



## Supplemental “Dual Xmit” Test Report

**REPORT NO.:** RF970423H06-01

**MODEL NO.:** HiveAP 28 ag

**RECEIVED:** April 24, 2008

**TESTED:** May 09 to 20, 2008

**ISSUED:** May 21, 2008

**APPLICANT:** Aerohive Networks, Inc.

**ADDRESS:** 3150-C Coronado Drive, Santa Clara, California,  
95054

**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.

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# 1. CERTIFICATION

**PRODUCT :** Outdoor HiveAP 28 a/b/g  
**BRAND NAME :** Aerohive  
**MODEL NO. :** HiveAP 28 ag  
**TESTED:** May 09 to 20, 2008  
**APPLICANT :** Aerohive Networks, Inc.  
**TEST ITEM:** ENGINEERING SAMPLE  
**STANDARDS :** 47 CFR FCC Part 15, Subpart C  
ANSI C63.4-2003

**PREPARED BY :** Carol Liao , **DATE:** May 21, 2008  
( Carol Liao, Specialist )

**TECHNICAL ACCEPTANCE :** Hank Chung , **DATE:** May 21, 2008  
Responsible for RF ( Hank Chung, Deputy Manager )

**APPROVED BY :** May Chen , **DATE:** May 21, 2008  
( May Chen, Deputy Manager )

**Note:**

Per a request of the FCC, the access point radio was tested for radiated emissions in restricted bands while transmitting on both 2.4 GHz and 5 GHz at simultaneously.



## 2. DUAL XMIT, CONDUCTED EMISSION MEASUREMENT

### 2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver	ESCS 30	847124/029	Feb. 28, 2009
Line-Impedance Stabilization Network(for EUT)	ESH3-Z5	848773/004	Nov. 08, 2008
Line-Impedance Stabilization Network(for Peripheral)	ENV-216	100071	Nov. 26, 2008
RF Cable (JETBAO)	RG233/U	Cable_CB_01	Dec. 09, 2008
50 ohms Terminator	50	3	Nov. 15, 2008
Software	ADT_Cond_V7.3.2	NA	NA

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in ADT Shielded Room No. B.
3. The VCCI Con B Registration No. is C-2193.



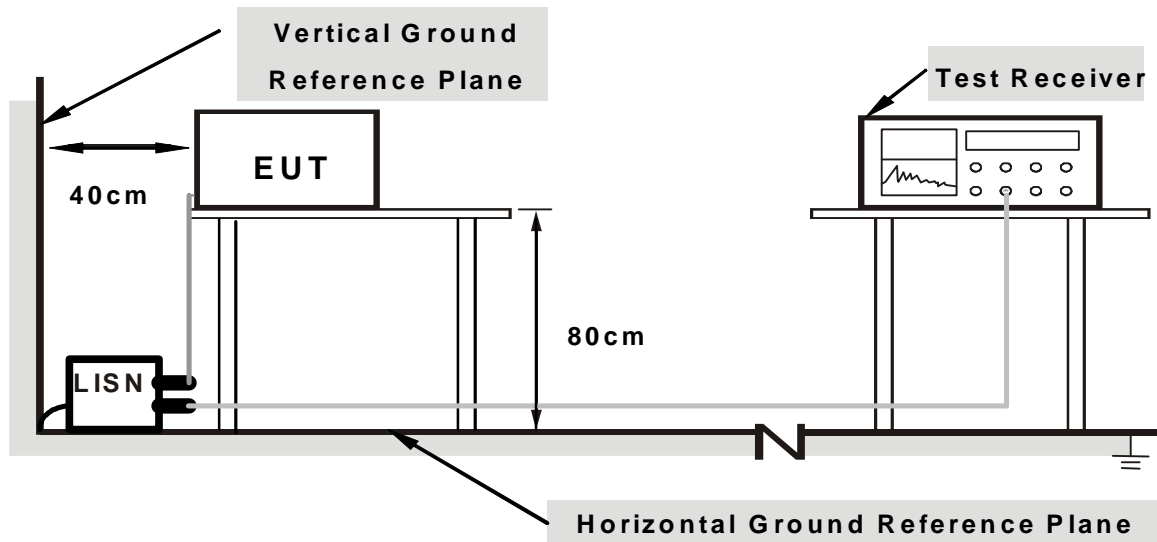
## 2.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

## 2.4 DEVIATION FROM TEST STANDARD

No deviation

## 2.5 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

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



## 2.5 EUT OPERATING CONDITIONS

- a. Placed the EUT on testing table.
- b. Prepared other computer system (support unit 1) to act as communication partner and placed it outside of testing area.
- c. The communication partners run test program "Telnet" to enable EUT under transmission/receiving condition continuously via UTP cable.

