



LABORATORY MEASUREMENTS

Pursuant To
47 CFR Part 15 Subpart B (August 20, 2002)
And
FCC Procedure ANSI C63.4 (1992)



0597
ILAC MRA

Applicant : ZyXEL Communications Corporation
No. 6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan

Model No. : ZyAIR B-220

Issue Date : May 5, 2003

Test Site Location : No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

We attest to the accuracy of this report :

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Project Engineer

Kaysi Chen

Reviewed By

Elton Chen



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1. General Information

1.1 General Description of EUT

Applicant	: ZyXEL Communications Corp.
Product	: 11Mbps Wireless USB Stick
Model No.	: ZyAIR B-220
FCC ID.	: I88B220
Rated Power	: 5V
Power Cord	: N/A
Test Voltage	: 120Vac, 60Hz
Sample Received	: April 3, 2003
Test Date(s)	: April 8, 2003 to April 24, 2003

1.2 Additional information about the EUT

The EUT is a 11Mbps Wireless USB Stick, and it's provides a flexible data communications system that user can use to access various services (navigating the Internet, email, printer services, etc.) on the wired network without additional expensive network cabling infrastructure.

We verified that the models listed as below are identical to ZyAIR B-220 (EUT), the difference model serves as marketing strategy:

Model number:

Lantech WL-555

Lantech 8800-555

B-220

Telefonica B-220

For more detail features, please refer to user's Manual.



1.3 Description of Peripherals

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	HP	P5661AV	SG20400774	FCC DoC Approved
Key Board	HP	SK-2502C	M011234429	FCC DoC Approved
Monitor	HP	D8897	CN14835153	ARSCM350S
Mouse	HP	M-S48a	5670990	JNZ201213
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved



2. Test Specifications

2.1 Standards

Both conducted and radiated emission testing were performed according to the procedures in ANSI C63.4: 1992. Test results are in compliance with the requirements of 47 CFR Part 15 (August 20, 2002) Class B equipment.

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

2.2 Definition of Device Classification

Unintentional radiator:

A device that intentionally generates radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is marketed for use by the general public, or which is intended to be used in the home.

Class B Digital Device:

A digital device which is marketed for use in a residential environment, notwithstanding use in a commercial, business or industrial environment. Example of such devices is designed to market for the general public.

Note:

A manufacturer may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

2.3 EUT Operation Condition

Plug the EUT into PC, and turn on the power, then run the test program “ZDGonfig” under Windows OS.

The EUT was transmitted continuously during the test.



3. Test Condition

3.1 Test Equipment

Equipment	Brand	Model No.	ITS ID No.
EMI Test Receiver	Rohde & Schwarz	ESCS 30	EC318
EMI Test Receiver	Rohde & Schwarz	ESMI	EC317
Shield Room	N/A	N/A	N/A
Spectrum Analyzer	Advantest	R3162	EC347
Turn Table	Electro-Metrics	EM4710	EP306
Bilog Antenna	Electro-Metrics	EM-6917-1	EC325
Antenna Tower	Electro-Metrics	EM-4720	EP307

Note:

The calibration interval of the above instruments is 12 months.

3.2 EUT Grounding

The unit is grounded as normal use.

3.3 Test Environment

If ambient levels of emissions exceed the appropriated limit, the following steps were taken to assure compliance. First, the measurement bandwidth was reduced, if this did not affect the peak readings. Such a reduction can allow much closer examination close to local ambient signals. Second, the antenna could be brought closer to the EUT. Finally, in severe cases, testing was re-performed at night or other time when the offending signal was off in the air.

