



A D T

# Supplemental “Transmit Simultaneously” Test Report

**REPORT NO.:** RF991126E02N-2

**MODEL NO.:** AR5B225

**FCC ID:** PPD-AR5B225

**RECEIVED:** June 29, 2012

**TESTED:** July 12, 2012

**ISSUED:** July 24, 2012

**APPLICANT:** Qualcomm Atheros, Inc.

**ADDRESS:** 1700 Technology Drive, San Jose, CA 95110

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.) Ltd.,  
Taoyuan Branch Hsin Chu Laboratory

**LAB ADDRESS:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

**TEST LOCATION (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung  
Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

**TEST LOCATION (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung  
Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

This report should not be used by the client to claim  
product certification, approval, or endorsement by  
TAF or any government agencies.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



A D T

## Table of Contents

RELEASE CONTROL RECORD .....	3
1. CERTIFICATION .....	4
2. SUMMARY OF TEST RESULTS .....	5
2.1 MEASUREMENT UNCERTAINTY .....	5
3. GENERAL INFORMATION .....	6
3.1 GENERAL DESCRIPTION OF EUT .....	6
3.2 DESCRIPTION OF ANTENNA .....	8
3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL: .....	9
3.4 DESCRIPTION OF SUPPORT UNITS .....	10
3.5 CONFIGURATION OF SYSTEM UNDER TEST .....	10
4. TEST TYPES AND RESULTS .....	11
4.1 RADIATED EMISSION MEASUREMENT .....	11
4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....	11
4.1.2 TEST INSTRUMENTS .....	12
4.1.3 TEST PROCEDURES .....	14
4.1.4 DEVIATION FROM TEST STANDARD .....	14
4.1.5 TEST SETUP .....	15
4.1.6 EUT OPERATING CONDITIONS .....	15
4.1.7 TEST RESULTS .....	16
5. INFORMATION ON THE TESTING LABORATORIES .....	18
6. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB .....	19



A D T

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF991126E02N-2	Original release	July 24, 2012



A D T

## 1. CERTIFICATION

**PRODUCT :** 1X1 802.11b/g/n - BT Combo PCIe minicard

**BRAND NAME :** Atheros

**MODEL NO. :** AR5B225

**TEST SAMPLE:** ENGINEERING SAMPLE

**APPLICANT :** Atheros Communications, Inc.

**TESTED:** July 12, 2012

**STANDARDS :** FCC Part 15, Subpart C (Section 15.247),  
ANSI C63.10-2009

The above equipment (Model: AR5B225) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, 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** : Lori Chung , **DATE:** July 24, 2012  
( Lori Chung, Specialist )

**APPROVED BY** : May Chen , **DATE:** July 24, 2012  
( May Chen, Deputy Manager )



A D T

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.247(d)	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.2dB at 499.81MHz
15.209			

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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)	5.59 dB
Radiated emissions (1GHz -6GHz)	3.84 dB
Radiated emissions (6GHz -18GHz)	4.09 dB
Radiated emissions (18GHz -40GHz)	4.24 dB



A D T

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Mobile Computer
MODEL NO.	MC92N0
POWER SUPPLY	DC 7.4V from battery DC 12V from direct charging
MODULATION TYPE	<b>For WLAN</b> CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM  <b>For BT</b> GFSK, $\pi/4$ -DQPSK, 8DPSK
MODULATION TECHNOLOGY	<b>For WLAN</b> : DSSS, OFDM  <b>For BT</b> : FHSS
TRANSFER RATE	<b>For WLAN</b> 802.11b: Up to 11Mbps 802.11g: Up to 54Mbps 802.11n: Up to 150Mbps  <b>For BT</b> Up to 3Mbps
OPERATING FREQUENCY	<b>For WLAN</b> 2.4GHz: 2.412 ~ 2.462GHz  <b>For BT</b> 2402MHz ~ 2480MHz
NUMBER OF CHANNEL	<b>For WLAN</b> 11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)  <b>For BT</b> 79
MAXIMUM OUTPUT POWER	<b>For WLAN</b> 802.11b: 109.648mW 802.11g: 169.824mW 802.11n (20MHz): 151.356mW 802.11n (40MHz): 117.490mW  <b>For BT</b> GFSK: 12.359 mW 8DPSK: 17.061 mW GFSK(LE mode): 17.061 mW
ANTENNA TYPE	See item 3.2



