FCC TEST REPORT

according to

FCC Rules and Regulations

Part 15 Subpart C

Applicant	AboCom Systems, Inc.	
Address	1F, No 21, Yanfa 2nd Rd., SBIP, HsinChu City 300, Taiwan (R.O.C)	
Equipment	802.11b/g Wireless LAN USB 2.0 Adapter	
Model No.	WUG2650 / WUG2654	
FCC ID	MQ4WUG2650-4	
Trade Name	AboCom	

- The test result refers exclusively to the test presented test model / sample.,
- Without written approval of Exclusive Certification Corp. the test report shall not be reproduced except in full.

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CERTIFICATE OF COMPLIANCE

according to

FCC Rules and Regulations Part 15 Subpart C

Applicant	AboCom Systems, Inc.
Address	1F, No 21, Yanfa 2nd Rd., SBIP, HsinChu City 300, Taiwan (R.O.C)
Equipment	802.11b/g Wireless LAN USB 2.0 Adapter
Model No.	WUG2650 / WUG2654
FCC ID	MQ4WUG2650-4

I HEREBY CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4.** The equipment was *passed* the test performed according to **FCC Rules** and **Regulations Part 15 Subpart C (2002).** The test was carried out on Jul. 02, 2004 at *Exclusive Certification Corp.*

Signature

Anson Chou / Manager

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1. Report of Measurements and Examinations

1.1. List of Measurements and Examinations

FCC Rule	. Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. Conducted Emission	Pass
15.209	. Radiated Emission	Pass
15.247(a)(2)	. 6dB Bandwidth	Pass
15.247(b)	. Maximum Peak Output Power	Pass
15.247(c)	. 100kHz Bandwidth of Frequency Band Edges	Pass
15.247(d)	. Power Spectral Density	Pass
1.1307 1.1310 2.1091 2.1093	. RF Exposure Compliance	Pass

Test by:

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1.2. Antenna Requirements

1.2.1. 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.

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1.3. Test of Conducted Emission

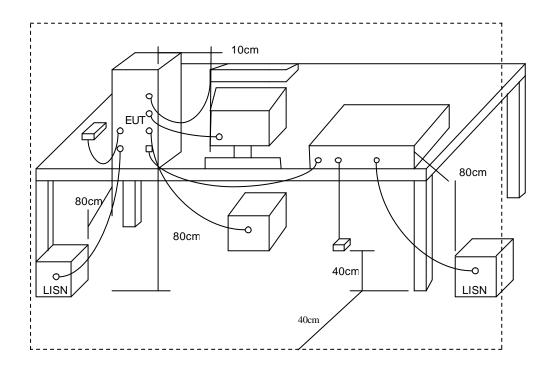
Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 115 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

1.3.1. Test Procedures

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connecting to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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1.3.2. Typical Test Setup Layout of Conducted Emission



1.3.3. Conducted Emission Requirement

Except for A digital devices, for equpment that is designed to be connected to the public utility (AC) power line on any frequency voltage that is conducted back onto the AC power line on ant frequency or frequencies within the band 150KHz to 30MHz shall not exceed the limits in the following table, as measured using a 50µH/50 ohms line impeddance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the Radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency	Quasi Peak	Average	
(MHz)	(dB μ V)	(dB μ V)	
0.15 – 0.5	66-56*	56-46*	
0.5 – 5.0	56	46	
5.0 – 30.0	60	50	

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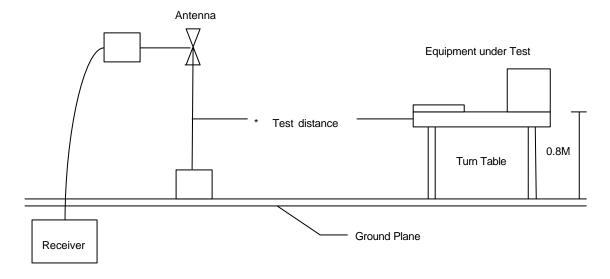
1.4. Test of Radiated Emission

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2001. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

1.4.1. Test Procedures

- 1. The EUT was placed on a rotatable table top 0.8 meter above ground.
- 2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- 3. The table was rotated 360 degrees to determine the position of the highest radiation.
- 4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- 5. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- 6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- 7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- 8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

