ENGINEERING TEST REPORT

PCMCIA WIRELESS LAN CARD
Model No: WL-201
FCC ID: MXF-WL201

CLASS II PERMISSIVE CHANGE UNDER
FCC PART 15, SUBPART C, PARA. 15.247
DIRECT SEQUENCE SPREAD SPECTRUM (DSSS) TRANSMITTERS
OPERATING IN THE FREQUENCY BAND FROM 2412 - 2462 MHz

UltraTech's FILE NO.: GTT-005FTX

TESTED FOR:

GEMTEK TECHNOLOGY CO., LTD.
11 Fl., 181 Tatung Rd., Sec. 1, Hsi-chih
Taipei Hsien, Taiwan, R.O.C.

TESTED BY:

UltraTech Engineering Labs Inc.
4181 Sladeview Crescent, Unit 33
Mississauga, Ontario
Canada L5L 5R2

PREPARED BY: Tri M. Luu, P.Eng.

DATE: Feb. 05, 1999

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1. EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System	Not applicable for Class II Permissive Change
15.247(b)	Maximum Peak Power	Yes
15.247(c)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Not applicable for Class II Permissive Change
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
15.247(d)	Transmitted Power Density of a Direct Sequence Spread Spectrum System	Not applicable for Class II Permissive Change
15.247(e)	Processing Gain of Direct Sequence Spread Spectrum System	Not applicable for Class II Permissive Change
15.107, 15.109	AC Power Conducted Emissions & Radiated Emissions Digital Circuit Portions	Not applicable for Class II Permissive Change

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*

2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*

3) *THAT the data was obtained on representative production units, representative.*

4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:

_____

Tri Minh Luu, P. Eng.
V.P., Engineering

DATE: Feb. 05, 1999

2. EXHIBIT 2 - GENERAL INFORMATION

2.1 Applicant

GEMTEK TECHNOLOGY CO., LTD.
11 Fl., 181 Tatung Rd., Sec. 1, Hsi-chih
Taipei Hsien, Taiwan, R.O.C.

Applicant's Representative: Mr. Howard Chen

2.2 Manufacturer

GEMTEK TECHNOLOGY CO., LTD.
11 Fl., 181 Tatung Rd., Sec. 1, Hsi-chih
Taipei Hsien, Taiwan, R.O.C.

Applicant's Representative: Mr. Howard Chen

2.3 Description of Equipment under Test

PRODUCT NAME:	PCMCIA WIRELESS LAN CARD
SERIAL NUMBER:	Pre-production
TYPE OF EQUIPMENT:	DSSS Transmitters
MODULATION:	1 Mb/s DPSK or 2 Mb/s QPSK
CHIP RATE:	5.5 Mchips/s (DPSK) or 11 Mchips/s (QPSK)
OPERATING FREQ.:	2412 – 2462 MHz
NUMBER OF CHANNEL:	11
CHANNEL SPACING:	5 MHz
BANDWIDTH (6 dB OBW):	10 MHz minimum
POWER RATING:	39 mW max. (direct) or 122 mW EIRP
EXTERNAL ANTENNA TYPE GAIN:	

(1) Gemtek AL-100 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(2) Gemtek AL-101 Loopy Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(3) Gemtek AL-102 Dipole ANT Right-Angle Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(4) Gemtek AL-110 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 12 dBi, Antenna Pattern: Uni-directional, Connector Type: SMB Modified with reversed thrust.

EMISSION DESIGNATION:	Direct Sequence Spread Spectrum
DUTY CYCLE:	Continuous
OSC. FREQUENCY(IES):	32.768 KHz, 22 MHz, 40MHz, 560 MHz (VCO), 2450 MHz (IF), 280 MHz (IF), Tx Local Osc.: Tx freq. – IF freq. (280 MHz)
INPUT SUPPLY:	Using DC Power from a laptop computer
ASSOCIATED DEVICES:	Not applicable
FCC ID:	MXF-WL201
INTERFACE PORTS:	Not applicable

2.4 Related Submittal(s)/Grant

This application is for FCC Class II Permissive Change authorization with the following modifications applied to the EUT:

The internal antenna was removed and replaced by a reversed thrust SMA female connector for attachment with the following optional external antennae:

(1) Gemtek AL-100 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(2) Gemtek AL-101 Loopy Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(3) Gemtek AL-102 Dipole ANT Right0-Angle Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.
(4) Gemtek AL-110 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 12 dBi, Antenna Pattern: Uni-directional, Connector Type: SMB Modified with reversed thrust.