<b>ANTENNA CONNECTOR</b>	See item 3.2
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	NA
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:**

1. This report is prepared for FCC class II permissive change and IC reassessment change. The difference compared with the Report No.: RF991126E02-2 design is as the following information:
  - u BOM change –  
Chain(0): add external LNA(Rx only) and SPDT  
Chain(1): only add external LNA (Rx only)
  - u H/W version is AW-NB126H.
2. Only radiated spurious emissions were re-evaluated to confirm that the new switch and LNA did not introduce intermodulation issues and the switch did not affect the radiated spurious signal levels. The proposed changes do not affect output power and as the new component locations are not close to the antenna, and power remains the same, RF exposure was also not re-evaluated
3. The test mode was reference to the worst case in the original test report. Therefore only the test data of the mode was recorded in this report individually
4. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



A D T

### 3.2 DESCRIPTION OF ANTENNA

There are five sets of antennas provided to this EUT, please refer to the following table:

No.	Brand	Model	Gain(dBi) (included cable loss)	Antenna Type	Connector	Cable Loss(dB)	Cable Length
1	WNC	81-EBJ15.005	3.62	PIFA	IPEX	1.15	300mm
2	INPAQ	DAMA1BM30000402	3.2	Dipole	SMA Reverse	0.5	N.A.
3	Tyco	TBN009	2.06	PIFA	U.FL	0.96	300mm
4	Tyco	TBN010	2.64	PIFA	U.FL	0.95	300mm
5	Hitachi Cable	HBY17	1.97	PIFA	IPEX	0.99	306mm

Note: 1. Main – Wireless / Aux – BT  
2. Antenna (model: 81-EBJ15.005 and DAMA1BM30000402) were chosen for final test.



A D T

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

EUT configure mode	Applicable to		Description
	RE<1G	RE <sup>3</sup> 1G	
-	√	√	-

Where RE &lt; 1G: Radiated Emission below 1GHz

RE<sup>3</sup> 1G: Radiated Emission above 1GHz

#### Radiated Emission Test:

- 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)
WLAN + Bluetooth	1 to 11	6	OFDM	BPSK	6
	0 to 78	39	FHSS	8DPSK	DH5

#### TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Nelson Teng
RE <sup>3</sup> 1G	25deg. C, 65%RH	120Vac, 60Hz	Nelson Teng



### 3.4 DESCRIPTION OF SUPPORT UNITS

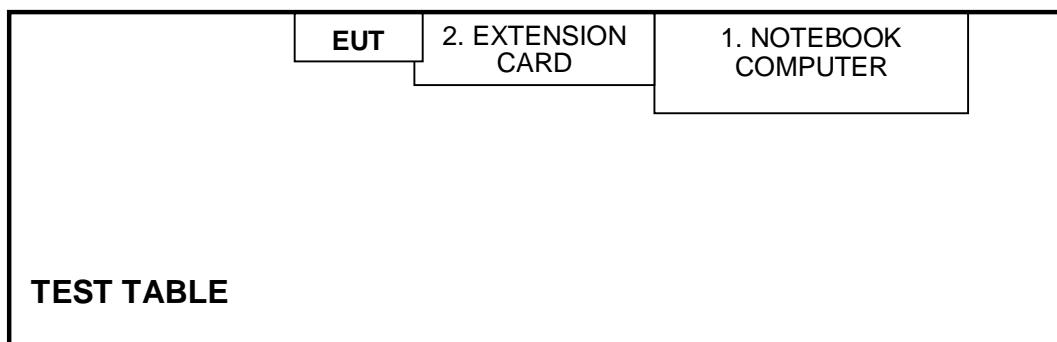
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	Lenovo	3000 N200	NA	NA
2	EXTENSION CARD	Atheros	NA	NA	NA