1.4.2. Typical Test Setup Layout of Radiated Emission



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1.5. 6dB Bandwidth

1.5.1. Test Procedure:

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. Set RBW of spectrum analyzer to 100 KHz and VBW to 100 KHz.
- 3. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

1.5.2. Test Setup Layout:



1.6. Maximum Peak Output Power

1.6.1. Test Procedure:

The antenna port (RF output) of the EUT was connected to the input (RF input) of a spectrum analyzer. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

1.6.2. Test Setup Layout:



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1.7. Band Edges Measurement

1.7.1. Test Procedure:

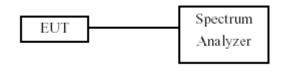
- 1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- 2. Set both RBW and VBW of spectrum analyzer to 100 MHz with convenient frequency span including 100 MHz bandwidth from band edge.
- 3. The band edges was measured and recorded.

1.8. Power Spectral Density

1.8.1. Test Procedure:

- 1. The transmitter output was connected to spectrum analyzer.
- 2. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=span/3KHz.
- 3. The power spectral density was measured and recorded.
- 4. The Sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

1.8.2. Test Setup Layout:



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1.9. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 - 0.11000	16.42000 - 16.42300	399.9 – 410.0	4.500 - 5.250
0.49500 - 0.505**	16.69475 - 16.69525	608.0 - 614.0	5.350 - 5.460
2.17350 - 2.19050	16.80425 - 16.80475	960.0 - 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 - 8.500
4.17725 – 4.17775	37.50000 - 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 - 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 - 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 - 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 - 138.00000	2200.0 - 2300.0	14.470 – 14.500
8.29100 - 8.29400	149.90000 - 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 - 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 - 8.38675	156.70000 - 156.90000	2655.0 - 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 - 167.17000	3260.0 - 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 - 173.20000	3332.0 - 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 - 285.00000	3345.8 - 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 - 335.40000	3600.0 - 4400.0	Above 38.6
13.36000 - 13.41000			

^{**:} Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

1.10. Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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1.11. RF Exposure

FCC Rules and Regulations Part 1.1307, 1.1310, 2.1091, 2.1093: RF Exposure Compliance

1.11.1. Limit For Maximum Permissible Exposure (MPE)

(A) Limits for Occupational / Controlled Exposure

Frequency Range	Electric Field	Magnetic Field	Power Density (S)	Averaging Time
(MHz)	Strength (E) (V/m)	Strength (H) (A/m)	(mW/ cm²)	$ E ^2$, $ H ^2$ or S
				(minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range	Electric Field	Magnetic Field	Power Density (S)	Averaging Time
(MHz)	Strength (E) (V/m)	Strength (H) (A/m)	(mW/cm²)	$ E ^2$, $ H ^2$ or S
				(minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F=frequency in MHz

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^{*}Plane-wave equivalent power density

1.11.2. MPE Calculations

E (V/m) =
$$\frac{\sqrt{30 \cdot P \cdot G}}{d}$$
 Power Density: Pd (mW/cm²) = $\frac{E^2}{3770}$

E = Electric field (V/m)

P = Peak output power (W)

G = Antenna numeric gain (numeric)

d = Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 10 W/m². We can change the formula to:

$$d = \sqrt{\frac{30 \ P \ G}{3770}}$$

1.11.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

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2. Test Configuration of Equipment under Test

2.1. Test Mode and Test Software

The following test mode and test software was performed for conduction and radiation test:

- 802.11b (CH LO: 2412MHz) 802.11b (CH MID: 2437MHz) 802.11b (CH HI: 2462MHz)
- 802.11g (CH LO: 2412MHz) 802.11g (CH MID: 2437MHz) 802.11g (CH HI: 2462MHz)
- An executive programs, "ZD1211EVL" Application under WIN XP.
- Link Mode (The function of EUT is data transmitting which can be operated by connecting with host through wireless .)
- During the test, "Ping. exe" was executive under WinXP to link with the remote workstation to transmitting data by wireless.

