



EMC TEST REPORT

Report No. : EME-021189

Model No. : WB1500S

Issued Date : Oct. 14, 2002

Applicant : AboCom Systems, Inc.
300 1F, No. 21, R&D Rd. II, SBIP, Hsin-Chu,
Taiwan, R.O.C.

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Ko-Tze-Nan Chia-Tung Li, Shiang-Shan District,
Hsinchu, Taiwan, R.O.C.

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Project Engineer

Kaysi Chen

Reviewed By

Elton Chen



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Summary of Tests

802.11b Wireless Short PC Card-Model: WB1500S

FCC ID: MQ4WB1K5S

Test	Reference	Results
Radiated Spurious Emission test	15.205, 15.209	Complies



1. General information

1.1 Identification of the EUT

Manufacturer	: AboCom System, Inc.
Product	: 802.11b Wireless Short PC Card
Model No.	: WB1500S
FCC ID.	: MQ4WB1K5S
Frequency Range	: 2412MHz to 2462MHz
Channel Number	: 11
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: BPSK, QPSK, CCK
Power Supply	: 5Vdc from PC
Power Cord	: N/A
Sample Received	: Oct. 8, 2002
Test Date(s)	: Oct. 9, 2002

1.2 Additional information about the EUT

The EUT lets user take full advantage of user's PC's mobility with access to real-time information and online services anytime and anywhere. Plus, with the network installation's simplicity and flexibility, user can eliminate the needs to pull cable through walls and ceilings and allow the network to go where wires cannot go.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"



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1.3 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : 1.9dBi

Antenna Type : Dipole Antenna

Connector Type : MMCX

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	N/A	N/A	N/A	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved

Remark: The PC is provided by client.



2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section §15.205 、 §15.209 、 §15.247 and ANSI C63.4/1992.

Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading recorded also on the report.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

The EUT setup configurations please refer to the photo of test configuration in item.

2.2 Operation mode

Plug the EUT into PC and turn on the power, then run the test program “Prism test Utility” under Window OS.

The EUT was continuously transmit during the test.



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2.4 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	May 24, 2002
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 10, 2002
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2002
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	100189	June 4, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2002
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 20, 2002
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3111	June 20, 2002
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A
Microwave Amplifier	Agilent	2GHz~26.5GHz	8348A	3111A00567	Dec. 20, 2001

Note:

1. The calibration interval of the above instruments is 12 months.

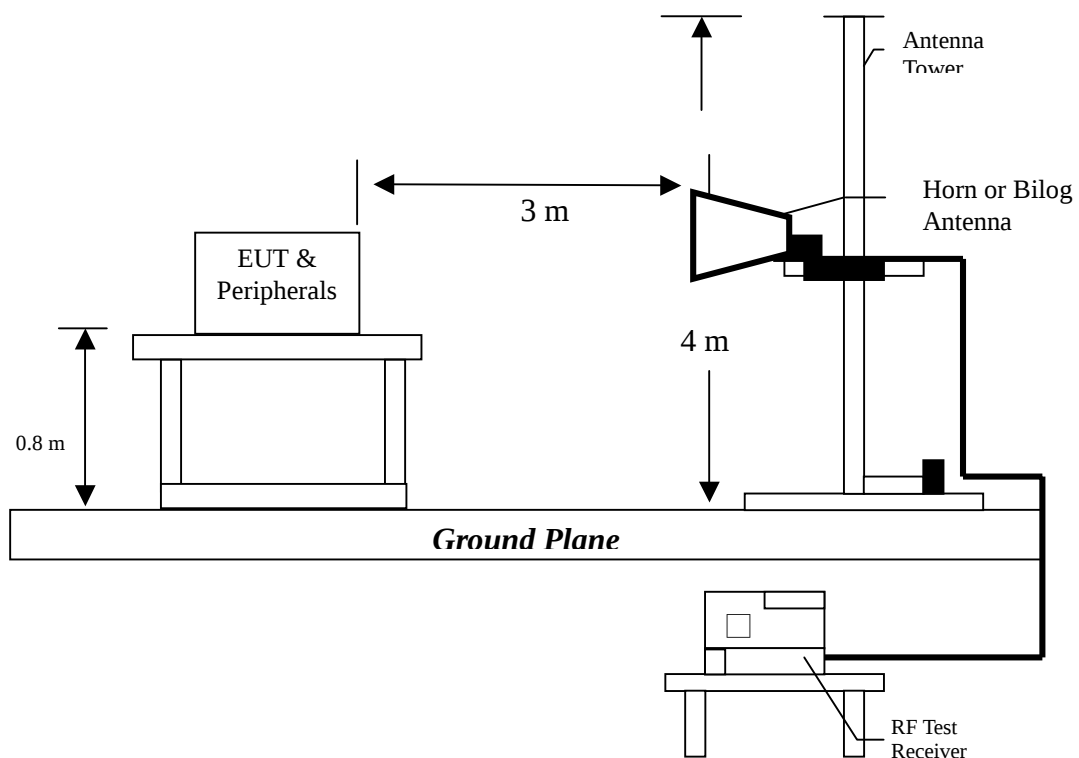
3. Radiated Emission test

3.1 Operating environment

Temperature: 25 °C
Relative Humidity: 56 %

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, 1MHz – for frequencies above 1GHz.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.



3.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is ± 3.078 dB.



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3.4 Radiated spurious emission test data

3.4.2 Measurement results: frequency above 1GHz

EUT : WB1500S

Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2038	PK	V	0	29.36	19.31	48.67	74	-25.33
2038	AV	V	0	29.36	14.64	44	54	-10
4076	PK	V	28.02	34.59	45.16	51.73	74	-22.27
4076	AV	V	28.02	34.59	43.46	50.03	54	-3.97
6114	PK	V	28.02	37.74	-	-	74	-
6114	AV	V	28.02	37.74	-	-	54	-
8152	PK	V	28.02	40.05	39.25	51.28	74	-22.72
8152	AV	V	28.02	40.05	29.14	41.17	54	-12.83
10190	PK	V	28.02	41.99	-	-	74	-
10190	AV	V	28.02	41.99	-	-	54	-
4824	PK	V	28.02	35.47	39.37	46.82	74	-27.18
4824	AV	V	28.02	35.47	28.68	36.13	54	-17.87
7236	PK	V	28.02	38.42	44.8	55.2	74	-18.8
7236	AV	V	28.02	38.42	40.3	50.7	54	-3.3
9648	PK	V	28.02	41.35	-	-	74	-
9648	AV	V	28.02	41.35	-	-	54	-
12060	PK	V	28.02	43.38	-	-	74	-
12060	AV	V	28.02	43.38	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



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The radiated spurious emissions at

Frequency(MHz)	Margin
4076	-1.17

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : WB1500S

Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2038	PK	H	0	29.36	22.17	51.53	74	-22.47
2038	AV	H	0	29.36	19.23	48.59	54	-5.41
4076	PK	H	28.02	34.59	48.68	55.25	74	-18.75
4076	AV	H	28.02	34.59	46.26	52.83	54	-1.17
6114	PK	H	28.02	37.74	-	-	74	-
6114	AV	H	28.02	37.74	-	-	54	-
8152	PK	H	28.02	40.05	40.16	52.19	74	-21.81
8152	AV	H	28.02	40.05	32.25	44.28	54	-9.72
10190	PK	H	28.02	41.99	-	-	74	-
10190	AV	H	28.02	41.99	-	-	54	-
4824	PK	H	28.02	35.47	38.49	45.94	74	-28.06
4824	AV	H	28.02	35.47	28.18	35.63	54	-18.37
7236	PK	H	28.02	38.42	42.03	52.43	74	-21.57
7236	AV	H	28.02	38.42	35.26	45.66	54	-8.34
9648	PK	H	28.02	41.35	-	-	74	-
9648	AV	H	28.02	41.35	-	-	54	-
12060	PK	H	28.02	43.38	-	-	74	-
12060	AV	H	28.02	43.38	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



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EUT : WB1500S

Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2063	PK	V	0	29.36	19.86	49.22	74	-24.78
2063	AV	V	0	29.36	15.17	44.53	54	-9.47
4126	PK	V	28.02	34.59	43.56	50.13	74	-23.87
4126	AV	V	28.02	34.59	40.73	47.3	54	-6.7
6189	PK	V	28.02	37.74	-	-	74	-
6189	AV	V	28.02	37.74	-	-	54	-
8252	PK	V	28.02	39.97	38.03	49.98	74	-24.02
8252	AV	V	28.02	39.97	29.28	41.23	54	-12.77
10315	PK	V	28.02	42.06	-	-	74	-
10315	AV	V	28.02	42.06	-	-	54	-
4874	PK	V	28.02	35.47	36.53	43.98	74	-30.02
4874	AV	V	28.02	35.47	27.4	34.85	54	-19.15
7311	PK	V	28.02	38.42	44.38	54.78	74	-19.22
7311	AV	V	28.02	38.42	38.24	48.64	54	-5.36
9748	PK	V	28.02	41.35	-	-	74	-
9748	AV	V	28.02	41.35	-	-	54	-
12185	PK	V	28.02	43.38	-	-	74	-
12185	AV	V	28.02	43.38	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



