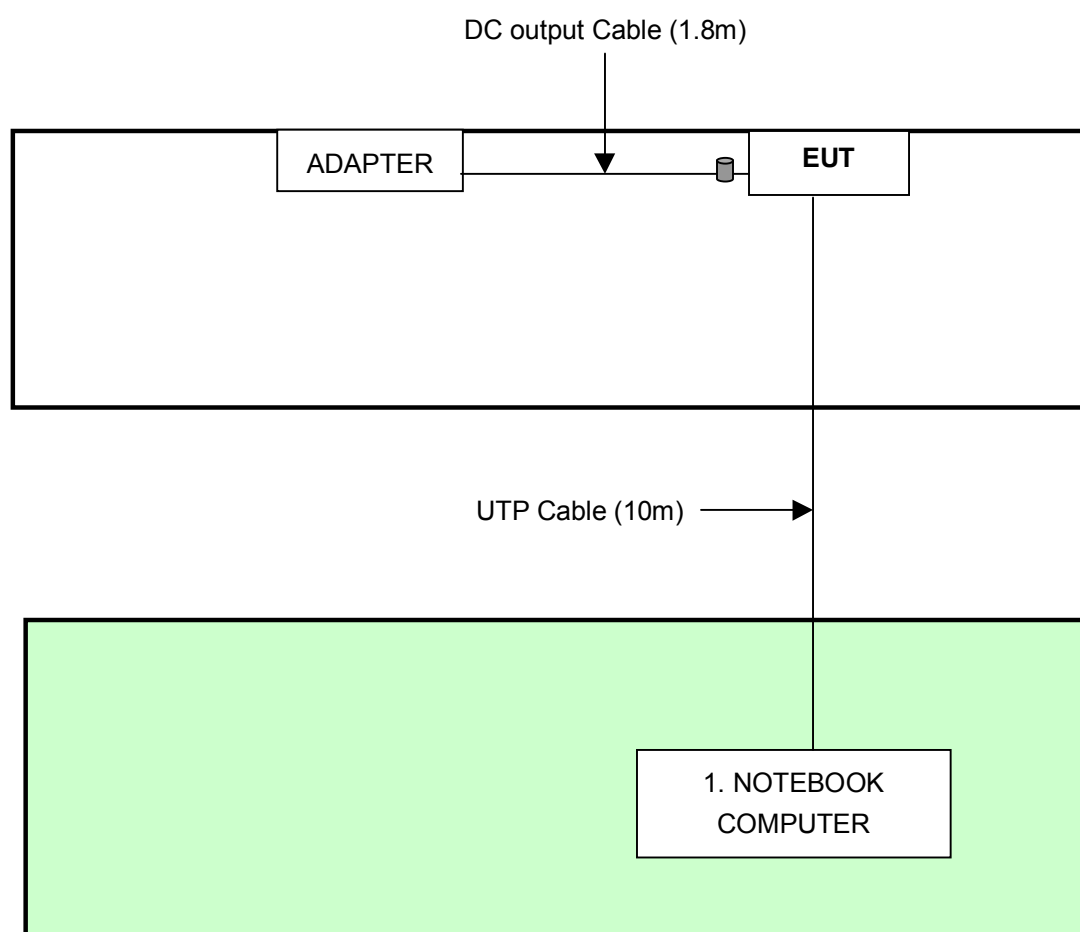
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook Computer	DELL	PP01L	TW-09C748- 12800-1A3-1999	FCC DoC

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

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

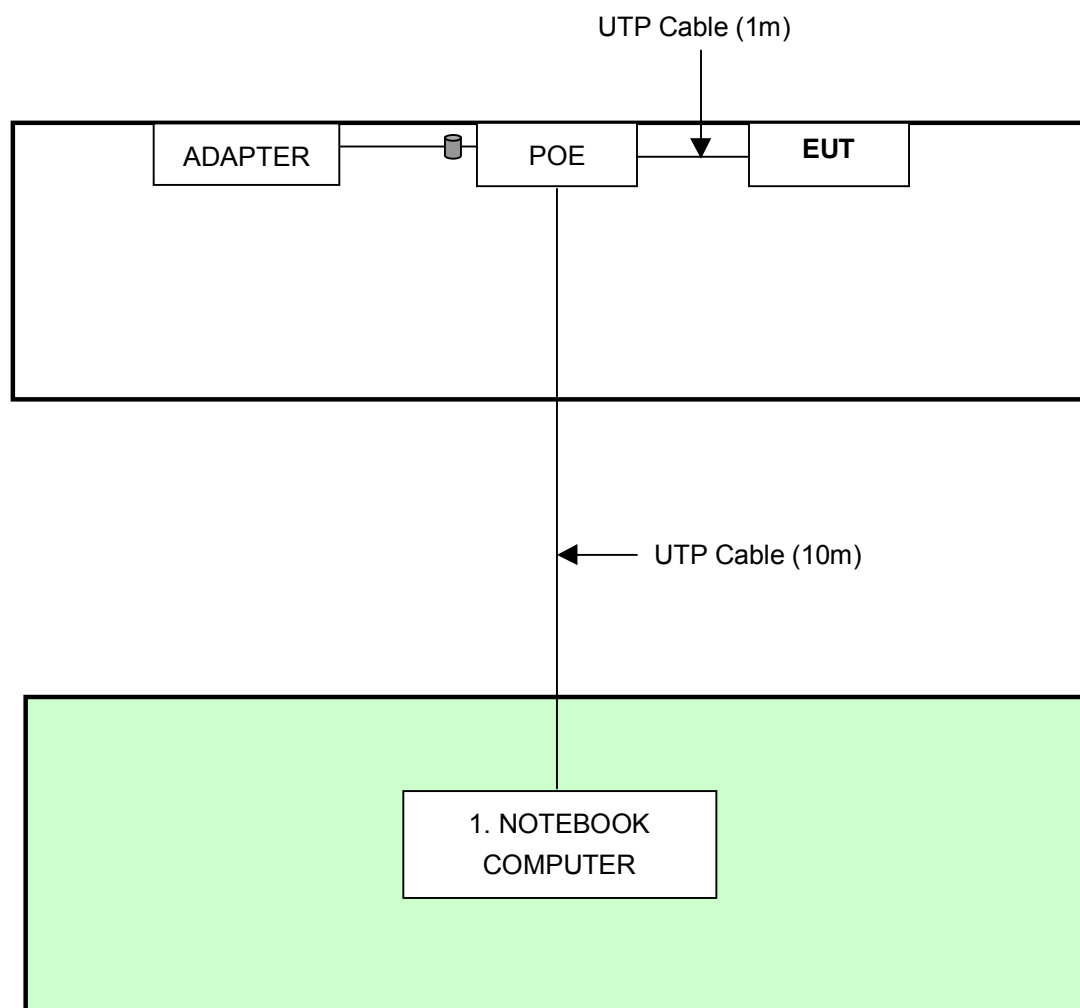
### 3.5 CONFIGURATION OF SYSTEM UNDER TEST