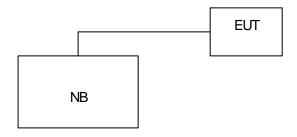
2.2. Description of Test System

Device	Model No.	Manufacturer	Description
Notebook	R40(2723-BV1)	IBM	Power Cord, Unshielding, 1.8m
AP Router(Remote site)	ARM914	ABOCOM	Power Cord, Unshielding, 1.8m

Use Cable:

Cable	Description
USB Cable	Unshielding, 1.1m

2.3. Connection Diagram of Test System



1. The TP cable is connected from Notebook to the EUT.

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2.4. Feature of Equipment under Test

- Complies with IEEE 802.11g standard for 2.4GHz Wireless LAN
- USB 2.0 compliant
- USB Plug & Play
- Interoperable with existing network infrastructure
- Secure information transmission
- Freedom to roam while staying connected
- Compatible with specialty wireless products and services
- Up to 54 Mbps data rate
- Antenna is built in the card with LEDs indication
- Low power consumption
- · Easy to install and configure
- Auto-installation and configuration (optional)

2.5. History of this test report

ORIGINAL.

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3. General Information of Test

Test Site:	Exclusive Certification Corp.
	4F-2, No. 28, Lane 78, Xing-Ai Rd. Nei-hu, Taipei City 114 Taiwan R.O.C.
Test Site Location (OATS1-SD):	No.68-1, Shihbachongsi, shihding Township,
	Taipei County 223, Taiwan, R.O.C.
Test Voltage:	AC 110V/ 60Hz (For Notebook)
Test in Compliance with:	ANSI C63.4-1992
	FCC Part 15 Subpart C
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz
	Radiation: from 30 MHz to 24620MHz
Test Distance:	The test distance of radiated emission from antenna to EUT is 10 M.

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4. Test Result and Data

4.1. Antenna Requirement

4.1.1. Antenna Construction and Directional Gain

Antenna type: Broad Band LTCC Multi Layer Ceramic Chip Antnna the maximum antenna gain: +2.0 dBi.

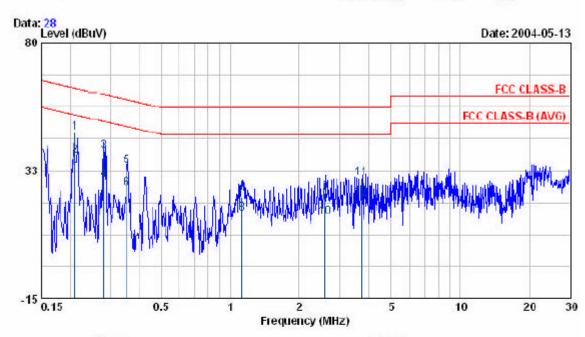
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4.2. Test Result of Conducted Emission

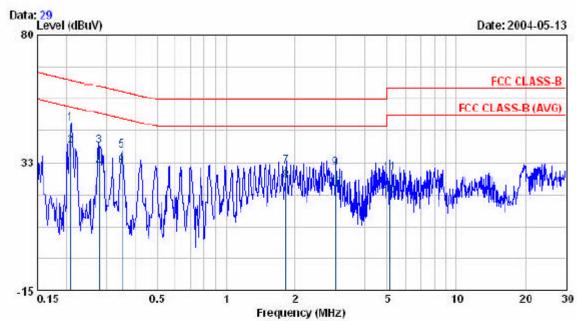
EUT : WUG2650/WUG2654

Power : 110V 60Hz(for notebook) Pol/Phase : NEUTRAL
Test Mode : LINK Temperature : 24 °C
Memo : Humidity : 58 %

