EMC
TEST REPORT

Report No. : EME-020705
Model No. : WUE1500
Issued Date : July 29, 2002

Applicant : AboCom Systems, Inc.
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Taiwan, R.O.C.

Test By : Intertek Testing Services Taiwan Ltd.
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Project Engineer

Kaysi Chen

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Approved By

MICHAEL CHEN
GENERAL MANAGER
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Reviewed By

Elton Chen

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Summary of Tests

2.4GHz WLAN device-Model: WUE1500
FCC ID: MQ4WUE1K5

Test	Reference	Results
Minimum 6dB Bandwidth test	15.247(a)(2)	Complies
Maximum Output Power test	15.247(b)	Complies
RF Antenna Conducted Spurious test	15.247(c)	Complies
Radiated Spurious Emission test	15.205, 15.209	Complies
Power Spectrum Density test	15.247(d)	Complies
Power Line Conducted Emission test	15.207	Complies

1. General information

1.1 Identification of the EUT

Manufacturer	: AboCom System, Inc.
Product	: 2.4GHz WLAN device
Model No.	: WUE1500
FCC ID.	: MQ4WUE1K5
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	: June 26, 2002
Test Date(s)	: June 26, 2002 to July 23, 2002

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The 802.11b Wireless & Fast Ethernet USB Adapter is the multifunction device for the wireless network applications and based on the IEEE 802.11b standard offering a data rate of 11Mbps in a LAN environment and 10/100Mbps traditional network. It is a high-speed wireless network device that plugs into user's notebook or desktop PC and accesses to the LAN or peer-to-peer networking easily without wires or cables. Besides, this device allows user's to connect the traditional 10/100 Mbps network via the RJ-45 port.

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

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 : 1.1 dBi
Antenna Type : Dipole

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	IBM	634588V	BN3R1VC	FCC DoC Approved
Key Board	IBM	37L2548	0095996	FCC DoC Approved
Monitor	IBM	6331-0LN	23-NW855	ARSCM560S
Mouse	Logitech	850693-0001	LAZ82706831	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved
Notebook	HP	XE_3	TW20705468	FCC DoC Approved

Data Cable:
USB cable 1m length × 1
RJ-45 Cat. 5 UTP Cable 20m length × 1

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section §15.207、§15.209 、§15.247 and ANSI C63.4/1992.

The AC power conducted emissions was invested over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

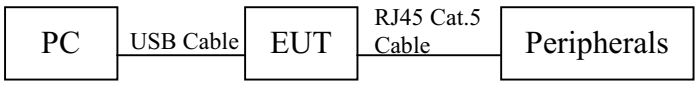
Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading recorded also on the report.

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

1) Connect the EUT to PC via a 1.0m length USB cable and 20m length unshielded RJ 45 Cat.5 cable connected to peripherals, then make EUT communicated with peripherals under 10/100 Mbps transmitter mode.
   The test configuration show as below:



2) Connect the USB cable to EUT, and then wireless LAN function will enable. Run the testing program " RF test tool", the EUT transmitted continuously during all the test.
   The test configuration show as below:

Note: LAN function and wireless LAN function CAN NOT active at the same time.

2.4 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	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
Pulse Limiter	Rohde & Schwarz	9kHz~30MHz	ESH3-Z2	848.766/052	N/A
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5822	Sep. 10, 2001
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
RF Power Meter	Boonton	10kHz~100GHz	4231A	79401	May 22, 2002
Power Sensor	Boonton	30MHz~8GHz	51011-EMC	32482	May 25, 2002

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

3. Minimum 6dB Bandwidth test

3.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 58 %

3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

See Minimum 6dB Bandwidth plot as file name “Minimum 6dB Bandwidth plot.pdf”

3.3 Measured data of Minimum 6dB Bandwidth test results

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
Low	2412.20	11.00	＞500kHz
Middle	2437.20	11.00	＞500kHz
High	2462.00	10.80	＞500kHz

4. Maximum Output Power test

4.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 58 %

4.2 Test setup & procedure

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to power meter via power sensor. Power was read directly and cable loss correction (1dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

4.3 Measured data of Maximum Output Power test results

Channel	Frequency (MHz)	C.B.L. (dB)	Reading (dBm)	Power Output		Limit (W)
				(dBm)	(mW)	
Lowest	2412	1	16.67	17.67	58.479	1
Middle	2437	1	16.16	17.16	51.999	1
Highest	2462	1	14.82	15.82	38.194	1