### Note:

- 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.

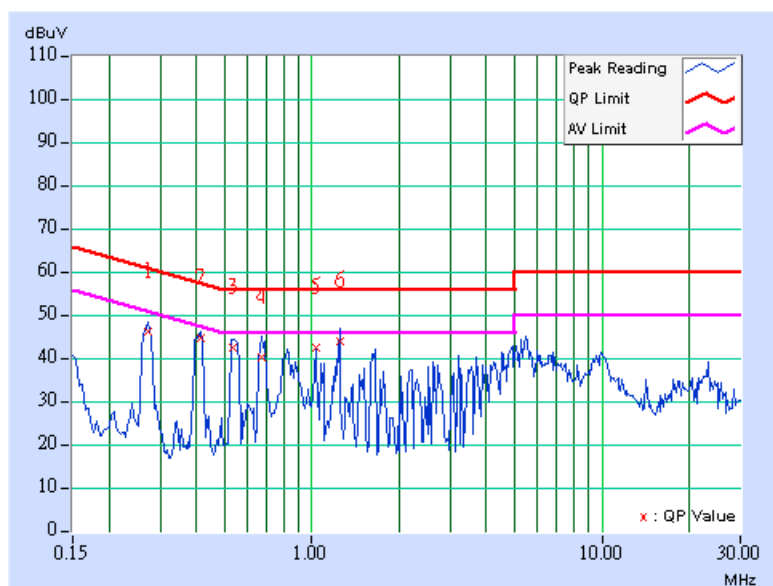
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11g +	1 to 11	6	OFDM	BPSK	6
802.11a	1 to 5	3	OFDM	BPSK	6

## 2.6 TEST RESULTS

<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>6dB BANDWIDTH</b>	9 kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 63%RH, 961hPa	<b>PHASE</b>	Line (L)
<b>TESTED BY</b>	Wen Yu		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.271	9.65	36.37	-	46.02	-	61.08	51.08	-15.06	-
2	0.416	9.66	35.09	-	44.75	-	57.54	47.54	-12.78	-
3	0.537	9.68	32.94	-	42.62	-	56.00	46.00	-13.38	-
4	0.670	9.70	30.66	-	40.36	-	56.00	46.00	-15.64	-
5	1.035	9.75	32.89	-	42.64	-	56.00	46.00	-13.36	-
6	1.246	9.78	34.46	-	44.24	-	56.00	46.00	-11.76	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.

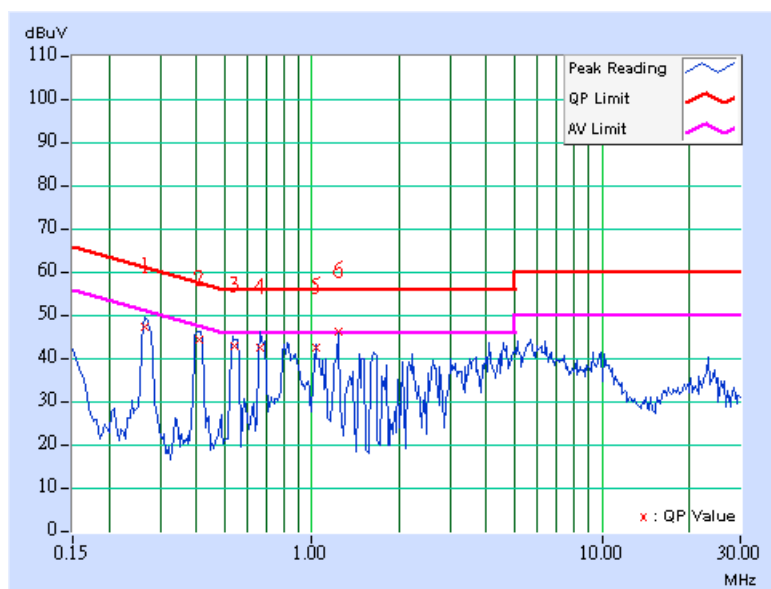




<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>6dB BANDWIDTH</b>	9 kHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 63%RH, 961hPa	<b>PHASE</b>	Neutral (N)
<b>TESTED BY</b>	Wen Yu		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.267	9.65	37.75	-	47.40	-	61.20	51.20	-13.80	-
2	0.408	9.65	34.80	-	44.45	-	57.69	47.69	-13.24	-
3	0.545	9.67	33.36	-	43.03	-	56.00	46.00	-12.97	-
4	0.666	9.69	32.85	-	42.54	-	56.00	46.00	-13.46	-
5	1.035	9.75	32.94	-	42.69	-	56.00	46.00	-13.31	-
<b>6</b>	<b>1.242</b>	<b>9.78</b>	<b>36.37</b>	<b>33.43</b>	<b>46.15</b>	<b>43.21</b>	<b>56.00</b>	<b>46.00</b>	<b>-9.85</b>	<b>-2.79</b>

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.





