



# EMC TEST REPORT

**Report No. : EME-030797**  
**Model No. : ZyAIR B-620**  
**Issued Date : July 15, 2003**

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

**Test By : Intertek Testing Services Taiwan Ltd.**  
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**Shiang-Shan District, Hsinchu City, Taiwan**

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Project Engineer

Kevin Chen

Reviewed By

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**Summary of Tests**

**Mini-PCI 11M Wireless LAN Card-Model: ZyAIR B-620**  
**FCC ID: I88B620**

Test	Reference	Results
Radiated Spurious Emission test	15.205, 15.209	Complies



## 1. General information

### 1.1 Identification of the EUT

Applicant	: ZyXEL Communications Corp.
Product	: Mini-PCI 11M Wireless LAN Card
Model No.	: ZyAIR B-620
FCC ID.	: I88B620
Frequency Range	: 2400MHz to 2483.5MHz
Channel Number	: 11
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: CCK (11Mps, 5.5Mbps), DQPSK (2Mbps), DBPSK (1Mbps)
Rated Power	: 5Vdc
Power Cord	: N/A
Test Voltage	: 120Vac, 60Hz
Sample Received	: June 30, 2003
Test Date(s)	: July 10, 2003 to July 11, 2003

### 1.2 Additional information about the EUT

The EUT is a Mini-PCI 11M Wireless LAN Card, 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.

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

Owing to the change the cable length of antenna, and after verifying the change of EUT, we conducted the Radiated Spurious Emission Test only.

Regarding to the relevant data of the test result, please refer to the FCC ID: I88B620 Granted on June. 25, 2003 issued for model No. ZyAIR B-620.



### 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 : 2dBi

Antenna Type : Dipole antenna

Connector Type : Male

### 1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	N/A	N/A	N/A	N/A
Key Board	HP	C4734-60323	MR80700043	FCC DoC Approved
Monitor	HP	D2827A	KR91050275	ARSCM560S
Mouse	HP	C3751-60201	LZB90450395	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved

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 、 § 15.207 、 § 15.209 、 § 15.247 and ANSI C63.4/1992.

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.

### **2.2 Operation mode**

Plug the EUT into PC via PCI to mini PCI adapter. Turn on all the power, and running the test program “ZPConfig” under Window OS.

The EUT was transmitted continuously during the test.

After verifying the maximum output power, we found the maximum output power was occurred at 11Mbps data rate. The final test was executed under this condition and recorded in this report individually.



### 2.3 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	Feb. 18, 2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2003
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	100186	Oct. 9, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2002
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 21, 2003
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3133	Feb. 21, 2003
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, 2002
RF Power Meter	Boonton	10kHz~100GHz	4231A	79401	Mar. 25, 2003
Power Sensor	Boonton	30MHz~8GHz	51011-EMC	32482	Mar. 25, 2003

Note:

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

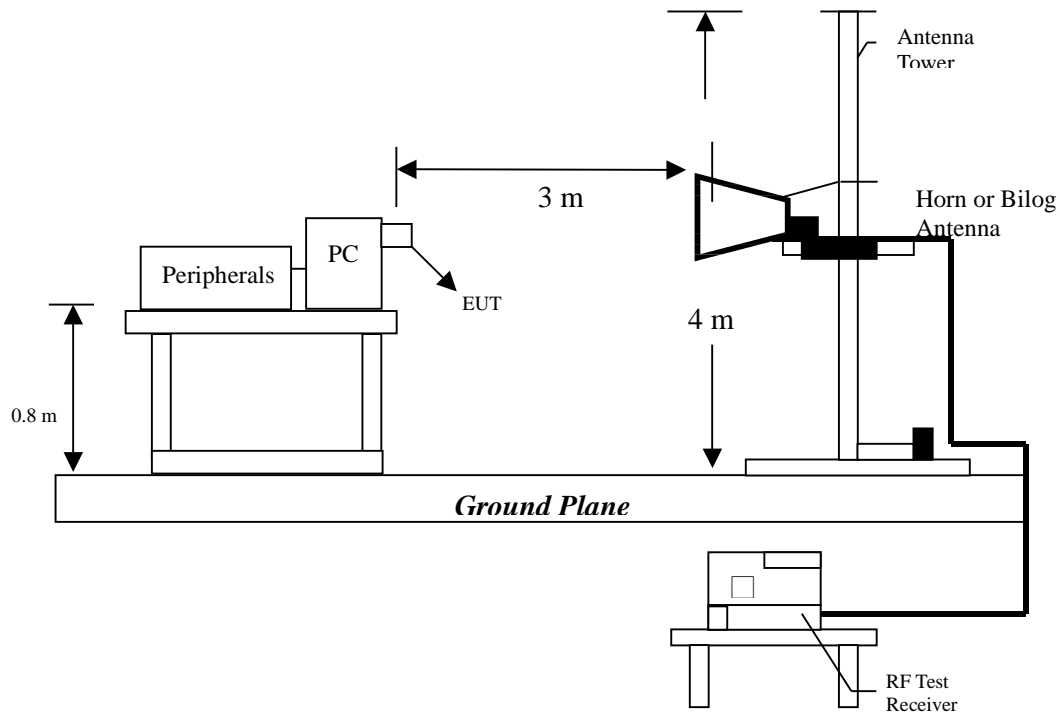
### 3. Radiated Emission test

#### 3.1 Operating environment

Temperature:	25	°C	(10-40°C)
Relative Humidity:	55	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

#### 3.2 Test setup & procedure

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



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 (1MHz RBW/VBW) recorded also on the report.

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.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

### 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 $\mu$ 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  $\pm 4.98$  dB.

Expanded uncertainty (k=2) of conducted emission measurement is  $\pm 2.02$  dB.



**3.4 Radiated spurious emission test data**

**3.4.1 Measurement results: frequencies equal to or less than 1 GHz**

EUT : ZyAIR B-620  
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
125.1000	QP	V	13.12	28.10	39.62	43.50	-3.88	1.50	30.00
235.6000	QP	V	12.63	20.80	35.25	46.00	-10.75	2.50	36.00
301.6000	QP	V	14.49	20.70	36.90	46.00	-9.10	2.20	340.00
431.6000	QP	V	17.70	22.20	39.90	46.00	-6.10	3.00	180.00
577.1000	QP	V	20.55	18.30	38.85	46.00	-7.15	1.00	90.00
720.6000	QP	V	22.57	18.50	41.07	46.00	-4.93	1.75	270.00
200.7000	QP	H	11.52	28.10	39.62	43.50	-3.88	1.20	58.00
299.7000	QP	H	14.45	20.80	35.25	46.00	-10.75	2.00	40.00
369.5000	QP	H	16.20	20.70	36.90	46.00	-9.10	3.00	335.00
431.6000	QP	H	17.70	22.20	39.90	46.00	-6.10	4.00	190.00
577.1000	QP	H	20.55	18.30	38.85	46.00	-7.15	2.50	95.00
720.6000	QP	H	22.57	18.50	41.07	46.00	-4.93	3.40	260.00

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss



EUT : ZyAIR B-620  
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
125.1000	QP	V	13.12	20.90	34.02	43.50	-9.48	1.20	35.00
167.7000	QP	V	14.43	23.00	37.43	43.50	-6.07	2.30	48.00
235.6000	QP	V	12.63	24.90	37.53	46.00	-8.47	3.00	330.00
301.6000	QP	V	14.49	20.00	34.49	46.00	-11.51	3.50	175.00
369.5000	QP	V	16.20	17.40	33.60	46.00	-12.40	1.80	92.00
577.1000	QP	V	20.55	20.40	40.95	46.00	-5.05	1.65	250.00
125.1000	QP	H	13.12	25.40	38.52	43.50	-4.98	1.80	40.00
235.6000	QP	H	12.63	29.50	42.13	46.00	-3.87	2.80	58.00
299.7000	QP	H	14.45	21.80	36.25	46.00	-9.75	3.60	325.00
551.9000	QP	H	19.69	19.20	38.89	46.00	-7.11	2.50	200.00
577.1000	QP	H	20.55	18.80	39.35	46.00	-6.65	1.00	185.00
720.6000	QP	H	22.57	18.40	40.97	46.00	-5.03	1.80	265.00