2.5 Test Methodology

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations (CFR47-1991), Part 15, Subpart C, Para. 15.247, Direct Sequence Spread Spectrum Transmitters operating in the Frequency Band 2412 - 2462 MHz.

Radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4-1992 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz.

2.6 Test Facility

Radiated Emissions were performed at the UltraTech's 3-to-10 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above site have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Sep. 20, 1998.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

2.7 Units of Measurements

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

3. EXHIBIT 3 - SYSTEM TEST CONFIGURATION

3.1 Test System Details

The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

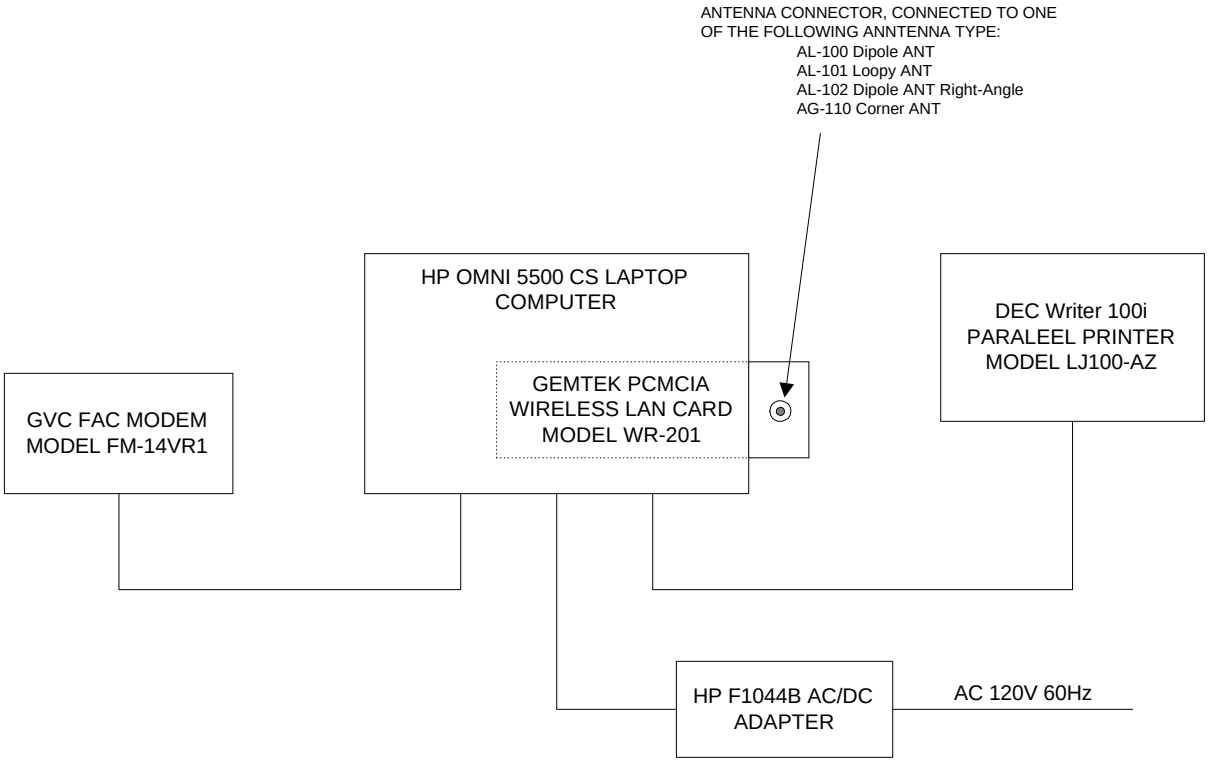
(1) **EUT**: GEMTEK TECHNOLOGY CO., LTD., PCMCIA WIRELESS LAN CARD, Model: WL-201, S/N: Pre-production
Power & I/O Cable: Not applicable.