### 3. DUAL XMIT, RADIATED EMISSION MEASUREMENT

#### 3.1 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.



### 3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	R3271A	85060311	July 15, 2008
HP Pre_Amplifier	8449B	3008A01922	Oct. 04, 2008
ROHDE & SCHWARZ Test Receiver	ESCS30	100375	Mar. 29, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	July 26, 2008
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 16, 2008
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 27, 2009
R&S Loop Antenna	HFH2-Z2	881058/15	Nov. 29, 2008
RF Switches (ARNITSU)	CS-201	1565157	Aug. 13, 2008
RF CABLE (Chaintek)	SF102	22054-2	Nov. 14. 2008
RF Cable(RICHTEC)	9913-30M N-N Cable	STCCAB-30M-1 GHz	Aug. 13, 2008
Software	ADT_Radiated_V 7.6.15.8	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 and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: R3271A) 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 3789C-3.



### 3.3 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 the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.
- g. The emissions up to 40 GHz were examined. Those emission falling within a restricted band were evaluated against the “restricted band emission limit” ( 54 dB $\mu$ V / 74 dB $\mu$ V).

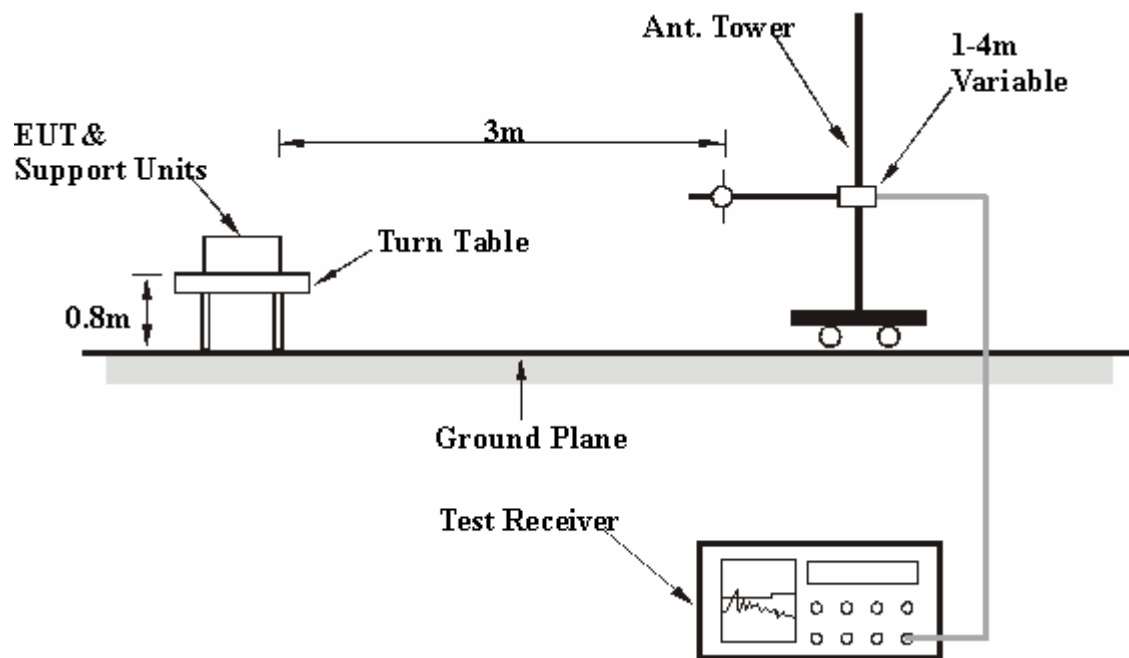
#### **NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection (PK) 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.

### 3.4 DEVIATION FROM TEST STANDARD

No deviation

### 3.5 TEST SETUP



### 3.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on testing table.
- b. Prepared other computer system (support unit 1) to act as communication partner and placed it outside of testing area.
- c. The communication partners run test program “Telnet” to enable EUT under transmission/receiving condition continuously via UTP cable.

