SAR TEST REPORT

REPORT NO.: SA911105R02A
MODEL NO.: UW320-IF
RECEIVED: Nov. 5, 2002
TESTED: Dec. 23, 2002

APPLICANT: Bromax Communications, Inc.

ADDRESS: No. 20, Kuang Fu Rd., Hsin Chu Industrial Park, Hu Kou, Hsin Chu 303, Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

LAB LOCATION: 47 14th Lin, Chiapau Tsun, Linko, Taipei, Taiwan, R.O.C.

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1. CERTIFICATION

PRODUCT :	Wireless USB Adapter
MODEL NO. :	UW320-IF
BRAND :	Bromax
APPLICANT :	Bromax Communications, Inc.
STANDARDS :	47 CFR Part 2 (Section 2.1093), FCC OET Bulletin 65, Supplement C (01-01)

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility on 6th Dec. 2002. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts for the measurements of the sample's EMC characteristics under the conditions herein specified.

CHECKED BY: Rennie Wang, **DATE:** December 13, 2002

Rennie Wang

APPROVED BY: Alan Lane, **DATE:** December 13, 2002

Dr. Alan Lane
Manager

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless USB Adapter
MODEL NO.	UW320-IF
POWER SUPPLY	DC powered by host
MODULATION TYPE	DBPSK, QPSK, CCK
RADIO TECHNOLOGY	DSSS
TRANSFER RATE	1/2/5.5/11Mbps
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11
CONDUCTED OUTPUT POWER	14.43 dBm (27.73mW)
ANTENNA TYPE	Dipole (2 different housing)
PEAK SAR	0.58 W/kg
DATA CABLE	NA
I/O PORTS	USB
ASSOCIATED DEVICES	NA

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC CFR 47 Part 2 (2.1093)
FCC OET Bulletin 65, Supplement C (01- 01)

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

3. DESCRIPTION OF TEST MODES AND CONFIGURATIONS

CARRIER MODULATION UNDER TEST	Un-modulated CW Carrier
CREST FACTOR	1.0
CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	Ch. 1: 2412MHz / 14.40dBm Ch. 6: 2437MHz / 14.43 dBm Ch. 11: 2462MHz / 14.43 dBm
ANTENNA CONFIGURATION	Dipole (2 different housing)
EUT POWER SOURCE	From Host Notebook
HOST POWER SOURCE	Fully Charged Battery

The following test configurations have been applied in this test report:

Mode a, I: EUT in the USB slot of the notebook, the bottom of the notebook contact the bottom of the flat phantom with 0cm separation distance.

Mode b, II: EUT in the USB slot of the notebook, the keyboard face of the notebook is perpendicular to the bottom of the flat phantom and the EUT is located between notebook and phantom. There is 1.5 cm separation distance between the tip of the EUT and the bottom of the flat phantom.

Note 1: Model a & b is for folded dipole, Model I & II is for extended dipole.

Note 2: Please reference “APPENDIX A” for the photos of test configuration.

Note 3: The output power of the un-modulated CW carrier has been adjusted to be the same with that of modulated signal.

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	DELL	PP01L	TW-09C748-12800-19O-B220	FCC DoC APPROVED

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).

5. TEST RESULTS

5.1 TEST PROCEDURES

The SAR value was calculated via the 3D spline interpolation algorithm which has been implemented in the software of DASY3 SAR measurement system manufactured and calibrated by Schmid & Partner.

A coarse scan with 20mm x 20mm grid was performed for the highest spatial SAR location. A fine scan with 5mm x 5mm x 7mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

5.2 MEASURED SAR RESULT

ENVIRONMENTAL CONDICTION	24 degree C 47% Humidity	TESTED BY	Bunny Yao

CHANNEL	FREQUENCY (MHz)	MODE	MEASURED 1g SAR (W/kg)
1	2412	a	0.526
6	2437	a	0.516
11	2462	a	0.526
1	2412	b	0.014
6	2437	b	0.013
11	2462	b	0.013
1	2412	I	0.556
6	2437	I	0.550
11	2462	I	0.580
1	2412	II	0.180
6	2437	II	0.215
11	2462	II	0.243

Note: Test configuration of each mode is described in section 3.

Note: In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.

Note: Please see the Appendix for the photo of the test configuration and also the data.

5.3 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / controlled Exposure Environment)
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	**1.6**	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

5.4 EUT CONDUCTED POWER VARIATION

The variation of the EUT conducted power measured before and after SAR testing should not over 5%. The test procedures for conducted power level is described in FCC rule part 2.1046.

The maximum variation in this testing is listed in the following table.

Channel	Mode	Conducted Power (Before)	Conducted Power (After)	Variation (%)
1	I	14.40 dBm	14.57 dBm	4.04 %

5.5 TISSUE

The tissue of 2450MHz for brain and body was well prepared according to the standard procedures. The required and measured dielectric parameters are listed in this table.