(2) **PERIPHERAL**: HP OmniBook Laptop Computer, Model HP OmniBook 5500 CS, FCC ID: B945500, S/N: TW63403246
I/O Cable: All I/O Cables were shielded
Power Supply Cable: Non-shielded

(3) **PERIPHERAL**: Digital DEC Writer 100I Parallel Printer, Model LJ100-AZ, S/N: OV44352056, FCC ID: EP8JP150
I/O CABLE: Shielded
POWER CABLE: Unshielded

(5) **PERIPHERAL**: GVC Fax Modem, Model FM-144VR1, FCC ID: DK4FM144VR1
I/O Cable: Shielded
Power Supply Cable: Non-shielded

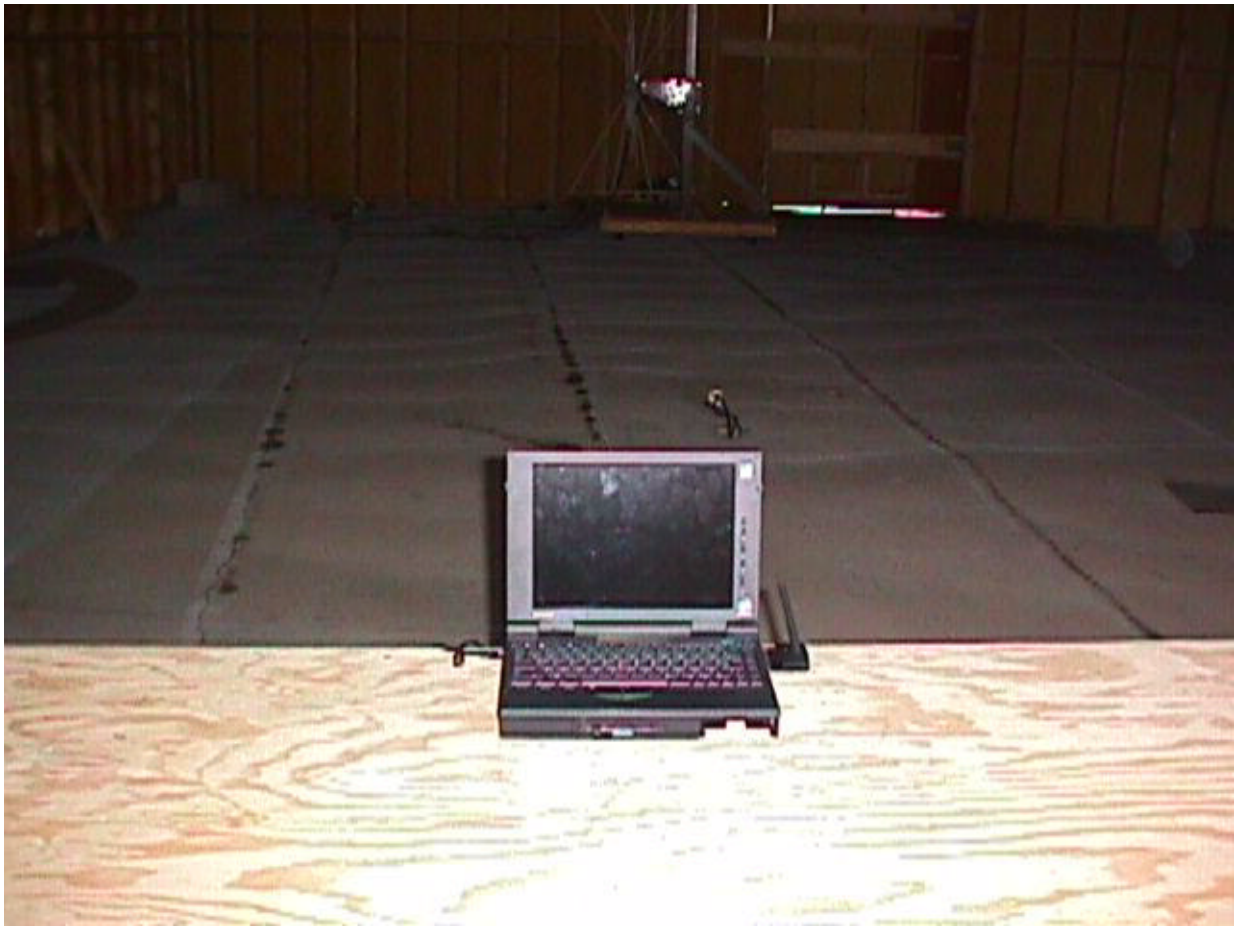
3.2 Block Diagrams Radiated Emission Measurements