5. RF Antenna Conducted Spurious test

5.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 58 %

5.2 Test setup & procedure

The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

See RF Antenna Conducted plot as file name “RF Antenna Conducted plot.pdf”

5.3 Measured data of the highest RF Antenna Conducted Spurious test result

Channel	Max Spurious level at Frequency (MHz)	Spurious Emission level (dBm)	Limit (dB)
Low	2395.26	-32.97	-19.63
Middle	698.34	-34.00	-20.16
High	722.040	-36.57	-21.75

Note: 1. Limit = peak power output (in 100kHz RBW) – 20dB
2. All the other emissions were very low the limit.

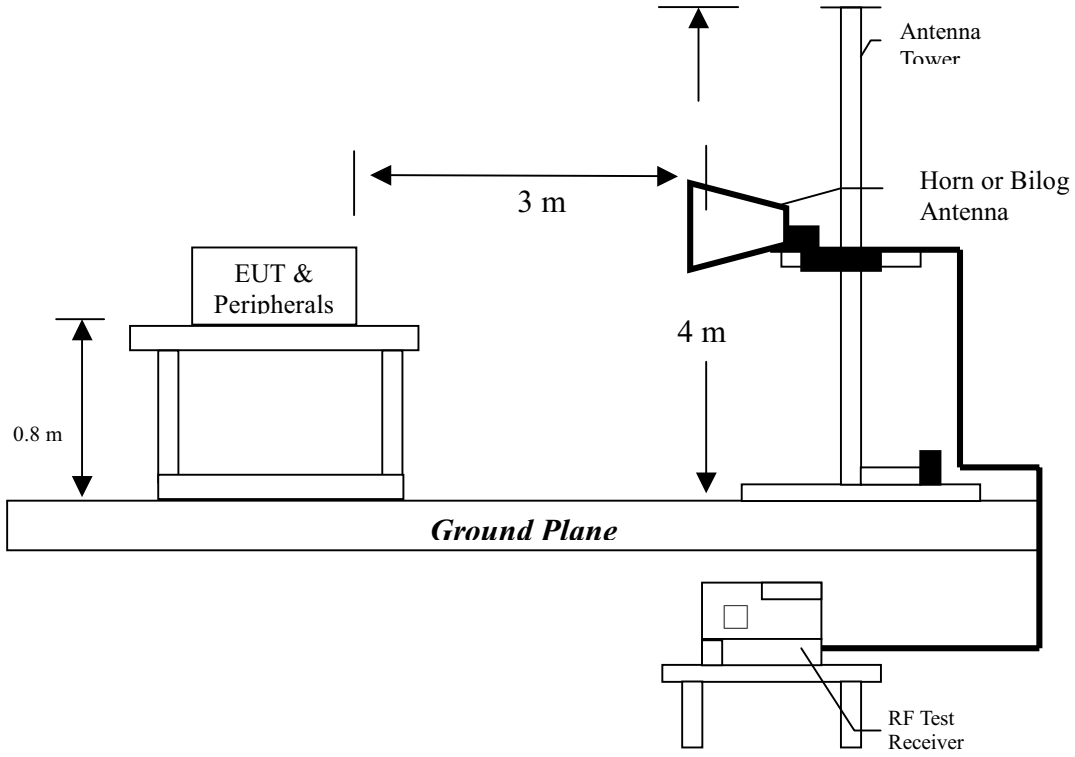
6. Radiated Emission test

6.1 Operating environment

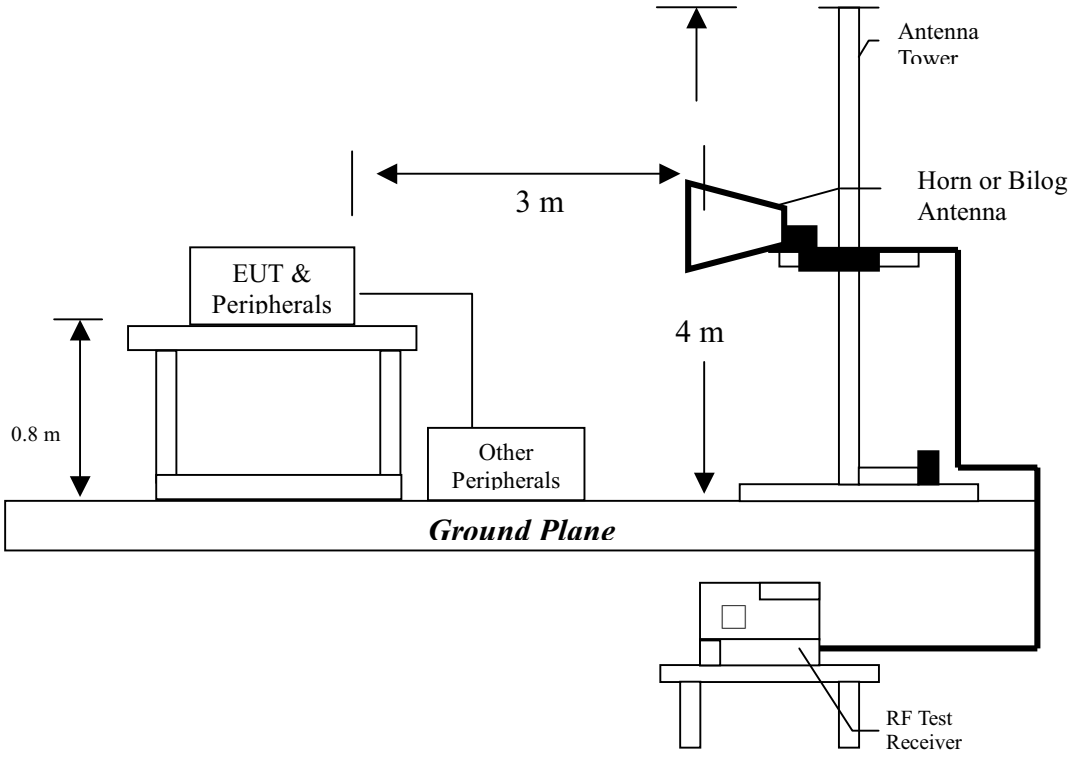
Temperature:	25	℃
Relative Humidity:	58	%

6.2 Test setup & procedure

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



The Diagram below shows the test setup for LAN Function, 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.

6.3 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.

6.4 Radiated spurious emission test data

6.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : WUE1500
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