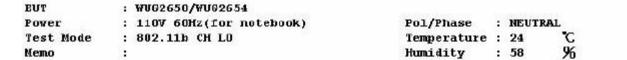


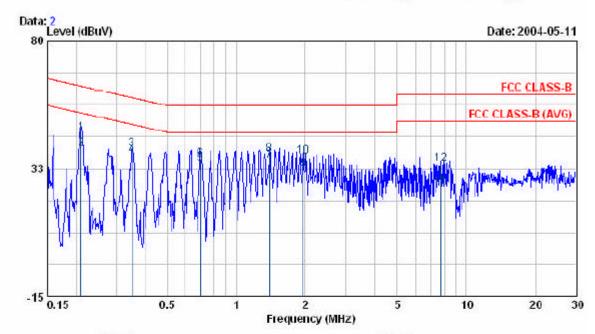
	Read				Over	
Freq	Level	Factor	Level	Limit	Limit	Remark
MHZ	aBuV	dB	dBuV	dBuV	dBuV	
0.210	46.27	0.42	46.69	63.20	-16.51	QP
0.210	37.57	0.42	37.99	53.20	-15.21	AVERAGE
0.281	39.32	0.44	39.76	60.79	-21.03	QP
0.281	28.40	0.44	28.84	50.79	-21.95	AVERAGE
0.352	33.70	0.45	34.15	58.93	-24.78	QP
0.352	25.23	0.45	25.68	48.93	-23.25	AVERAGE
1.123	22.36	0.52	22.88	56.00	-33.12	QP
1.123	15.98	0.52	16.50	46.00	-29.50	AVERAGE
2.604	23.85	0.55	24.40	56.00	-31.60	QP
2.604	14.82	0.55	15.37	46.00	-30.63	AVERAGE
3.716	28.82	0.57	29.39	56.00	-26.61	QP
3.716	21.83	0.57	22.40	46.00	-23.60	AVERAGE





	Read				Over		
Freq	Level	Factor	Level	Limit	Limit	Remark	
MHZ	dBuV	dВ	dBuV	dBuV	₫BuV		
0.210	46.35	0.42	46.77	63.22	-16.45	QP	
0.210	38.19	0.42	38.61	53.22	-14.61	AVERAGE	
0.280	38.15	0.44	38.59	60.81	-22.22	QP	
0.280	30.30	0.44	30.74	50.81	-20.07	AVERAGE	
0.351	36.52	0.45	36.97	58.94	-21.97	QP	
0.351	30.50	0.45	30.95	48.94	-17.99	AVERAGE	
1.819	30.31	0.54	30.85	56.00	-25.15	QP	
1.819	24.77	0.54	25.31	46.00	-20.69	AVERAGE	
3.008	29.60	0.56	30.16	56.00	-25.84	QP	
3.008	22.50	0.56	23.06	46.00	-22.94	AVERAGE	
5.110	27.89	0.59	28.48	60.00	-31.52	0P	
5.110	19.73	0.59	20.32	50.00	-29.68	AVERAGE	





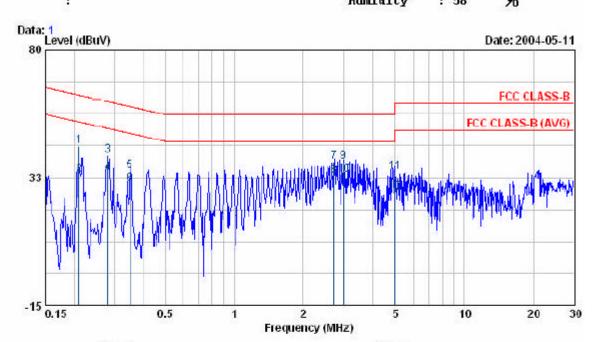
	Read				0ver		
Freq	Level	Factor	Level	Limit	Limit	Remark	
MHZ	aBuV	dB	abuv	abuv	dBuV		
0.211	45.19	0.42	45.61	63.17	-17.56	QP	
0.211	39.04	0.42	39.46	53.17	-13.71	AVERAGE	
0.350	39.24	0.45	39.69	58.96	-19.27	0P	
0.350	36.73	0.45	37.18	48.96	-11.78	AVERAGE	
0.700	33.63	0.49	34.12	46.00	-11.88	AVERAGE	
0.700	35.38	0.49	35.87	56.00	-20.13	QP	
1.399	34.42	0.53	34.95	46.00	-11.05	AVERAGE	
1.399	37.08	0.53	37.61	56.00	-18.39	QP	
1.960	31.27	0.54	31.81	46.00	-14.19	AVERAGE	
1.960	36.32	0.54	36.86	56.00	-19.14	0P	
7.769	24.60	0.68	25.28	50.00	-24.72	AVERAGE	
7.769	33.32	0.68	34.00	60.00	-26.00	QP	