ANTENNA CONNECTOR, CONNECTED TO ONE
OF THE FOLLOWING ANNTENNA TYPE:
AL-100 Dipole ANT
AL-101 Loopy ANT
AL-102 Dipole ANT Right-Angle
AG-110 Corner ANT
HP OMNI 5500 CS LAPTOP COMPUTER
GEMTEK PCMCIA WIRELESS LAN CARD MODEL WR-201
DEC Writer 100i PARALEEL PRINTER MODEL LJ100-AZ
GVC FAC MODEM MODEL FM-14VR1
HP F1044B AC/DC ADAPTER
AC 120V 60Hz

3.3 Photograph for RF Emission Measurements

Please refer to appendix the attached photos.

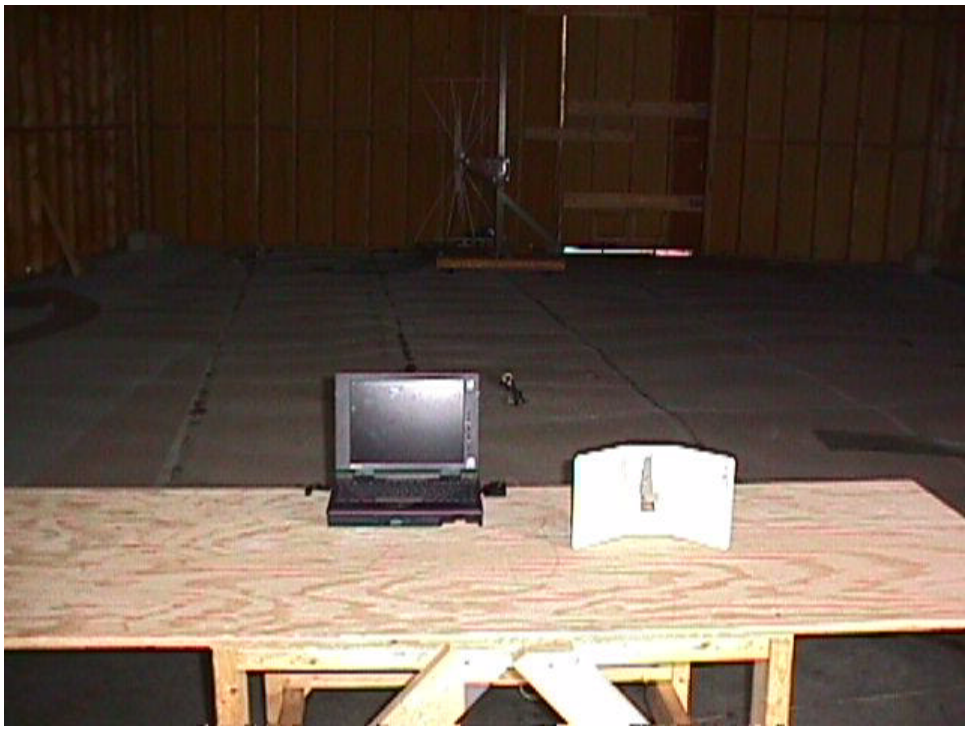
3.3.1 Test Configuration #1: Tested with AL-100 Dipole Antenna



3.3.2 Test Configuration #2: Tested with AL-101 Loopy Antenna

3.3.3 Test Configuration #3: Tested with AL-102 Dipole Antenna Right-Angle

3.3.4 Test Configuration #4: Tested with AG-110 Corner Antenna



3.4 Justification

No deviation, in both configuration and operation manners, different from normal operation were required.

3.5 EUT Operating Condition

Software provided by GEMTEK TECHNOLOGY CO., LTD. to set the EUT to transmit at lowest, middle and highest channel frequencies.

3.6 Special Accessories

No special accessories were required.

3.7 Equipment Modifications

To achieve compliance, the following change(s) were made by UltraTech's test house during compliance testing:

Not required.