47.80000	QP	V	12.91	18.59	31.50	40.00	-8.50
59.70000	QP	V	13.13	19.67	32.80	40.00	-7.20
73.70000	QP	V	10.78	14.92	25.70	40.00	-14.30
119.60000	QP	V	11.89	15.31	27.20	43.50	-16.30
132.10000	QP	V	13.36	17.44	30.80	43.50	-12.70
143.90000	QP	V	14.29	17.41	31.70	43.50	-11.80
47.80000	QP	H	12.91	14.59	27.50	40.00	-12.50
59.70000	QP	H	13.13	15.77	28.90	40.00	-11.10
73.70000	QP	H	10.78	15.42	26.20	40.00	-13.80
132.10000	QP	H	13.36	11.34	24.70	43.50	-18.80
263.80000	QP	H	13.32	16.58	29.90	46.00	-16.10
288.10000	QP	H	14.07	20.23	34.30	46.00	-11.70

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

EUT : WUE1500
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
48.10000	QP	V	12.88	18.72	31.60	40.00	-8.40
60.20000	QP	V	13.19	19.91	33.10	40.00	-6.90
143.90000	QP	V	14.29	16.51	30.80	43.50	-12.70
179.60000	QP	V	14.21	14.89	29.10	43.50	-14.40
624.80000	QP	V	21.31	12.39	33.70	46.00	-12.30
748.00000	QP	V	23.32	13.98	37.30	46.00	-8.70
47.90000	QP	H	12.91	13.59	26.50	40.00	-13.50
74.20000	QP	H	10.57	15.13	25.70	40.00	-14.30
179.60000	QP	H	14.21	20.79	35.00	43.50	-8.50
288.20000	QP	H	14.07	19.83	33.90	46.00	-12.10
655.60000	QP	H	21.49	9.11	30.60	46.00	-15.40
748.00000	QP	H	23.32	10.88	34.20	46.00	-11.80