#### WITH ADAPTER:



- NOTE:**
1. Support unit 1 was kept in the control room during the test.
  2. Please refer to the photos of test configuration in Item 6 also.

**WITH POE:**



- NOTE:** 1. Support unit 1 was kept in the control room during the test.  
2. Please refer to the photos of test configuration in Item 6 also.

## 4. TEST TYPES AND RESULTS (5150 ~ 5350MHz Band)

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength at 3m (dB $\mu$ V/m) *note 3
5150~5250	-27	68.3
5250~5350	-27	68.3
5725~5825	-27 *note 1	68.3
	-17 *note 2	78.3

**NOTE:**

1. For frequencies 10MHz or greater above or below the band edge.
2. All emissions within the frequency range from the band edge to 10MHz above or below the band edge.
3. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

### 4.1.3 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	100375	Sep. 19, 2006
CHASE Broadband Antenna	VULB9168	138	Dec. 11, 2006
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 27, 2006
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 05, 2007
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)	SF102	22054-2	Nov. 16. 2006
RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M- 1GHz	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 ~40GHz)	1.88 dB

#### 4.1.4 TEST PROCEDURES

- 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. 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 10dB 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 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

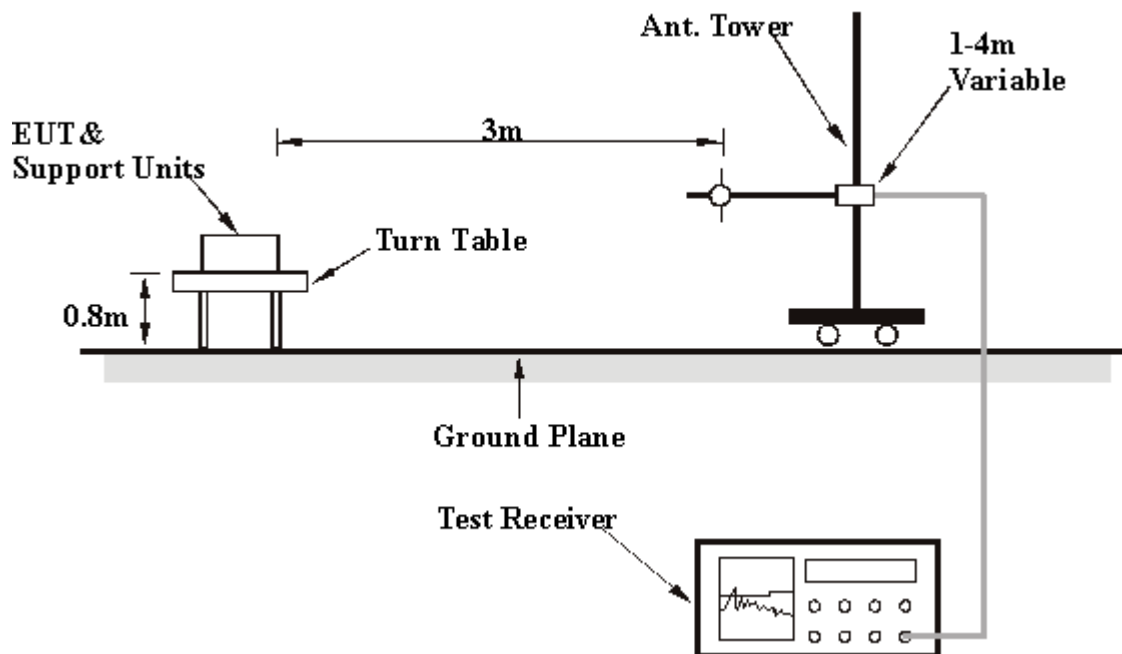
**NOTE:**

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 10 Hz for Average detection (AV) at frequency above 1GHz.

#### 4.1.5 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.6 TEST SETUP



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

#### 4.1.7 EUT OPERATING CONDITION

- a. Placed the EUT on the testing table.
- b. Prepared another computer system to act as a communication partner and placed it outside of testing area.
- c. The communication partner run “Art 48b5” test program to enable EUT under transmission/receiving condition continuously at specific channel frequency via UTP cable and wireless.

#### 4.1.8 TEST RESULTS

##### Below 1GHz Worst-Case Data

<b>TEST MODE</b>	With Adapter	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 59%RH, 969 hPa	<b>TESTED BY</b>	Tony Chen

##### 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	124.99	36.30 QP	43.50	-7.20	1.62 H	316	23.80	12.50
2	300.00	32.40 QP	46.00	-13.60	1.17 H	0	17.20	15.20
3	320.00	32.00 QP	46.00	-14.00	1.00 H	0	16.20	15.80
4	480.00	35.60 QP	46.00	-10.40	1.00 H	160	15.30	20.20
5	720.00	36.60 QP	46.00	-9.40	1.23 H	6	11.80	24.80
6	749.99	36.60 QP	46.00	-9.40	1.17 H	255	10.50	26.10
7	800.00	37.00 QP	46.00	-9.00	1.09 H	0	11.40	25.60
8	880.00	39.50 QP	46.00	-6.50	1.26 H	264	12.10	27.40
9	960.00	41.40 QP	46.00	-4.60	1.20 H	236	11.90	29.50