4. EXHIBIT 4 - TEST DATA

4.1 Maximum Peak Output Power @ FCC 15.247(b) and RF Exposure Limit FCC 1.1310

PRODUCT NAME: **PCMCIA WIRELESS LAN CARD, Model No.: WL-201**

FCC REQUIREMENTS:

FCC 15.247(b):- Maximum peak output power of the transmitter shall not exceed 1 Watt. If the antenna of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	...	...	F/1500	6
1500-100,000	...	...	1.0	30

F = Frequency in MHz
* = Plane-wave equivalent power density

CLIMATE CONDITION:

- Standard Temperature and Humidity: 23^{o}C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- HP RF Peak Power Meter, Model 8900, S/N: 2131A00124, Measuring Freq. Range: 01 - 18 GHz, 50 Ohm IN.
- HP RF Peak Power Sensor, Model 8481A, S/N: 2551A01965, Measuring Freq. Range: 0.1 - 18 GHz, 50 Ohm IN/OUT
- Bird 20 dB Attenuator, 50 Ohm IN/OUT

METHOD OF MEASUREMENTS:

FCC @ 1.1310 & OST Bulletin No. 65-October 1985

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

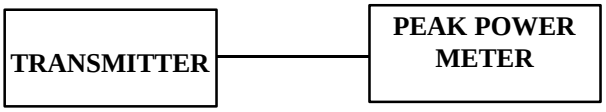
Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$r = \sqrt{PG/4\Pi S}$

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Jan. 29, 1999

MEASUREMENT DATA:

PEAK POWER MEASUREMENT

DIRECT PEAK POWER MEASUREMENTS AT THE ANTENNA TERMINAL WITH THE ANTENNA REPLACED BY A SMA CONNECTOR

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	DATA RATE / MODULATION	MEASURED PEAK TOTAL POWER (mW)	PEAK POWER LIMIT (mW)
1	2412	2 Mb/s QPSK	38.8	1000.0
6	2437	2 Mb/s QPSK	38.1	1000.0
11	2462	2 Mb/s QPSK	34.4	1000.0
1	2412	1 Mb/s BPSK	38.8	1000.0
6	2437	1 Mb/s BPSK	38.1	1000.0
11	2462	1 Mb/s BPSK	34.4	1000.0

MAX. EFFECTIVE ISOTROPIC RADIATED POWER (EIRP) MEASURED AT 3 METER DISTANCE (Substitution Method)

OPTIONAL TRANSMITTING ANTENNAS:

(1) Gemtek AL-100 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 3 dBi, Antenna Pattern: Omni directional, Connector Type: SMB Modified with reversed thrust.

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(4) Gemtek AL-110 Dipole Antenna, Frequency Range: 2.4-2.4835 GHz, Gain: 12 dBi, Antenna Pattern: Uni-directional, Connector Type: SMB Modified with reversed thrust.

Tx ANTENNA MODEL & GAIN	CARRIER FREQUENCY (MHz) @ MAX	DATA RATE / MODULATION @ MAX	Rx Antenna Gain (Numeric)	Max. Field Strength Level At 3 m (dBuV/m)	Max. EIRP POWER @ 1 MHz BW (mW)	Max. EIRP POWER In a full BW (mW)	PEAK POWER LIMIT (mW)
AL-100, 3dBi	2412	1 Mb/s QPSK	3.2	114.5	84.6	227.6	1000.0
AL-101, 3dBi	2412	1 Mb/s QPSK	3.2	112.6	54.6	176.7	1000.0
AL-102, 3dBi	2462	2 Mb/s QPSK	3.2	115.2	99.3	395.5	1000.0
AL-110, 12 dBi	2462	2 Mb/s BPSK	3.2	111.5	42.4	134.0	1000.0

RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\pi S)^{1/2}$

Tx ANTENNA MODEL & GAIN	CARRIER FREQUENCY (MHz) @ MAX	DATA RATE / MODULATION @ MAX	Max. PEAK EIRP POWER In a full BW (mW)	MNIMUM ALLOWABLE DISTANCE (r) FROM SKIN (Centi-Meter)
AL-100, 3dBi	2412	1 Mb/s QPSK	227.6	4.3
AL-101, 3dBi	2412	1 Mb/s QPSK	176.7	3.7
AL-102, 3dBi	2462	2 Mb/s QPSK	395.5	5.6
AL-110, 12 dBi	2462	2 Mb/s BPSK	134.0	3.3

Since the peak power density of 1 mW/cm^2 is at a very short distance from the radiating antenna, and in additional the average power density is much less, the applicant wishes to apply the exemption for the RF exposure limit warning or SAR tests.