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The radiated spurious emissions at

Frequency(MHz)	Margin
4126	-0.5

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : WB1500S

Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2063	PK	H	0	29.36	22.52	51.88	74	-22.12
2063	AV	H	0	29.36	20.31	49.67	54	-4.33
4126	PK	H	28.02	34.59	48.6	55.17	74	-18.83
4126	AV	H	28.02	34.59	46.93	53.5	54	-0.5
6189	PK	H	28.02	37.74	-	-	74	-
6189	AV	H	28.02	37.74	-	-	54	-
8252	PK	H	28.02	39.97	39.02	50.97	74	-23.03
8252	AV	H	28.02	39.97	30.23	42.18	54	-11.82
10315	PK	H	28.02	42.06	-	-	74	-
10315	AV	H	28.02	42.06	-	-	54	-
4874	PK	H	28.02	35.47	34.79	42.24	74	-31.76
4874	AV	H	28.02	35.47	25.84	33.29	54	-20.71
7311	PK	H	28.02	38.42	44.16	54.56	74	-19.44
7311	AV	H	28.02	38.42	36.45	46.85	54	-7.15
9748	PK	H	28.02	41.35	-	-	74	-
9748	AV	H	28.02	41.35	-	-	54	-
12185	PK	H	28.02	43.38	-	-	74	-
12185	AV	H	28.02	43.38	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



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Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2088	PK	V	0	29.36	19.4	48.76	74	-25.24
2088	AV	V	0	29.36	13.8	43.16	54	-10.84
4176	PK	V	28.02	34.59	40.57	47.14	74	-26.86
4176	AV	V	28.02	34.59	36.89	43.46	54	-10.54
6264	PK	V	28.02	37.74	-	-	74	-
6264	AV	V	28.02	37.74	-	-	54	-
8352	PK	V	28.02	39.97	28.03	39.98	74	-34.02
8352	AV	V	28.02	39.97	28.87	40.82	54	-13.18
10440	PK	V	28.02	42.21	-	-	74	-
10440	AV	V	28.02	42.21	-	-	54	-
4924	PK	V	28.02	35.47	35.63	43.08	74	-30.92
4924	AV	V	28.02	35.47	26.5	33.95	54	-20.05
7386	PK	V	28.02	38.42	43.32	53.72	74	-20.28
7386	AV	V	28.02	38.42	38.08	48.48	54	-5.52
9848	PK	V	28.02	41.55	-	-	74	-
9848	AV	V	28.02	41.55	-	-	54	-
12310	PK	V	28.02	43.75	-	-	74	-
12310	AV	V	28.02	43.75	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



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EUT : WB1500S

Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2088	PK	H	0	29.36	21.84	51.2	74	-22.8
2088	AV	H	0	29.36	18.23	47.59	54	-6.41
4176	PK	H	28.02	34.59	46.85	53.42	74	-20.58
4176	AV	H	28.02	34.59	43.92	50.49	54	-3.51
6264	PK	H	28.02	37.74	-	-	74	-
6264	AV	H	28.02	37.74	-	-	54	-
8352	PK	H	28.02	39.97	39.7	51.65	74	-22.35
8352	AV	H	28.02	39.97	31.22	43.17	54	-10.83
10440	PK	H	28.02	42.21	-	-	74	-
10440	AV	H	28.02	42.21	-	-	54	-
4924	PK	H	28.02	35.47	36.5	43.95	74	-30.05
4924	AV	H	28.02	35.47	27.11	34.56	54	-19.44
7386	PK	H	28.02	38.42	42.45	52.85	74	-21.15
7386	AV	H	28.02	38.42	35.21	45.61	54	-8.39
9848	PK	H	28.02	41.55	-	-	74	-
9848	AV	H	28.02	41.55	-	-	54	-
12310	PK	H	28.02	43.75	-	-	74	-
12310	AV	H	28.02	43.75	-	-	54	-

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. “-” means the emission is below the noise floor.



4. Emission on the band edge §FCC 15.247(C)

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

See band-edge plot as file name “Band-edge plot.pdf”.