##### 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)
<b>1</b>	<b>124.99</b>	<b>42.70 QP</b>	<b>43.50</b>	<b>-0.80</b>	<b>1.05 V</b>	<b>246</b>	<b>30.30</b>	<b>12.50</b>
2	176.25	40.00 QP	43.50	-3.50	1.00 V	207	30.00	9.90
3	500.00	32.90 QP	46.00	-13.10	1.00 V	348	12.20	20.70
4	624.98	32.80 QP	46.00	-13.20	1.12 V	92	10.00	22.90
5	680.00	35.00 QP	46.00	-11.00	1.01 V	259	11.30	23.70
6	720.00	38.60 QP	46.00	-7.40	1.02 V	239	13.80	24.80
7	800.00	40.10 QP	46.00	-5.90	1.00 V	114	14.50	25.60
8	880.00	35.10 QP	46.00	-10.90	1.00 V	229	7.70	27.40
9	960.00	36.70 QP	46.00	-9.30	1.21 V	184	7.20	29.50

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
  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.



<b>TEST MODE</b>	Adapter+POE	<b>FREQUENCY RANGE</b>	30-1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Quasi-Peak, 120kHz
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 59%RH, 969 hPa	<b>TESTED BY</b>	Tony Chen

#### 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	124.99	40.90 QP	43.50	-2.60	2.62 H	339	28.40	12.50
2	174.99	32.90 QP	43.50	-10.60	2.37 H	0	22.90	10.10
3	320.00	34.70 QP	46.00	-11.30	1.00 H	359	18.90	15.80
4	439.99	40.10 QP	46.00	-5.90	1.00 H	262	20.80	19.30
5	749.98	34.30 QP	46.00	-11.70	1.17 H	267	8.20	26.10
6	760.00	39.60 QP	46.00	-6.40	1.08 H	37	13.60	26.00
7	800.00	32.50 QP	46.00	-13.50	1.11 H	23	6.90	25.60
8	839.99	34.00 QP	46.00	-12.00	1.00 H	30	7.10	26.90
9	879.99	43.30 QP	46.00	-2.70	1.00 H	4	16.00	27.40
10	919.99	34.60 QP	46.00	-11.40	1.00 H	5	6.30	28.30
11	959.99	35.70 QP	46.00	-10.30	1.00 H	348	6.30	29.50

#### 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	79.99	34.10 QP	40.00	-5.90	1.00 V	95	26.10	8.00
2	124.99	42.40 QP	43.50	-1.10	2.42 V	22	29.90	12.50
3	175.00	40.90 QP	43.50	-2.60	1.00 V	68	30.80	10.10
4	249.99	30.20 QP	46.00	-15.80	1.00 V	171	16.20	14.00
5	500.04	34.80 QP	46.00	-11.20	1.00 V	68	14.10	20.70
6	550.00	30.80 QP	46.00	-15.20	1.24 V	103	8.00	22.80
7	624.98	31.30 QP	46.00	-14.70	1.00 V	233	8.40	22.90
8	749.98	34.00 QP	46.00	-12.00	1.00 V	181	7.90	26.10
9	759.99	38.70 QP	46.00	-7.30	1.44 V	3	12.60	26.00
10	839.99	32.30 QP	46.00	-13.70	1.70 V	223	5.40	26.90
11	879.99	33.70 QP	46.00	-12.30	1.26 V	22	6.30	27.40

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB)
  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.



### 802.11a OFDM modulation

<b>CHANNEL</b>	Channel 1	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

#### 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	#5150.00	62.10 PK	74.00	-11.90	1.01 H	162	26.30	35.80
1	#5150.00	50.00 AV	54.00	-4.00	1.01 H	162	14.20	35.80
2	*5180.00	107.50 PK			1.01 H	162	71.70	35.80
2	*5180.00	96.60 AV			1.01 H	162	60.80	35.80
3	10360.00	63.60 PK	68.30	-4.70	1.80 H	15	19.50	44.10

#### 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	#5150.00	51.80 PK	74.00	-22.20	1.00 V	168	16.00	35.80
1	#5150.00	41.40 AV	54.00	-12.60	1.00 V	168	5.60	35.80
2	*5180.00	97.20 PK			1.00 V	168	61.40	35.80
2	*5180.00	88.00 AV			1.00 V	168	52.20	35.80
3	10360.00	65.80 PK	68.30	-2.50	1.98 V	60	21.60	44.10

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#":The radiated frequency falling in the restricted band.



<b>CHANNEL</b>	Channel 4	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b>								
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	*5240.00	107.10 PK			1.00 H	174	71.30	35.80
1	*5240.00	97.60 AV			1.00 H	174	61.80	35.80
2	10480.00	64.80 PK	68.30	-3.50	1.60 H	340	20.30	44.40

<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>								
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	*5240.00	99.30 PK			1.12 V	162	63.50	35.80
1	*5240.00	89.00 AV			1.12 V	162	53.20	35.80
2	10480.00	65.80 PK	68.30	-2.50	2.00 V	58	21.30	44.40

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#": The radiated frequency falling in the restricted band.





<b>CHANNEL</b>	Channel 5	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b>								
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	*5260.00	107.30 PK			1.00 H	174	71.50	35.80
1	*5260.00	97.80 AV			1.00 H	174	62.00	35.80
2	10520.00	64.30 PK	68.30	-4.00	1.61 H	300	19.60	44.70

<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>								
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	*5260.00	99.60 PK			1.11 V	166	63.80	35.80
1	*5260.00	89.40 AV			1.11 V	166	53.60	35.80
2	10520.00	65.30 PK	68.30	-3.00	1.03 V	214	20.60	44.70

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#" The radiated frequency falling in the restricted band.