EUT : WUG2650/WUG2654

 Power
 : 110V 60Hz(for notebook)
 Pol/Phase
 : LINE

 Test Mode
 : 802.11b CH L0
 Temperature
 : 24
 C

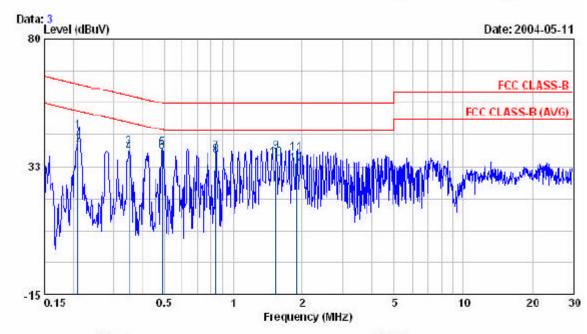
 Nemo
 : Humidity
 : 58
 %



	Read				0ver		
Freq	Level	Factor	Level	Limit	Limit	Remark	
MHZ	dBuV	dB	dBuV	dBuV	dBuV		
0.211	43.82	0.42	44.24	63.17	-18.93	0P	
						- 15 Bits 3200 Bits (C)	
0.211	33.02	0.42	33.44	53.17	-19.73	AVERAGE	
0.281	40.10	0.44	40.54	60.80	-20.26	QP	
0.281	33.75	0.44	34.19	50.80	-16.61	AVERAGE	
0.351	34.29	0.45	34.74	58.95	-24.21	QP	
0.351	29.33	0.45	29.78	48.95	-19.17	AVERAGE	
2.730	37.58	0.56	38.14	56.00	-17.86	QP	
2.730	32.42	0.56	32.98	46.00	-13.02	AVERAGE	
3.010	37.53	0.56	38.09	56.00	-17.91	QP	
3.010	32.75	0.56	33.31	46.00	-12.69	AVERAGE	
4.969	33.96	0.58	34.54	56.00	-21.46	QP	
4.969	26.08	0.58	26.66	46.00	-19.34	AVERAGE	



% Humidity : 58 Memo

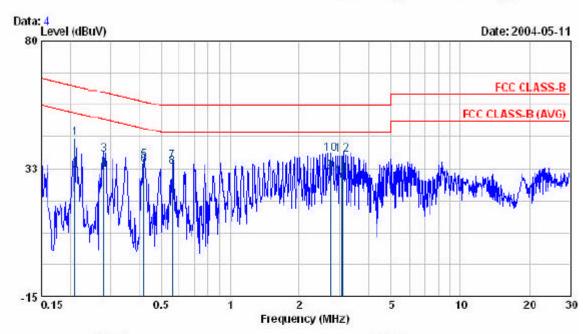


	Read				Over	
Freq	Level	Factor	Level	Limit	Limit	Remark
		300000000				
MHZ	aBuV	dВ	dBuV	dBuV	dBuV	
0.211	45.21	0.42	45.63	63.19	-17.56	QP
0.211	40.03	0.42	40.45	53.19	-12.74	AVERAGE
0.350	39.06	0.45	39.51	58.96	-19.45	QP
0.350	36.96	0.45	37.41	48.96	-11.55	AVERAGE
0.490	38.77	0.47	39.24	56.16	-16.92	QP
0.490	37.56	0.47	38.03	46.16	-8.13	AVERAGE
0.840	37.14	0.50	37.64	56.00	-18.36	QP
0.840	36.13	0.50	36.63	46.00	-9.37	AVERAGE
1.538	37.26	0.53	37.79	56.00	-18.21	QP
1.538	34.84	0.53	35.37	46.00	-10.63	AVERAGE
1.888	36.72	0.54	37.26	56.00	-18.74	QP
1.888	32.91	0.54	33.45	46.00	-12.55	AVERAGE

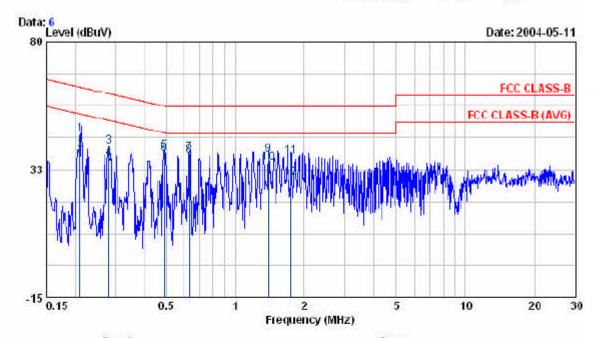
EUT : WUG2650/WUG2654

Power : 110V 60Hz(for notebook) Pol/Phase : LINE

Test Mode : 802.11b CH MID Temperature : 24 $^{\circ}$ C Memo : Humidity : 58 $^{\circ}$ %