3.4 Test Platform

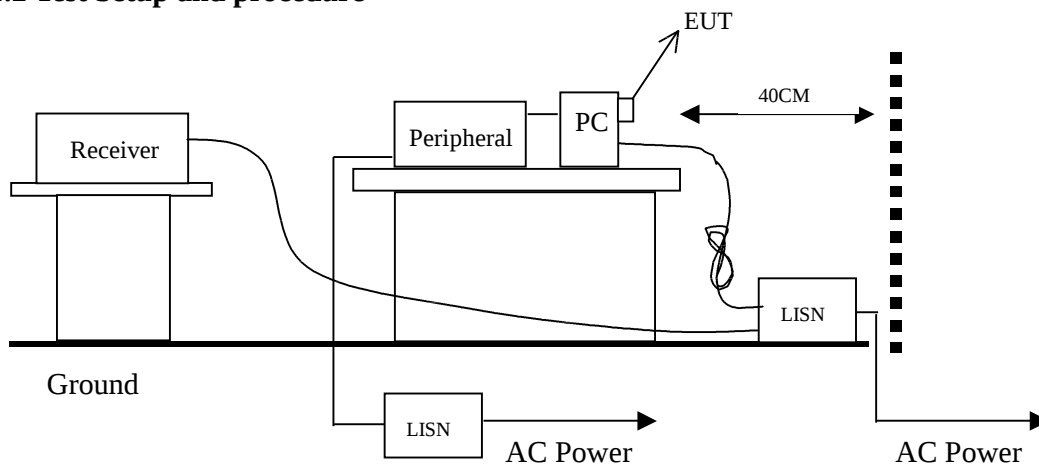
Tests were made on a 0.8 meter high, 1m×1.5m non-conductive platform.

4. Conducted Emission Measurements (FCC 15.107)

4.1 Operating environment

Temperature:	24	°C
Relative Humidity:	52	%
Atmospheric Pressure	1023	hPa

4.2 Test Setup and procedure



The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission



4.3 Conducted Emission Limits:

Freq. (MHz)	Maximum RF Line Voltage			
	Class A (dB μ V)		Class B (dB μ V)	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56	56~46
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

4.4 Uncertainty of Conducted Emission

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.6 dB.



4.5 Conducted Emission Data

(1) Line

EUT : ZyAIR B-220
Test Condition : Tx at low channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.23800	28.60	62.17	27.40	52.17	-33.57	-24.77
0.35000	29.10	58.96	27.20	48.96	-29.86	-21.76
4.95800	23.10	56.00	16.40	46.00	-32.90	-29.60
6.92600	25.50	60.00	18.80	50.00	-34.50	-31.20
13.97400	35.90	60.00	33.20	50.00	-24.10	-16.80
19.02200	29.50	60.00	23.50	50.00	-30.50	-26.50

(2) Neutral

EUT : ZyAIR B-220
Test Condition : Tx at low channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.23800	26.50	62.17	22.40	52.17	-35.67	-29.77
0.35000	25.30	58.96	16.20	48.96	-33.66	-32.76
6.71800	21.10	60.00	15.50	50.00	-38.90	-34.50
12.91800	25.50	60.00	22.90	50.00	-34.50	-27.10
16.55800	27.00	60.00	24.50	50.00	-33.00	-25.50
19.02200	29.10	60.00	23.00	50.00	-30.90	-27.00

Remark:

1. “*” Undetectable
2. Margin Value = Reading level - Limit value
3. The emission level of other frequency were very low against the limit



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(1) Line

EUT : ZyAIR B-220
Test Condition : Tx at middle channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.19800	28.10	63.69	26.60	53.69	-35.59	-27.09
0.23800	31.30	62.17	30.10	52.17	-30.87	-22.07
0.35000	31.80	58.96	30.10	48.96	-27.16	-18.86
6.92600	28.60	60.00	19.80	50.00	-31.40	-30.20
13.50200	35.00	60.00	32.20	50.00	-25.00	-17.80
19.02200	28.50	60.00	22.60	50.00	-31.50	-27.40

(2) Neutral

EUT : ZyAIR B-220
Test Condition : Tx at middle channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.23800	27.10	62.17	22.30	52.17	-35.07	-29.87
0.35000	26.50	58.96	19.50	48.96	-32.46	-29.46
1.87800	23.20	56.00	19.90	46.00	-32.80	-26.10
6.68600	21.40	60.00	15.00	50.00	-38.60	-35.00
13.50200	25.50	60.00	22.50	50.00	-34.50	-27.50
19.02200	29.10	60.00	23.00	50.00	-30.90	-27.00

Remark:

1. “*” Undetectable
2. Margin Value = Reading level - Limit value
3. The emission level of other frequency were very low against the limit



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(1) Line

EUT : ZyAIR B-220
Test Condition : Tx at high channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.19800	28.00	63.69	26.50	53.69	-35.69	-27.19
0.23800	31.20	62.17	30.00	52.17	-30.97	-22.17
0.35000	31.80	58.96	30.00	48.96	-27.16	-18.96
3.87800	21.20	56.00	14.10	46.00	-34.80	-31.90
6.92600	29.20	60.00	20.10	50.00	-30.80	-29.90
13.73400	33.10	60.00	29.30	50.00	-26.90	-20.70