<b>CHANNEL</b>	Channel 8	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

#### 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	*5320.00	106.30 PK			1.00 H	175	70.50	35.80
1	*5320.00	96.30 AV			1.00 H	175	60.50	35.80
2	#5350.00	57.10 PK	74.00	-16.90	1.00 H	175	21.30	35.80
2	#5350.00	43.80 AV	54.00	-10.20	1.00 H	175	8.00	35.80
3	#10640.00	65.60 PK	74.00	-8.40	1.80 H	15	19.70	45.90
3	#10640.00	51.70 AV	54.00	-2.30	1.80 H	15	5.80	45.90

#### 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	*5320.00	98.30 PK			1.11 V	162	62.50	35.80
1	*5320.00	87.60 AV			1.11 V	162	51.80	35.80
2	#5350.00	49.10 PK	74.00	-24.90	1.11 V	162	13.30	35.80
2	#5350.00	35.40 AV	54.00	-18.60	1.11 V	162	-0.40	35.80
3	#10640.00	66.70 PK	74.00	-7.30	1.07 V	236	20.80	45.90
<b>3</b>	<b>#10640.00</b>	<b>53.20 AV</b>	<b>54.00</b>	<b>-0.80</b>	<b>1.07 V</b>	<b>236</b>	<b>7.30</b>	<b>45.90</b>

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#"The radiated frequency falling in the restricted band.

### 802.11a Turbo OFDM modulation

<b>CHANNEL</b>	Channel 1	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	12Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

#### 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	#5150.00	62.00 PK	74.00	-12.00	1.00 H	176	26.20	35.80
1	#5150.00	49.00 AV	54.00	-5.00	1.00 H	176	13.20	35.80
2	*5210.00	104.00 PK			1.00 H	176	68.20	35.80
2	*5210.00	94.30 AV			1.00 H	176	58.50	35.80
3	10420.00	60.10 PK	68.30	-8.20	1.45 H	64	15.80	44.30

#### 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	#5150.00	52.80 PK	74.00	-21.20	1.85 V	160	17.00	35.80
1	#5150.00	39.40 AV	54.00	-14.60	1.85 V	160	3.60	35.80
2	*5210.00	94.80 PK			1.85 V	160	59.00	35.80
2	*5210.00	84.70 AV			1.85 V	160	48.90	35.80
3	10420.00	65.60 PK	68.30	-2.70	1.00 V	64	21.30	44.30

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#"The radiated frequency falling in the restricted band.



<b>CHANNEL</b>	Channel 2	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	12Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

#### 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	*5250.00	103.00 PK			1.00 H	177	67.20	35.80
1	*5250.00	93.80 AV			1.00 H	177	58.00	35.80
2	10500.00	60.70 PK	68.30	-7.60	1.50 H	341	16.20	44.50

#### 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	*5250.00	96.00 PK			1.12 V	161	60.20	35.80
1	*5250.00	85.80 AV			1.12 V	161	50.00	35.80
2	10500.00	65.00 PK	68.30	-3.30	1.98 V	62	20.50	44.50

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#":The radiated frequency falling in the restricted band.



<b>CHANNEL</b>	Channel 3	<b>FREQUENCY RANGE</b>	1 ~ 40 GHz
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	12Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>DETECTOR FUNCTION</b>	Peak(PK) Average (AV)
<b>ENVIRONMENTAL CONDITIONS</b>	27deg. C, 63%RH, 969hPa	<b>TESTED BY</b>	Tony Chen

#### 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	*5290.00	102.00 PK			1.00 H	176	66.20	35.80
1	*5290.00	93.00 AV			1.00 H	176	57.20	35.80
2	#5350.00	53.60 PK	74.00	-20.40	1.00 H	176	17.90	35.80
2	#5350.00	41.60 AV	54.00	-12.40	1.00 H	176	5.90	35.80
3	10580.00	61.70 PK	68.30	-6.60	1.44 H	340	16.50	45.30

#### 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	*5290.00	95.60 PK			1.25 V	168	59.80	35.80
1	*5290.00	84.90 AV			1.25 V	168	49.10	35.80
2	#5350.00	47.20 PK	74.00	-26.80	1.25 V	168	11.50	35.80
2	#5350.00	33.50 AV	54.00	-20.50	1.25 V	168	-2.20	35.80
3	10580.00	65.20 PK	68.30	-3.10	1.99 V	60	20.00	45.30

- NOTE:**
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. "\*" : Fundamental frequency
  6. "#" The radiated frequency falling in the restricted band.

## 4.2 PEAK TRANSMIT POWER MEASUREMENT

### 4.2.1 LIMITS OF PEAK TRANSMIT POWER MEASUREMENT

Frequency Band	Limit
5.15 – 5.25GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.725 – 5.825GHz	The lesser of 1W (30dBm) or 17dBm + 10logB

**NOTE:** Where B is the 26dB emission bandwidth in MHz.

### 4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP40	100036	Nov. 23, 2006

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, 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.

#### 4.2.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer.
2. Set span to encompass the entire emission bandwidth of the signal.
3. Set RBW to 1MHz, VBW to 300kHz.
4. Using the spectrum analyzer's channel power measurement function to measure the output power.

**NOTE:**

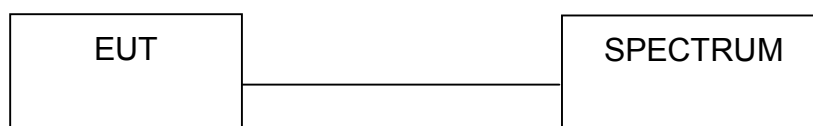
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.5 TEST SETUP