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss



EUT : ZyAIR B-620  
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
125.1000	QP	V	13.12	23.40	36.52	43.50	-6.98	2.50	32.00
165.8000	QP	V	14.55	22.20	36.75	43.50	-6.75	1.80	87.00
235.6000	QP	V	12.63	26.20	38.83	46.00	-7.17	3.20	241.00
301.6000	QP	V	14.49	20.80	35.29	46.00	-10.71	2.70	176.00
369.5000	QP	V	16.20	17.60	33.80	46.00	-12.20	1.10	85.00
577.1000	QP	V	20.55	19.80	40.35	46.00	-5.65	2.80	220.00
233.7000	QP	H	12.53	28.40	40.93	46.00	-5.07	1.90	33.00
299.7000	QP	H	14.45	20.70	35.15	46.00	-10.85	2.10	42.00
369.5000	QP	H	16.20	20.60	36.80	46.00	-9.20	2.60	275.00
431.6000	QP	H	17.70	21.90	39.60	46.00	-6.40	3.00	160.00
577.1000	QP	H	20.55	18.90	39.45	46.00	-6.55	2.80	77.00
720.6000	QP	H	22.57	18.30	40.87	46.00	-5.13	1.52	235.00

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss



**3.4.2 Measurement results: frequency above 1GHz**

EUT : ZyAIR B-620  
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
4824	PK	V	32.496	35.47	-	-	74	-
4824	AV	V	32.496	35.47	-	-	54	-
7236	PK	V	34.32	38.42	-	-	74	-
7236	AV	V	34.32	38.42	-	-	54	-
4824	PK	H	32.496	35.47	-	-	74	-
4824	AV	H	32.496	35.47	-	-	54	-
7236	PK	H	34.32	38.42	-	-	74	-
7236	AV	H	34.32	38.42	-	-	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, and the noise floor listed below:  
 For PK:  
 1GHz-10GHz: 50dBuV  
 10GHz-26.5GHz: 60dBuV  
  
 For AV:  
 1GHz-10GHz: 40dBuV  
 10GHz-26.5GHz: 45dBuV



EUT : ZyAIR B-620  
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
4874	PK	V	32.496	35.47	-	-	74	-
4874	AV	V	32.496	35.47	-	-	54	-
7311	PK	V	34.32	38.42	-	-	74	-
7311	AV	V	34.32	38.42	-	-	54	-
4874	PK	H	32.496	35.47	-	-	74	-
4874	AV	H	32.496	35.47	-	-	54	-
7311	PK	H	34.32	38.42	-	-	74	-
7311	AV	H	34.32	38.42	-	-	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, and the noise floor listed below:

For PK:

1GHz-10GHz: 50dBuV  
10GHz-26.5GHz: 60dBuV

For AV:

1GHz-10GHz: 40dBuV  
10GHz-26.5GHz: 45dBuV



EUT : ZyAIR B-620  
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)
4924	PK	V	32.496	35.47	-	-	74	-
4924	AV	V	32.496	35.47	-	-	54	-
7386	PK	V	34.32	38.42	-	-	74	-
7386	AV	V	34.32	38.42	-	-	54	-
4924	PK	H	32.496	35.47	-	-	74	-
4924	AV	H	32.496	35.47	-	-	54	-
7386	PK	H	34.32	38.42	-	-	74	-
7386	AV	H	34.32	38.42	-	-	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, and the noise floor listed below:

For PK:

1GHz-10GHz: 50dBuV  
10GHz-26.5GHz: 60dBuV

For AV:

1GHz-10GHz: 40dBuV  
10GHz-26.5GHz: 45dBuV



**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”.