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

EUT : WUE1500
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
59.80000	QP	V	13.13	16.67	29.80	40.00	-10.20
144.00000	QP	V	14.29	18.31	32.60	43.50	-10.90
179.40000	QP	V	14.21	16.19	30.40	43.50	-13.10
192.00000	QP	V	12.03	14.47	26.50	43.50	-17.00
624.80000	QP	V	21.31	11.19	32.50	46.00	-13.50
748.00000	QP	V	23.32	13.58	36.90	46.00	-9.10
47.90000	QP	H	12.91	12.19	25.10	40.00	-14.90
59.80000	QP	H	13.13	13.57	26.70	40.00	-13.30
180.10000	QP	H	13.55	21.85	35.40	43.50	-8.10
287.90000	QP	H	14.07	18.73	32.80	46.00	-13.20
656.10000	QP	H	21.49	9.91	31.40	46.00	-14.60
747.90000	QP	H	23.32	10.18	33.50	46.00	-12.50

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

EUT : WUE1500
Test Condition : LAN 10Mbps

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
73.70000	QP	V	10.78	18.82	29.60	40.00	-10.40
179.60000	QP	V	14.21	12.79	27.00	43.50	-16.50
203.90000	QP	V	11.53	19.27	30.80	43.50	-12.70
431.60000	QP	V	17.66	12.74	30.40	46.00	-15.60
500.20000	QP	V	18.57	11.13	29.70	46.00	-16.30
624.80000	QP	V	21.31	12.39	33.70	46.00	-12.30
73.70000	QP	H	10.78	13.02	23.80	40.00	-16.20
179.60000	QP	H	14.21	16.19	30.40	43.50	-13.10
192.00000	QP	H	12.03	19.27	31.30	43.50	-12.20
203.90000	QP	H	11.53	17.87	29.40	43.50	-14.10
335.00000	QP	H	15.30	14.10	29.40	46.00	-16.60
625.10000	QP	H	21.31	9.19	30.50	46.00	-15.50

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

EUT : WUE1500
Test Condition : LAN 100Mbps

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
38.60000	QP	V	13.00	21.90	34.90	40.00	-5.10
73.70000	QP	V	10.78	20.22	31.00	40.00	-9.00
174.70000	QP	V	14.21	15.19	29.40	43.50	-14.10
192.00000	QP	V	12.03	16.77	28.80	43.50	-14.70
203.90000	QP	V	11.53	20.87	32.40	43.50	-11.10
249.80000	QP	V	12.86	14.64	27.50	46.00	-18.50
73.70000	QP	H	10.78	14.62	25.40	40.00	-14.60
167.70000	QP	H	14.92	16.78	31.70	43.50	-11.80
179.60000	QP	H	14.21	21.29	35.50	43.50	-8.00
215.80000	QP	H	11.59	20.51	32.10	43.50	-11.40
335.00000	QP	H	15.30	13.10	28.40	46.00	-17.60
624.80000	QP	H	21.31	10.29	31.60	46.00	-14.40

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

6.4.2 Measurement results: frequency above 1GHz

The radiated spurious emissions at

Frequency(MHz)	Margin
4824	-2.02

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

EUT : WUE1500
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2038	PK	V	0	30.79	20.16	50.95	74	-23.05
2038	AV	V	0	30.79	14.52	45.31	54	-8.69
4076	PK	V	28.02	37.54	36.74	46.26	74	-27.74
4076	AV	V	28.02	37.54	25.11	34.63	54	-19.37
6114	PK	V	28.02	41.82	37.05	50.85	74	-23.15
6114	AV	V	28.02	41.82	26.17	39.97	54	-14.03
8152	PK	V	28.02	44.95	-	-	74	-
8152	AV	V	28.02	44.95	-	-	54	-
4824	PK	V	28.02	37.9	48.53	58.41	74	-15.59
4824	AV	V	28.02	37.9	42.1	51.98	54	-2.02
7236	PK	V	28.02	43.26	41.96	57.2	74	-16.8
7236	AV	V	28.02	43.26	30.26	45.5	54	-8.5
9648	PK	V	28.02	46.8	-	-	74	-
9648	AV	V	28.02	46.8	-	-	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.

EUT : WUE1500
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2038	PK	H	0	30.79	18.06	48.85	74	-25.15
2038	AV	H	0	30.79	10.98	41.77	54	-12.23
4076	PK	H	28.02	37.54	36.45	45.97	74	-28.03
4076	AV	H	28.02	37.54	24.99	34.51	54	-19.49
6114	PK	H	28.02	41.82	36.81	50.61	74	-23.39
6114	AV	H	28.02	41.82	25.01	38.81	54	-15.19
8152	PK	H	28.02	44.95	-	-	74	-
8152	AV	H	28.02	44.95	-	-	54	-
4824	PK	H	28.02	37.9	46.83	56.71	74	-17.29
4824	AV	H	28.02	37.9	39.37	49.25	54	-4.75
7236	PK	H	28.02	43.26	40.52	55.76	74	-18.24
7236	AV	H	28.02	43.26	28.74	43.98	54	-10.02
9648	PK	H	28.02	46.8	-	-	74	-
9648	AV	H	28.02	46.8	-	-	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.