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

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

### 3.5 CONFIGURATION OF SYSTEM UNDER TEST





## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

<b>Frequencies (MHz)</b>	<b>Field strength (microvolts/meter)</b>	<b>Measurement distance (meters)</b>
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 (dB<sub>B</sub>V/m) = 20 log Emission level (uV/m).
3. 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

For below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250254	July 09, 2012	July 08, 2013
Agilent Pre-Selector	N9039A	MY46520311	July 09, 2012	July 08, 2013
Agilent Signal Generator	N5181A	MY49060517	July 09, 2012	July 08, 2013
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 15, 2011	Nov. 14, 2012
Agilent Pre-Amplifier	8449B	3008A02578	June 26, 2012	June 25, 2013
SPACEK LABS	SLKKa-48-6	9K16	Nov. 15, 2011	Nov. 14, 2012
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 09, 2012	Apr. 08, 2013
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 14, 2011	Nov. 13, 2012
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 26, 2011	Dec. 25, 2012
RF Cable	NA	CHGCAB_001	Oct. 07, 2011	Oct. 06, 2012
Software	ADT_Radiated_V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: July 12, 2012

**For above 1GHz:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 29, 2011	Aug. 28, 2012
Pre-Selector Agilent	N9039A	MY46520310	Aug. 29, 2011	Aug. 28, 2012
Signal Generator Agilent	N5181A	MY49060347	July 25, 2011	July 24, 2012
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 15, 2011	Nov. 14, 2012
Pre-Amplifier Agilent	8449B	3008A02465	Feb. 27, 2012	Feb. 26, 2013
SPACEK LABS	SLKKA-48-6	9K16	Nov. 15, 2011	Nov. 14, 2012
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Apr. 06, 2012	Apr. 05, 2013
Horn_Antenna AISI	AIH.8018	0000220091110	Nov. 23, 2011	Nov. 22, 2012
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 27, 2011	Dec. 26, 2012
RF Cable	NA	CHHCAB_001	Oct. 08, 2011	Oct. 07, 2012
Software	ADT_Radiated_V8.7.05	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	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 966 Chamber No. H.
3. The FCC Site Registration No. is 797305.
4. The CANADA Site Registration No. is IC 7450H-3.
5. Tested Date: July 12, 2012



A D T

#### 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 3 meter chamber room. 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

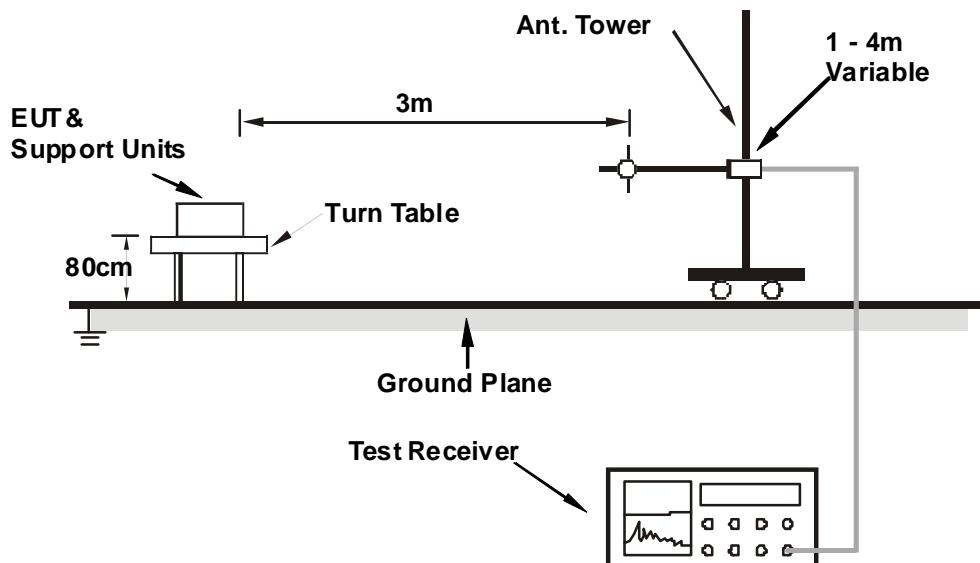
#### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 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 10 Hz for Average detection (AV) at frequency above 1GHz.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “ArcMfgTool 2.0.0.9” to enable EUT under transmission/receiving condition continuously at specific channel frequency.