#### 4.2.6 EUT OPERATING CONDITIONS

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



#### 4.2.7 TEST RESULTS

##### 802.11a OFDM modulation

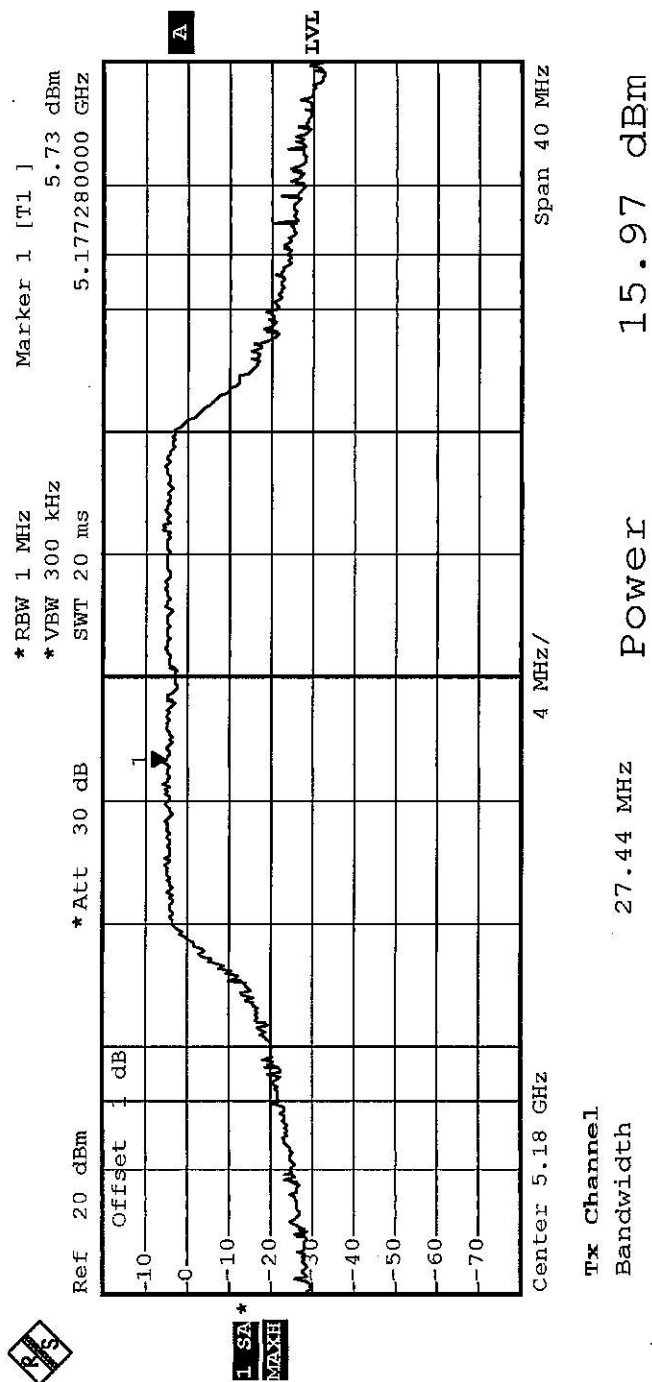
<b>MODULATION TYPE</b>	BPSK	<b>TRANSFER RATE</b>	6Mbps
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	30deg.C, 65%RH, 969hPa
<b>TESTED BY</b>	Sky Liao		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	26dBc Occupied Bandwidth (MHz)	PASS/FAIL
1	5180	39.537	15.97	17.00	27.44	PASS
4	5240	35.481	15.50	17.00	27.37	PASS
5	5260	31.915	15.04	24.00	28.42	PASS
8	5320	31.117	14.93	24.00	25.13	PASS

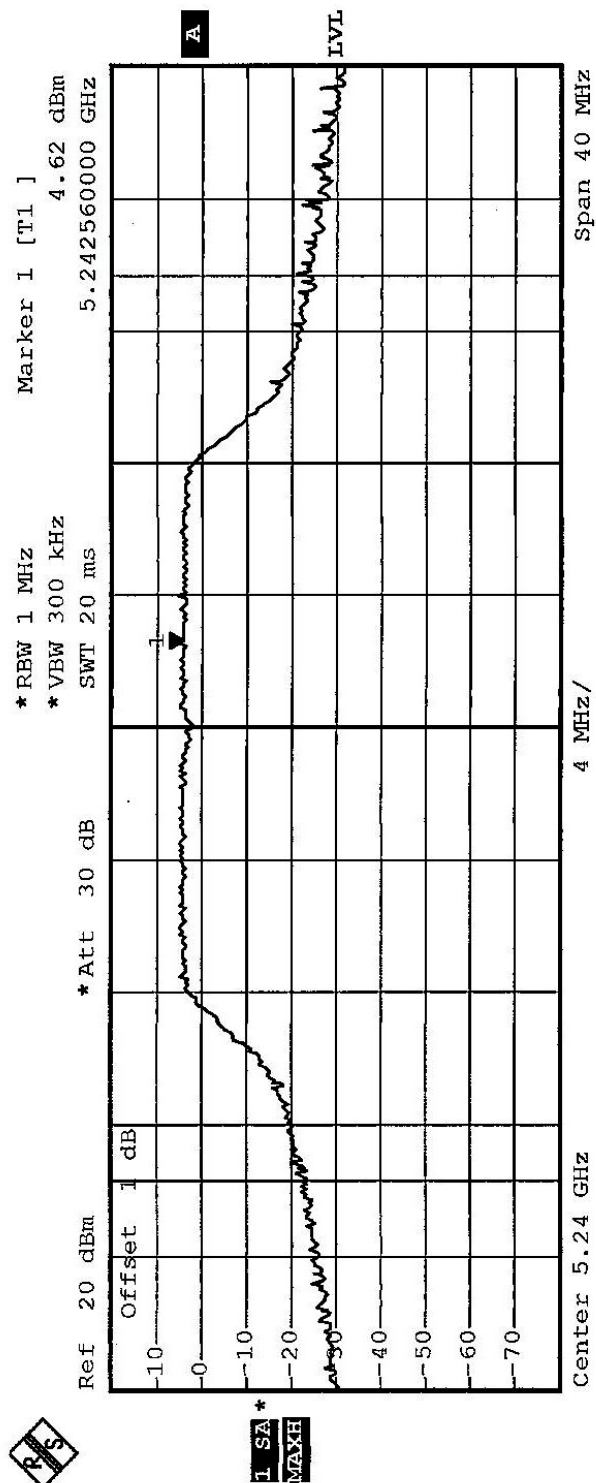
**NOTE:** The 26dBc Occupied Bandwidth plot, please refer to the following pages.