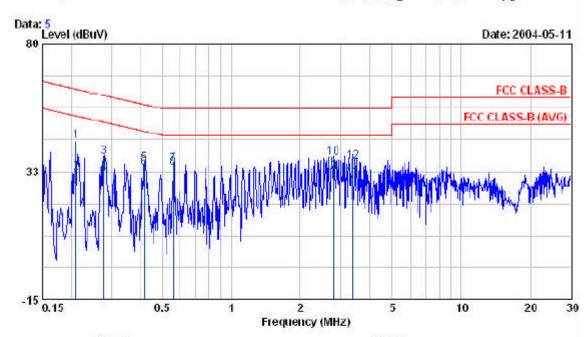
	Read				Over	
Freq	Level	Factor	Level	Limit	Limit	Remark
				Bernard -	5000000	
MHZ	aBuV	dB	dBuV	dBuV	4BuV	
0.211	43.41	0.42	43.83	63.19	-19.36	QP
0.211	31.25	0.42	31.67	53.19	-21.52	AVERAGE
0.281	37.17	0.44	37.61	60.80	-23.19	QP
0.281	31.52	0.44	31.96	50.80	-18.84	AVERAGE
0.421	35.06	0.46	35.52	57.44	-21.92	QP
0.421	33.25	0.46	33.71	47.44	-13.73	AVERAGE
0.559	34.51	0.48	34.99	56.00	-21.01	QP
0.559	32.42	0.48	32.90	46.00	-13.10	AVERAGE
2.730	30.89	0.56	31.45	46.00	-14.55	AVERAGE
2.730	37.17	0.56	37.73	56.00	-18.27	QP
3.075	29.11	0.56	29.67	46.00	-16.33	AVERAGE
3.075	36.88	0.56	37.44	56.00	-18.56	QP



	Read				Over		
Freq	Level	Factor	Level	Limit	Limit	Remark	
MHZ	dBuV	ав	dBuV	dBuV	∉Bu V		
0.210	45.15	0.42	45.57	63.20	-17.63	QP	
0.210	39.17	0.42	39.59	53.20	-13.61	AVERAGE	
0.281	40.43	0.44	40.87	60.80	-19.93	QP	
0.281	36.10	0.44	36.54	50.80	-14.26	AVERAGE	
0.490	38.79	0.47	39.26	56.17	-16.91	QP	
0.490	37.61	0.47	38.08	46.17	-8.09	AVERAGE	
0.630	37.97	0.49	38.46	56.00	-17.54	QP	
0.630	37.17	0.49	37.66	46.00	-8.34	AVERAGE	
1.398	37.29	0.53	37.82	56.00	-18.18	QP	
1.398	34.33	0.53	34.86	46.00	-11.14	AVERAGE	
1.753	36.73	0.54	37.27	56.00	-18.73	QP	
1.753	28.61	0.54	29.15	46.00	-16.85	AVERAGE	

EUT : WUG2650/WUG2654

Power : 110V 60Hz(for notebook) Pol/Phase : LINE



	Read				Over	
Freq	Level	Factor	Level	Limit	Limit	Remark
MHZ	dBuV	dВ	dBuV	dBuV	dBuV	
0.210	42 27	0.40	42 70	62 10	10 40	OD.
	43.37	0.42	43.79	63.19	-19.40	QP
0.210	31.52	0.42	31.94	53.19	-21.25	AVERAGE
0.279	37.43	0.44	37.87	60.86	-22.99	QP
0.279	31.06	0.44	31.50	50.86	-19.36	AVERAGE
0.419	34.93	0.46	35.39	57.47	-22.07	QP
0.419	33.16	0.46	33.62	47.47	-13.84	AVERAGE
0.560	34.57	0.48	35.05	56.00	-20.95	QP
0.560	33.34	0.48	33.82	46.00	-12.18	AVERAGE
2.799	31.26	0.56	31.82	46.00	-14.18	AVERAGE
2.799	36.87	0.56	37.43	56.00	-18.57	QP
3.359	29.54	0.57	30.11	46.00	-15.89	AVERAGE
3.359	35.72	0.57	36.29	56.00	-19.71	QР