EUT : WUE1500
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2063	PK	V	0	30.79	19.04	49.83	74	-24.17
2063	AV	V	0	30.79	13.1	43.89	54	-10.11
4126	PK	V	28.02	37.54	36.01	45.53	74	-28.47
4126	AV	V	28.02	37.54	25.95	35.47	54	-18.53
6189	PK	V	28.02	41.82	35.44	49.24	74	-24.76
6189	AV	V	28.02	41.82	26.51	40.31	54	-13.69
8252	PK	V	28.02	45.12	-	-	74	-
8252	AV	V	28.02	45.12	-	-	54	-
4874	PK	V	28.02	37.9	40.73	50.61	74	-23.39
4874	AV	V	28.02	37.9	31.66	41.54	54	-12.46
7311	PK	V	28.02	43.26	41.85	57.09	74	-16.91
7311	AV	V	28.02	43.26	29.41	44.65	54	-9.35
9748	PK	V	28.02	46.8	-	-	74	-
9748	AV	V	28.02	46.8	-	-	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.

EUT : WUE1500
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2063	PK	H	0	30.79	18.7	49.49	74	-24.51
2063	AV	H	0	30.79	12.05	42.84	54	-11.16
4126	PK	H	28.02	37.54	35.11	44.63	74	-29.37
4126	AV	H	28.02	37.54	24.87	34.39	54	-19.61
6189	PK	H	28.02	41.82	36.77	50.57	74	-23.43
6189	AV	H	28.02	41.82	26.14	39.94	54	-14.06
8252	PK	H	28.02	45.12	-	-	74	-
8252	AV	H	28.02	45.12	-	-	54	-
4874	PK	H	28.02	37.9	39.56	49.44	74	-24.56
4874	AV	H	28.02	37.9	28.66	38.54	54	-15.46
7311	PK	H	28.02	43.26	40.75	55.99	74	-18.01
7311	AV	H	28.02	43.26	29.54	44.78	54	-9.22
9748	PK	H	28.02	46.8	-	-	74	-
9748	AV	H	28.02	46.8	-	-	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.

EUT : WUE1500
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2088	PK	V	0	30.79	19.11	49.9	74	-24.1
2088	AV	V	0	30.79	12.91	43.7	54	-10.3
4176	PK	V	28.02	37.54	38.93	48.45	74	-25.55
4176	AV	V	28.02	37.54	26.21	35.73	54	-18.27
6264	PK	V	28.02	41.98	39.16	53.12	74	-20.88
6264	AV	V	28.02	41.98	28.24	42.2	54	-11.8
8352	PK	V	28.02	45.12	-	-	74	-
8352	AV	V	28.02	45.12	-	-	54	-
4924	PK	V	28.02	37.9	40.1	49.98	74	-24.02
4924	AV	V	28.02	37.9	28.78	38.66	54	-15.34
7386	PK	V	28.02	43.26	40.15	55.39	74	-18.61
7386	AV	V	28.02	43.26	27.42	42.66	54	-11.34
9848	PK	V	28.02	46.78	-	-	74	-
9848	AV	V	28.02	46.78	-	-	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.

EUT : WUE1500
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
2088	PK	H	0	30.79	18.19	48.98	74	-25.02
2088	AV	H	0	30.79	8.96	39.75	54	-14.25
4176	PK	H	28.02	37.54	38.83	48.35	74	-25.65
4176	AV	H	28.02	37.54	25.75	35.27	54	-18.73
6264	PK	H	28.02	41.98	37.39	51.35	74	-22.65
6264	AV	H	28.02	41.98	26.26	40.22	54	-13.78
8352	PK	H	28.02	45.12	-	-	74	-
8352	AV	H	28.02	45.12	-	-	54	-
4924	PK	H	28.02	37.9	38.79	48.67	74	-25.33
4924	AV	H	28.02	37.9	27.59	37.47	54	-16.53
7386	PK	H	28.02	43.26	38.29	53.53	74	-20.47
7386	AV	H	28.02	43.26	26.76	42	54	-12
9848	PK	H	28.02	46.78	-	-	74	-
9848	AV	H	28.02	46.78	-	-	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.