Peak Power Output:  
CHANNEL 1

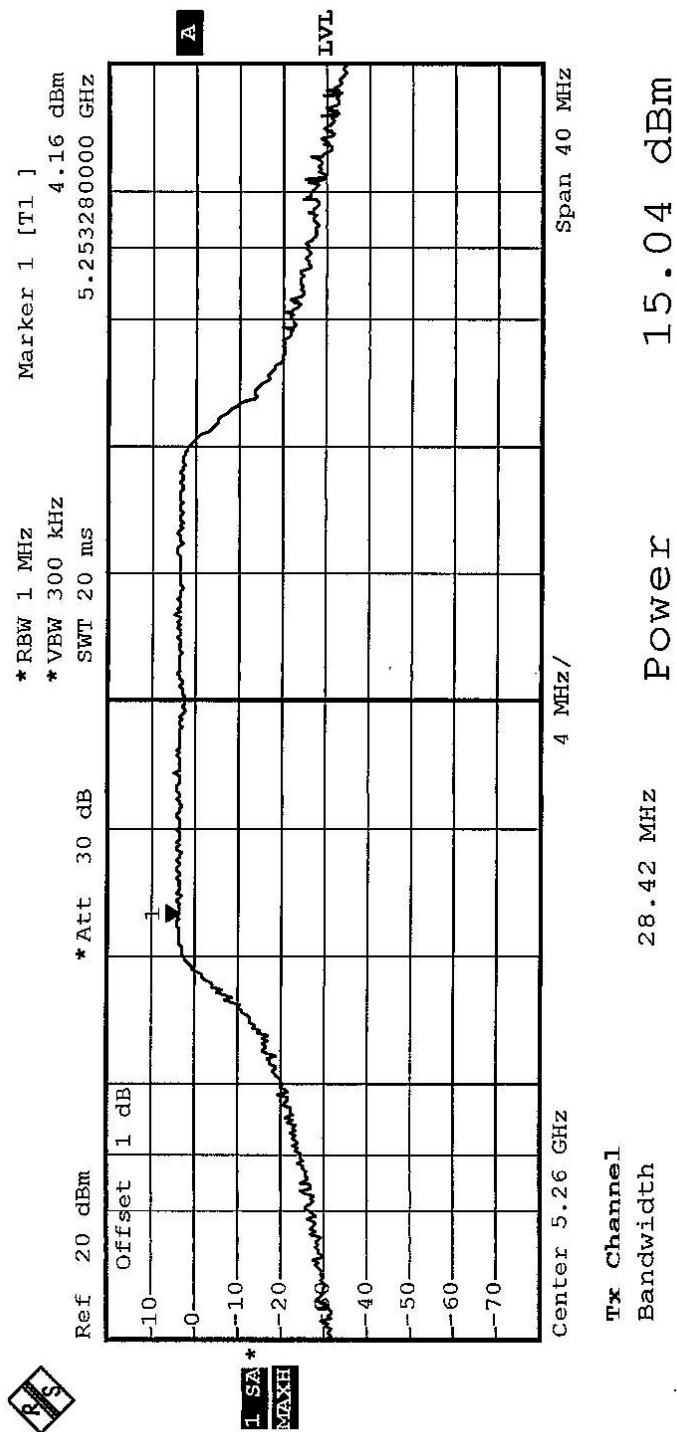


CHANNEL 4

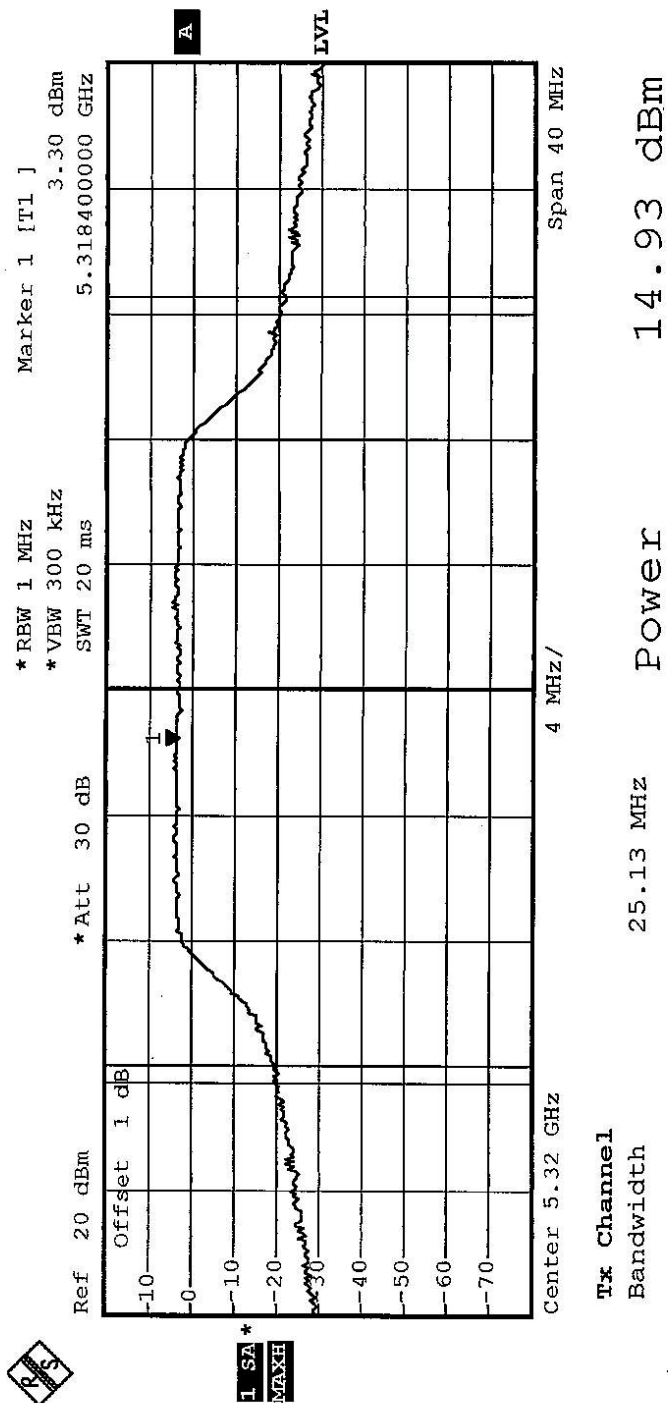