(2) Neutral

EUT : ZyAIR B-220
Test Condition : Tx at high channel

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.23800	27.20	62.17	22.30	52.17	-34.97	-29.87
0.35000	26.50	58.96	19.50	48.96	-32.46	-29.46
1.87800	23.30	56.00	19.90	46.00	-32.70	-26.10
3.99000	23.70	56.00	17.40	46.00	-32.30	-28.60
6.71800	22.10	60.00	15.50	50.00	-37.90	-34.50
17.84600	25.60	60.00	21.30	50.00	-34.40	-28.70

Remark:

1. “*” Undetectable
2. Margin Value = Reading level - Limit value
3. The emission level of other frequency were very low against the limit

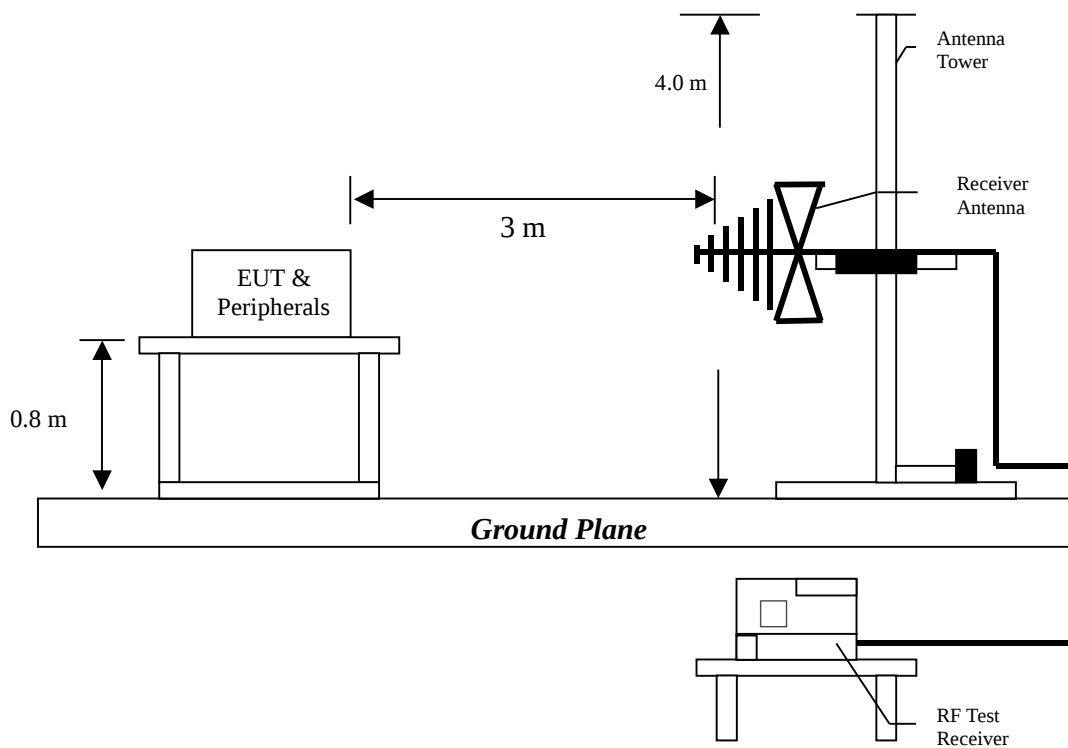
5. Radiated Emission Measurements (FCC 15.109)

5.1 Operating environment

Temperature:	27	°C
Relative Humidity:	65	%
Atmospheric Pressure	1023	hPa

5.2 Test Setup and procedure

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



The equipment under test were placed on the top of rotation table 0.8 meter above ground plane.

The table was 360 degrees to determine the position of the highest radiation.

EUT is set 3 meters from the EMI receiving antenna, which is mounted on a variable height mast. The antenna 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. The bandwidth was setting on the EMI meter 120 kHz.

The levels are quasi peak value readings. The frequency spectrum from 30MHz to 1000MHz was investigated.



5.3 Radiated Emission Limits:

According to FCC 15.109, except for Class A digital device, the field strength of radiated emission from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Class B Radiated Emission Limits:

Frequency MHz	Field Strength dB μ V/m
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

5.4 Uncertainty of Radiated Emission

Expanded uncertainty (k=2) of radiated emission measurement is ± 4.98 dB.