7. Power Spectrum Density test

7.1 Operating environment

Temperature: 20 ℃
Relative Humidity: 59 %

7.2 Test setup & procedure

The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly and cable loss (1dB)/external attenuator (3dB) correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

See Power Spectrum Density plot as file name "Power Spectrum Density plot.pdf"

7.3 Measured data of Power Spectrum Density test results

Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
Low	2412.005	-10.90	8
Middle	2437.006	-11.34	8
High	2462.006	-12.91	8

8. 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”.

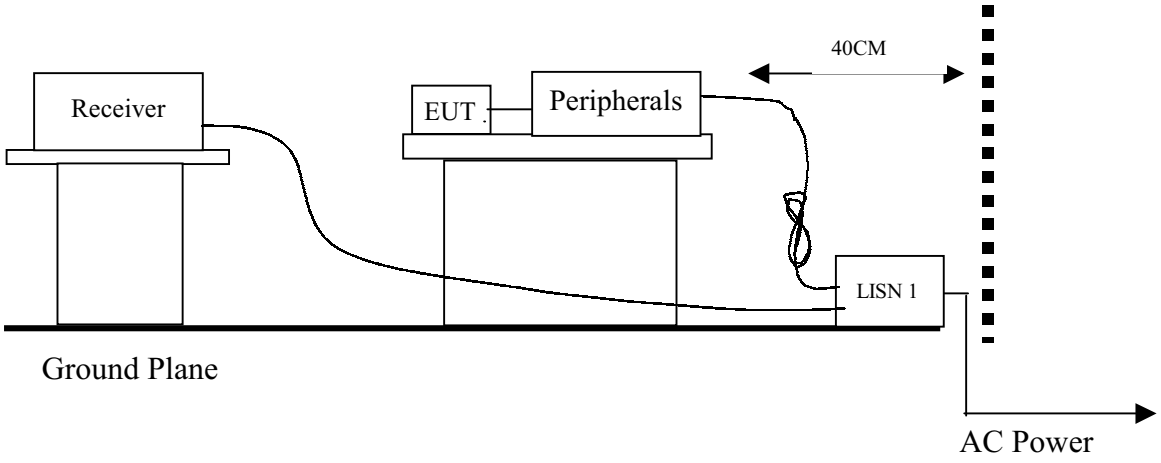
9. Power Line Conducted Emission test §FCC 15.207

9.1 Operating environment

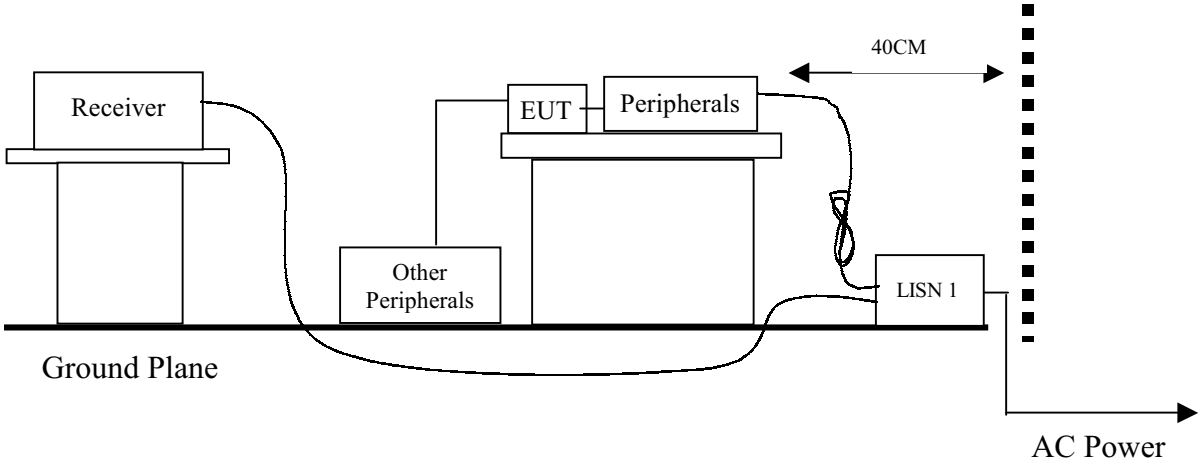
Temperature: 25 ℃
Relative Humidity: 58 %

9.2 Test setup & procedure

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



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



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/1992 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

See Power Line Conducted Emission plot as file name "Power Line Conducted Emission plot.pdf".