**Tx Channel** 15.50 dBm  
Bandwidth 27.37 MHz  
Power

CHANNEL 5

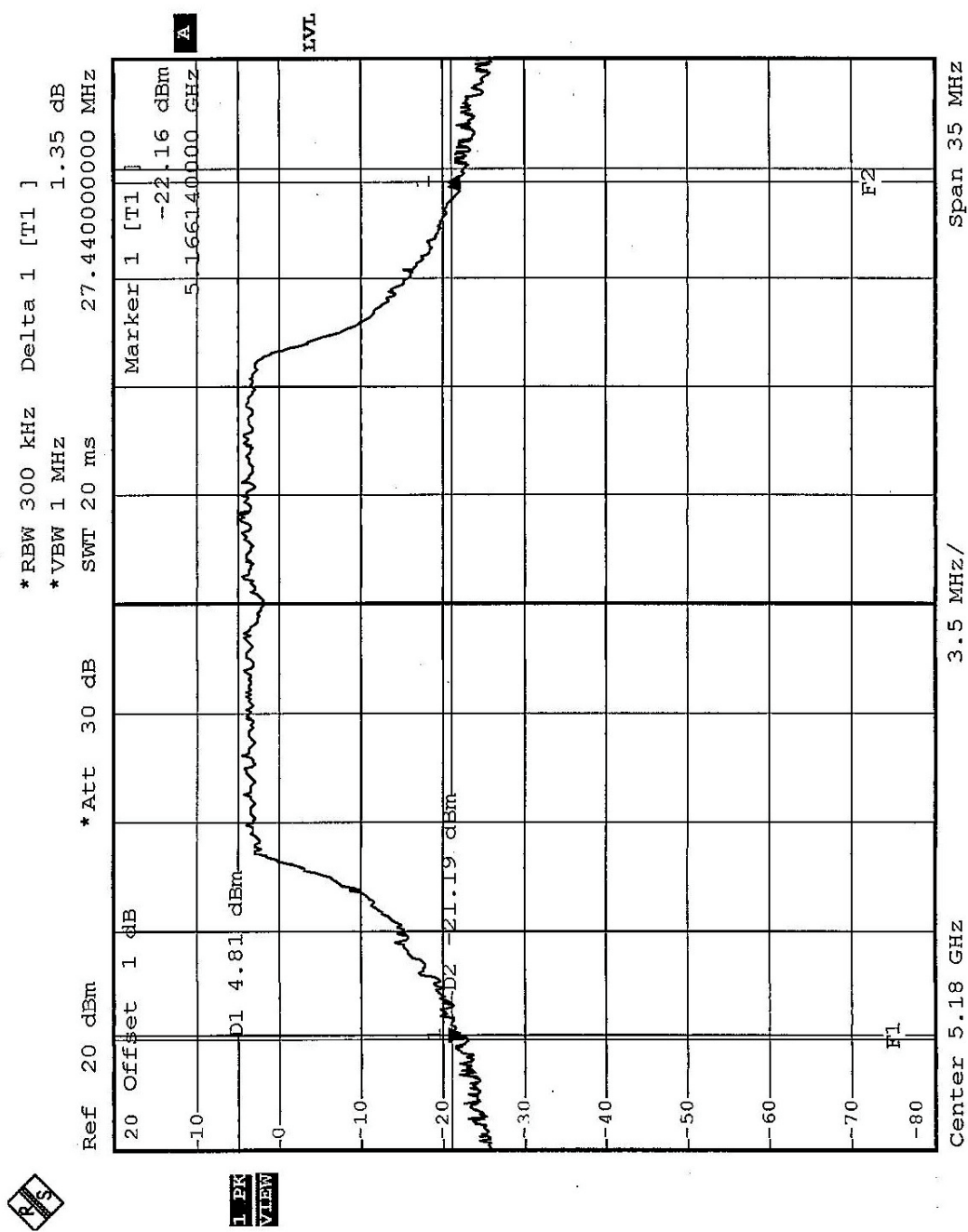


CHANNEL 8

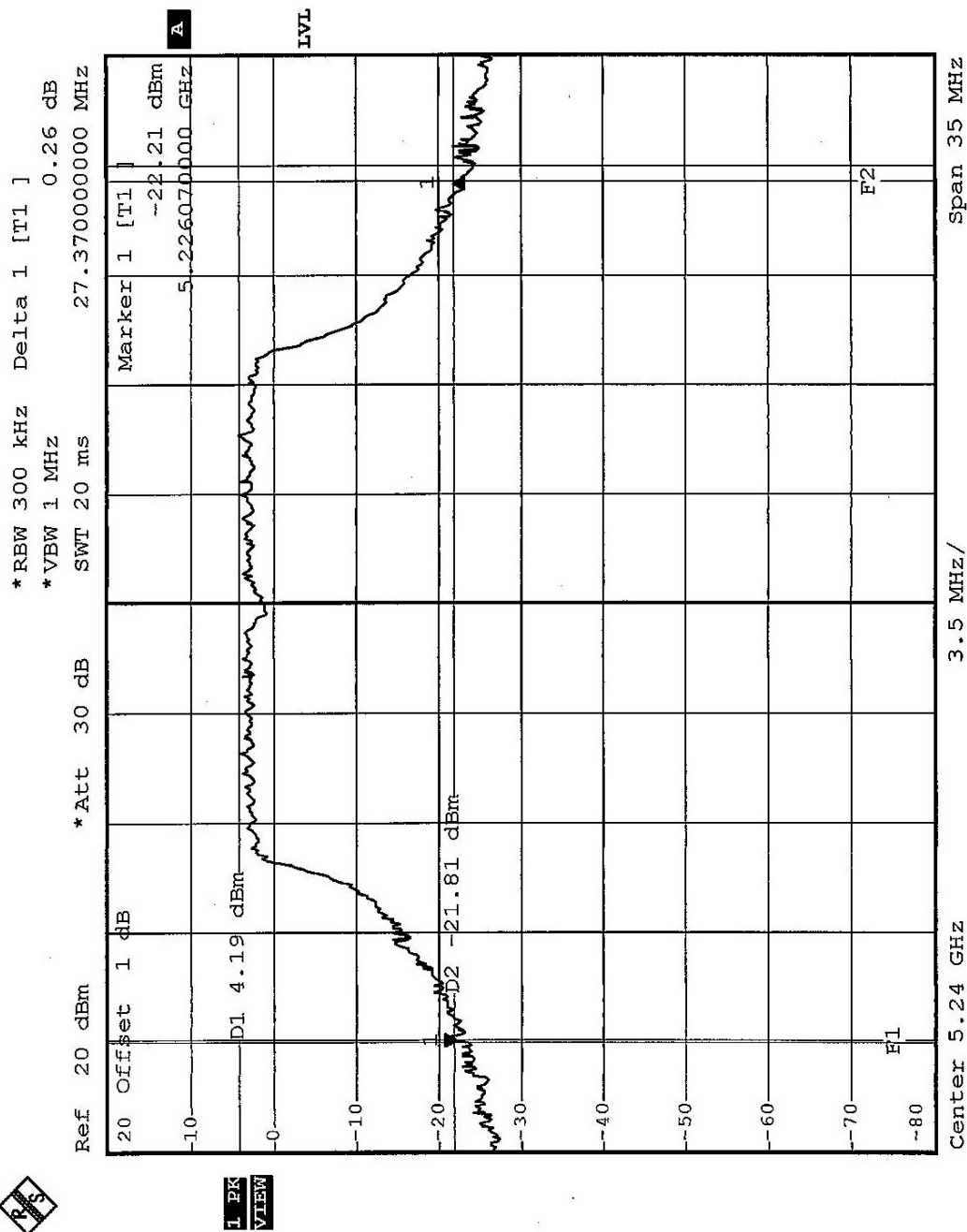