5.5 Radiated Emission Test Data

(1) Polarity : Vertical
EUT : ZyAIR B-220
Test Condition : Tx at low channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
220.1000	12.47	14.93	27.40	46.00	-18.60
307.4000	14.44	11.06	25.50	46.00	-20.50
396.7000	17.57	11.73	29.30	46.00	-16.70
439.3000	18.06	10.64	28.70	46.00	-17.30
484.0000	18.86	12.54	31.40	46.00	-14.60
800.2000	24.35	9.95	34.30	46.00	-11.70

(2) Polarity : Horizontal
EUT : ZyAIR B-220
Test Condition : Tx at low channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
86.3000	8.34	24.36	32.70	40.00	-7.30
175.5000	12.97	13.43	26.40	43.50	-17.10
220.1000	12.47	25.23	37.70	46.00	-8.30
249.2000	13.24	28.56	41.80	46.00	-4.20
375.3000	16.57	18.03	34.60	46.00	-11.40
484.0000	18.86	12.64	31.50	46.00	-14.50

Remark:

1. Calculated level (dB μ V/m)= Correction Factor (dB/m)+ Meter Reading (dB μ V)
2. Correction Factor = Ant. Factor (dB/m) + cable loss (dB)
3. Margin Value = Calculated level- Limit Value
4. “*” Undetectable



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(1) Polarity : Vertical
EUT : ZyAIR B-220
Test Condition : Tx at middle channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
72.7000	7.94	23.06	31.00	40.00	-9.00
220.1000	12.47	14.73	27.20	46.00	-18.80
307.4000	14.44	11.56	26.00	46.00	-20.00
396.7000	17.57	12.03	29.60	46.00	-16.40
439.3000	18.06	11.34	29.40	46.00	-16.60
484.0000	18.86	12.14	31.00	46.00	-15.00

(2) Polarity : Horizontal
EUT : ZyAIR B-220
Test Condition : Tx at middle channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
86.3000	8.34	23.16	31.50	40.00	-8.50
175.5000	12.97	13.83	26.80	43.50	-16.70
220.1000	12.47	25.13	37.60	46.00	-8.40
387.0000	17.10	17.70	34.80	46.00	-11.20
484.0000	18.86	11.74	30.60	46.00	-15.40
645.0000	21.64	11.46	33.10	46.00	-12.90

Remark:

1. Calculated level (dB μ V/m)= Correction Factor (dB/m)+ Meter Reading (dB μ V)
2. Correction Factor = Ant. Factor (dB/m) + cable loss (dB)
3. Margin Value = Calculated level- Limit Value
4. “*” Undetectable



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(1) Polarity : Vertical
EUT : ZyAIR B-220
Test Condition : Tx at high channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
220.1000	12.47	15.93	28.40	46.00	-17.60
249.2000	13.24	13.26	26.50	46.00	-19.50
307.4000	14.44	11.46	25.90	46.00	-20.10
396.7000	17.57	11.13	28.70	46.00	-17.30
439.3000	18.06	10.64	28.70	46.00	-17.30
484.0000	18.86	11.94	30.80	46.00	-15.20

(2) Polarity : Horizontal
EUT : ZyAIR B-220
Test Condition : Tx at high channel

Freq. (MHz)	Corr. Factor (dB/m)	Reading (dB μ V)	Calculated (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
86.3000	8.34	23.96	32.30	40.00	-7.70
220.1000	12.47	24.63	37.10	46.00	-8.90
375.3000	16.57	16.23	32.80	46.00	-13.20
396.7000	17.57	17.23	34.80	46.00	-11.20
484.0000	18.86	11.74	30.60	46.00	-15.40
645.0000	21.64	10.36	32.00	46.00	-14.00

Remark:

1. Calculated level (dB μ V/m)= Correction Factor (dB/m)+ Meter Reading (dB μ V)
2. Correction Factor = Ant. Factor (dB/m) + cable loss (dB)
3. Margin Value = Calculated level- Limit Value
4. “*” Undetectable



Appendix A1: Outlook of EUT





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Appendix A2: Inner view of EUT







Appendix B1: Conducted Emission Test Set-up (front)





Appendix B2: Conducted Emission Test Set-up (rear)





Appendix B3: Radiated Emission Test Set-up (front)





Appendix B4: Radiated Emission Test Set-up (rear)