	Brain		Muscle	
	Required	**Measured**	**Required**	**Measured**
Permitivity (ε_r)	39.2±5%	NA	52.7±5%	52.95
Conductivity (σ)	1.8±5%	NA	1.95±5%	1.990

The measured parameters of the used tissue.

Tissue Prepared and Measured on 23th Dec. 2002				
	Brain		**Muscle**	
	Value	**Freq. (MHz)**	**Value**	**Freq.(MHz)**
Max Permitivity	NA	NA	53.11	2400
Min. Permitivity	NA	NA	52.85	2500
Max Conductivity	NA	NA	2.044	2500
Min Conductivity	NA	NA	1.932	2400

5.6 TEST EQUIPMENT FOR TISSUE PROPERTY

Item	Name	Provider	Type	Series No.	Calibrated Until
1	Network Analyzer	Agilent	8720ES	NA	May 6, 2003
2	Dielectric Probe	Agilent	85070C	NA	NA

6. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue, and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 50mW RF input power was used instead of 250mW used by Schmid & Partner, then the measured SAR will be linearly extrapolated to that of 250mW RF power.

6.1 TEST EQUIPMENT

Item	Name	Provider	Type	Series No.	Calibrated Until
1	SAM Phantom	S & P	QD000 P40 CA	PT-1150	NA
2	Validation Dipole	S & P	D2450V2	716	Sept. 25, 2004
3	Signal Generator	R & S	SMP04	10001	May 5, 2003
4	E-Field Probe	S & P	ET3DV6	1687	Sept. 27, 2003
5	DAE	S & P	DAE3 V1	510	April 10, 2004
6	Robot Positioner	Staubli Unimation	NA	NA	NA

6.2 VALIDATION RESULT

Environmental Condition	24 degree C 47% Humidity	Test Engineer	Bunny Yao
2450MHz System Validation Test in Body Tissue			
Required	Measured	Deviation (%)	Separation Distance
14.30 (1g)	14.0	2.1	1.0 cm
6.74 (10g)	6.65	1.3	1.0 cm

Note: Please see Appendix for the photo of system validation test.

7. MEASUREMENT UNCERTAINTIES

	Uncertainty Value	Probability Distribution	Divisor	C_i	Stantard Uncertainty
Test Sample Related					
Test Sample Positioning	±6%	Normal	1	1	±6%
Drift of Output Power	±5%	Rectangular	$\sqrt{3}$	1	±2.9%
Phantom and Setup					
Phantom Uncertainty	±0%	Rectangular	$\sqrt{3}$	1	±0%
Liquid Conductivity(target)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
Liqiuid Conductivity(meas)	±10%	Rectangular	$\sqrt{3}$	0.5	±2.9%
Liquid Permittivity(target)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
Liquid Permittivity(meas)	±5%	Rectangular	$\sqrt{3}$	0.5	±1.4%
RF Ambient Conditions	±3%	Rectangular	$\sqrt{3}$	1	±1.7%
System Check					
Calibration	± 2.6 %	normal	1	1	± 2.6 %
Axial isotropy	± 2.3 %	rectangular	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	± 0.9 %
Hemispherical isotropy	± 9.6 %	rectangular	$\sqrt{3}$	$\sqrt{cp}$	± 3.9 %
Spatial resolution	± 0.5 %	rectangular	$\sqrt{3}$	1	± 0.3 %
Boundary effect	± 4.0 %	rectangular	$\sqrt{3}$	1	± 6.4 %
Linearity	± 4.7 %	rectangular	$\sqrt{3}$	1	± 2.7 %
Detection Limit	± 2.0 %	rectangular	$\sqrt{3}$	1	± 1.2 %
Readout Electronics	± 1.0 %	normal	1	1	± 1.0 %
Mechanical Constrains of Robot	± 0.4 %	normal	1	1	± 0.4 %
Probe positioning	± 5.0 %	rectangular	$\sqrt{3}$	1	± 2.9 %
Extrapolation/Integration	± 3.9 %	rectangular	$\sqrt{3}$	1	± 2.3 %
Dipole/Liquid Distance	± 1.0 %	rectangular	$\sqrt{3}$	1	± 0.6 %
Dipole Input Power	± 4.7 %		1	1	± 4.7 %
Liquid conductivity (target)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %
Liquid conductivity (meas.)	± 10 %	rectangular	$\sqrt{3}$	0.6	± 3.5 %
Liquid permittivity (target)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %
Liquid permittivity (meas.)	± 5.0 %	rectangular	$\sqrt{3}$	0.6	± 1.7 %

RF Ambient condition	± 3.0 %	normal	1	1	± 1.7 %
Combined Standard Uncertainty					±12.4 %
Expanded Uncertainty (K=2)					±24.9 %

8. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
New Zealand	MoC
Norway	NEMKO
R.O.C.	BSMI, DGT, CNLA

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.

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The address and road map of all our labs can be found in our web site also.