## 26dB Occupied Bandwidth:

CHANNEL 1

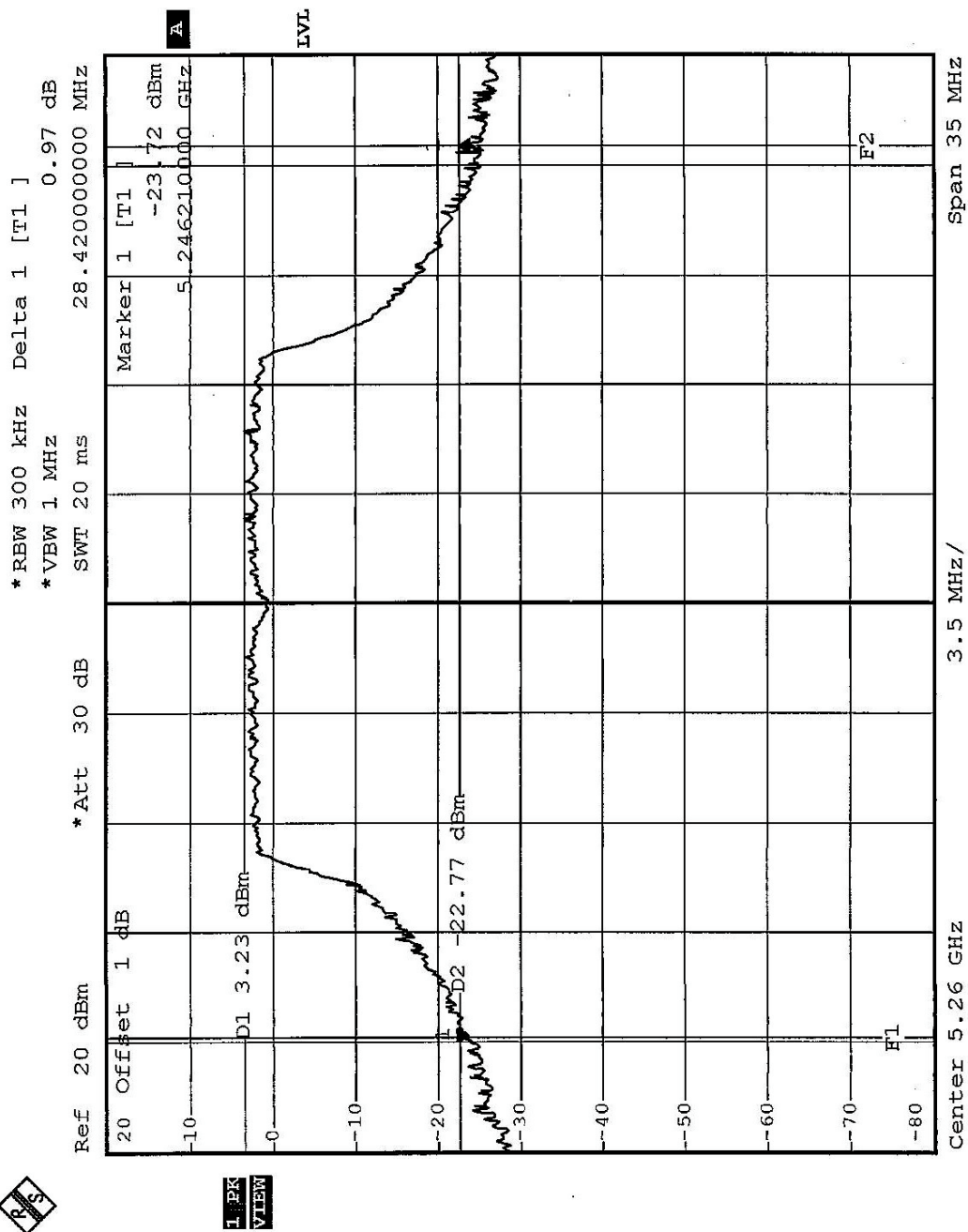


CHANNEL 4



1 PK  
VIEW

CHANNEL 5



CHANNEL 8