A D T

#### 4.1.7 TEST RESULTS

##### BELOW 1GHz DATA :

FREQUENCY RANGE		Below 1GHz	DETECTOR FUNCTION		Quasi-Peak (QP)		
-----------------	--	------------	-------------------	--	-----------------	--	--

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	99.87	30.3 QP	43.5	-13.2	1.75 H	11	20.40	9.86
2	198.99	38.4 QP	43.5	-5.1	1.75 H	256	27.18	11.25
3	299.95	35.2 QP	46.0	-10.8	1.50 H	326	19.95	15.29
4	<b>499.81</b>	<b>44.8 QP</b>	<b>46.0</b>	<b>-1.2</b>	<b>1.50 H</b>	<b>227</b>	<b>24.45</b>	<b>20.39</b>
5	600.42	41.1 QP	46.0	-4.9	1.00 H	123	18.45	22.67
6	796.55	37.5 QP	46.0	-8.5	2.00 H	233	11.68	25.85

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	99.40	30.8 QP	43.5	-12.7	1.25 V	21	21.04	9.80
2	300.00	38.3 QP	46.0	-7.7	1.68 V	234	22.97	15.29
3	399.86	42.5 QP	46.0	-3.5	1.02 V	225	24.68	17.86
4	497.63	42.7 QP	46.0	-3.3	1.00 V	237	22.33	20.33
5	600.32	41.4 QP	46.0	-4.6	1.35 V	177	18.71	22.66
6	799.87	41.2 QP	46.0	-4.8	1.00 V	22	15.24	25.92

##### 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.



A D T

### ABOVE 1GHz DATA

FREQUENCY RANGE		1GHz ~ 25GHz		DETECTOR FUNCTION		Peak (PK) Average (AV)	
-----------------	--	--------------	--	-------------------	--	---------------------------	--

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	4874.00	48.3 PK	74.0	-25.7	1.07 H	159	6.35	41.99
2	4874.00	41.3 AV	54.0	-12.7	1.07 H	159	-0.73	41.99
3	4882.00	52.9 PK	74.0	-21.1	1.00 H	56	10.90	42.00
4	4882.00	22.8 AV	54.0	-31.2	1.00 H	56	-19.20	42.00
5	7311.00	53.5 PK	74.0	-20.5	1.00 H	123	7.01	46.53
6	7311.00	40.2 AV	54.0	-13.8	1.00 H	123	-6.30	46.53
7	7323.00	56.7 PK	74.0	-17.3	1.00 H	96	10.14	46.56
8	7323.00	26.6 AV	54.0	-27.4	1.00 H	96	-19.96	46.56

### 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	4874.00	47.8 PK	74.0	-26.2	1.07 V	124	5.85	41.99
2	4874.00	40.7 AV	54.0	-13.3	1.07 V	124	-1.26	41.99
3	4882.00	52.9 PK	74.0	-21.1	1.00 V	37	10.90	42.00
4	4882.00	22.8 AV	54.0	-31.2	1.00 V	37	-19.20	42.00
5	7311.00	52.3 PK	74.0	-21.7	1.00 V	135	5.73	46.53
6	7311.00	40.5 AV	54.0	-13.5	1.00 V	135	-6.04	46.53
7	7323.00	54.9 PK	74.0	-19.1	1.00 V	73	8.34	46.56
8	7323.00	24.8 AV	54.0	-29.2	1.00 V	73	-21.76	46.56

### 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.



A D T

## 5. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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: 886-3-3270892

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

**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.



A D T

## 6. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

---END---