Emission Limit

FCC Part 15 Paragraph 15.207		
Freq. (MHz)	Maximum RF Line Voltage	
	uV	dBuV
0.45 - 30	250	48.0

9.3 Power Line Conducted Emission test data

EUT : WUE1500
Test Condition : Tx at low Channel

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.53000	27.9	48.00	-20.10
LINE	1.32200	25.2	48.00	-22.80
LINE	7.65000	34.2	48.00	-13.80
LINE	11.87400	29.4	48.00	-18.60
LINE	19.17000	30.3	48.00	-17.70
LINE	29.09800	33.6	48.00	-14.40
NEUTRAL	0.61800	30.1	48.00	-17.90
NEUTRAL	1.22600	28.4	48.00	-19.60
NEUTRAL	8.78600	28.6	48.00	-19.40
NEUTRAL	12.12200	31.0	48.00	-17.00
NEUTRAL	19.41000	32.5	48.00	-15.50
NEUTRAL	28.45800	35.0	48.00	-13.00

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
   Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : WUE1500
Test Condition : Tx at middle Channel

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.53000	26.9	48.00	-21.10
LINE	1.22600	26.6	48.00	-21.40
LINE	7.46600	32.5	48.00	-15.50
LINE	11.24200	33.0	48.00	-15.00
LINE	19.14600	33.3	48.00	-14.70
LINE	29.41800	33.8	48.00	-14.20
NEUTRAL	0.53000	29.9	48.00	-18.10
NEUTRAL	0.61800	29.7	48.00	-18.30
NEUTRAL	1.22600	28.7	48.00	-19.30
NEUTRAL	11.24200	32.3	48.00	-15.70
NEUTRAL	19.14600	33.1	48.00	-14.90
NEUTRAL	28.53800	33.3	48.00	-14.70

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : WUE1500
Test Condition : Tx at high Channel

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.61000	28.3	48.00	-19.70
LINE	1.22600	27.0	48.00	-21.00
LINE	7.55400	31.9	48.00	-16.10
LINE	11.24200	29.9	48.00	-18.10
LINE	19.13800	30.9	48.00	-17.10
LINE	29.41800	33.5	48.00	-14.50
NEUTRAL	0.53000	29.6	48.00	-18.40
NEUTRAL	0.61000	30.4	48.00	-17.60
NEUTRAL	1.22600	29.0	48.00	-19.00
NEUTRAL	10.09800	31.1	48.00	-16.90
NEUTRAL	18.96200	30.4	48.00	-17.60
NEUTRAL	28.45000	34.7	48.00	-13.30

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : WUE1500
Test Condition : LAN enable 10Mbps

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.61000	29.2	48.00	-18.80
LINE	1.68200	27.3	48.00	-20.70
LINE	5.01000	21.7	48.00	-26.30
LINE	10.56200	35.2	48.00	-12.80
LINE	14.04200	31.0	48.00	-17.00
LINE	29.58600	34.2	48.00	-13.80
NEUTRAL	0.61000	30.9	48.00	-17.10
NEUTRAL	1.22600	28.6	48.00	-19.40
NEUTRAL	1.66600	29.9	48.00	-18.10
NEUTRAL	5.04200	21.9	48.00	-26.10
NEUTRAL	10.56200	35.3	48.00	-12.70
NEUTRAL	28.61800	34.2	48.00	-13.80

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

EUT : WUE1500
Test Condition : LAN enable 100Mbps

Power Line (circle)	Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Margin (dB) QP
LINE	0.61000	29.3	48.00	-18.70
LINE	1.75400	30.0	48.00	-18.00
LINE	5.23400	32.5	48.00	-15.50
LINE	10.53800	33.4	48.00	-14.60
LINE	18.24200	37.1	48.00	-10.90
LINE	29.23400	35.2	48.00	-12.80
NEUTRAL	0.61000	31.1	48.00	-16.90
NEUTRAL	1.31400	30.3	48.00	-17.70
NEUTRAL	5.23400	34.5	48.00	-13.50
NEUTRAL	11.05800	33.5	48.00	-14.50
NEUTRAL	18.24200	37.7	48.00	-10.30
NEUTRAL	29.23400	35.9	48.00	-12.10

Remark:
1. 1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.