Note:

**For 15.247:**

The access point was tested for out of band radiated emissions with the unit transmitting on 802.11g, 2437 MHz and 802.11a on 5785 MHz. These frequencies and power levels were chosen because these frequencies produced the worst case radiated emissions during the radiated emissions in restricted bands test performed previously. The unit was set to transmit at the same power level as was used in the initial radiated emissions tests and was transmitting at the same data rate. (Please refer to RF970423H06 test report)

The harmonic of the fundamental signals were recorded in this report.

The antennas tested in this product are as following:

No.	Brand	Gain (dBi)	Antenna Type	Antenna Connector
1	2.4-2.5GHz	8	Omnidirectional	Type fixed N male
2	5GHz	10	Omnidirectional	Type fixed N male



### 3.7 TEST RESULTS

<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>FREQUENCY RANGE</b>	30MHz~1000MHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 66%RH, 965 hPa	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<b>TESTED BY</b>	Sky Liao		

#### 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	74.62	31.64 QP	40.00	-8.36	1.69 H	127	20.49	11.15
2	200.00	29.01 QP	43.50	-14.49	1.43 H	183	16.98	12.03
3	300.00	37.24 QP	46.00	-8.76	1.17 H	35	20.65	16.59
4	400.00	28.97 QP	46.00	-17.03	1.00 H	325	10.92	18.05
5	500.00	37.46 QP	46.00	-8.54	1.44 H	61	16.41	21.05
6	600.00	35.04 QP	46.00	-10.96	1.30 H	312	11.50	23.54
7	700.00	33.67 QP	46.00	-12.33	1.00 H	57	9.15	24.52
8	800.00	32.31 QP	46.00	-13.69	1.00 H	84	4.26	28.05
9	900.00	37.29 QP	46.00	-8.71	1.34 H	53	7.62	29.67

#### 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	74.83	26.27 QP	40.00	-13.73	1.00 V	263	15.16	11.11
2	200.00	28.61 QP	43.50	-14.89	1.00 V	147	16.58	12.03
3	300.00	36.35 QP	46.00	-9.65	1.00 V	317	19.76	16.59
4	400.00	30.06 QP	46.00	-15.94	1.00 V	268	12.01	18.05
5	500.00	33.05 QP	46.00	-12.95	1.00 V	323	12.00	21.05
6	600.00	33.64 QP	46.00	-12.36	1.29 V	312	10.10	23.54
7	700.00	29.12 QP	46.00	-16.88	1.31 V	243	4.60	24.52
8	800.00	31.23 QP	46.00	-14.77	1.00 V	325	3.18	28.05
9	900.00	35.02 QP	46.00	-10.98	1.13 V	249	5.35	29.67

**NOTE:**

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



<b>INPUT POWER (SYSTEM)</b>	120Vac, 60Hz	<b>FREQUENCY RANGE</b>	1000MHz~40000MHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 66%RH, 965 hPa	<b>DETECTOR FUNCTION &amp; BANDWIDTH</b>	Peak (PK) Average (AV) 1 MHz
<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	5140.60	52.20 PK	74.00	-21.80	1.31 H	314	15.97	36.23
2	5140.60	39.50 AV	54.00	-14.50	1.31 H	314	3.27	36.23
3	7311.00	53.60 PK	74.00	-20.40	1.18 H	316	11.08	42.52
4	7311.00	39.50 AV	54.00	-14.50	1.18 H	316	-3.02	42.52
5	11570.00	57.10 PK	74.00	-16.90	1.17 H	249	10.15	46.95
6	11570.00	43.40 AV	54.00	-10.60	1.17 H	249	-3.55	46.95

**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	5140.60	65.30 PK	74.00	-8.70	1.30 V	5	29.07	36.23
2	5140.60	51.30 AV	54.00	-2.70	1.30 V	5	15.07	36.23
3	7311.00	54.10 PK	74.00	-19.90	1.25 V	348	11.58	42.52
4	7311.00	39.60 AV	54.00	-14.40	1.25 V	348	-2.92	42.52
5	11570.00	45.60 PK	74.00	-28.40	1.21 V	97	-1.35	46.95
6	11570.00	40.30 AV	54.00	-13.70	1.21 V	97	-6.65	46.95

**NOTE:**

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





#### 4. INFORMATION ON THE TESTING LABORATORIES

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

<b>USA</b>	FCC, UL, A2LA
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA, CSA
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If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab:**

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Fax: 886-2-26052943

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

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

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