FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

AMBIT Microsystems Corporation

4-1, Ming Shen Street, Tu Chen Industrial District.
Tu Chen, Taipei Hsien 236, Taiwan, R.O.C.

FCC ID: MCLT60H42400

August 13, 2002

This Report Concerns:	**Equipment Type:**
☒ Class II Permissive Change	MiniPCI IIIB Wireless LAN Card

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Report No.:	R0208075
Test Date:	August 8, 2002
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Ambit Microsystems Corporation*'s Model: *T60H424* or the "EUT" as referred to in this report is a MINIPCI IIIB Wireless LAN Card.

The EUT is complied with IEEE 80211b 11 Mbps Standard. The WLAN application is implemented via a RF module. This RF module is developed for Wireless LAN application complied with IEEE 802.11b 11Mbps standard in ISM band. It can be used to provide a variety of low-cost wireless network interfaces to build your wireless connection via simply SMT procedure to speed the time to market. Three Intersil's chips are implemented in the RF module including ISL3985, HFA3783.

The EUT has the following functions:

- Compatible with IEEE 802.11b high rate standard to provide wireless Ethernet speeds of 11Mbps data rate
- Dynamic data rate switching with 11, 5.5, 2, and 1 Mbps
- Allows auto fallback data rate for optimized reliability, throughput and transmission range
- Supports wireless data encryption with 64/128-bit WEP standard for security
- Dual diversity antenna connectors supported for the multi-path environment
- Drivers supports Windows 95, 98, 98SE, NT, ME, 2000, Win XP.

** The test data in this test report was good for the test sample only. It may have deviation for other test samples.*

1.2 Objective

This type approval report is prepared on behalf of. *Ambit Microsystems Corporation* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Antenna Requirement, Conducted and Spurious Radiated Emission as a Class II Permissive Change.

1.3 Related Submittal(s)/Grant(s)

This Class II permissive change device was originally granted on 4/15/2002. Please refer to BACL report R0203066. The manufacturer did not make any modification on the EUT. Per marketing purpose, the device was installed in AMBIT KT5 laptop and tested with the different antenna.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2000, 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.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory Corporation. The radiated testing was performed at an antenna-to-EUT distance of 3 Meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI).

The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2000.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2610A02165	12/6/02
HP	Spectrum Analyzer	8593B	2919A00242	12/20/02
HP	Amplifier	8349B	2644A02662	12/20/02
HP	Quasi-Peak Adapter	85650A	917059	12/6/02
HP	Amplifier	8447E	1937A01046	12/6/02
A.H. System	Horn Antenna	SAS0200/571	261	12/27/02
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/02
Com-Power	LISN	LI-200	12208	12/20/02
Com-Power	LISN	LI-200	12005	12/20/02
BACL	Data Entry Software	DES1	0001	12/20/02

*** Statement of Traceability: Bay Area Compliance Laboratory Corp.** certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (NIST).

1.7 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
HP	Power Supply	HP F1781A	None	DoC
AMBIT	Laptop	KT5	None	DoC

1.8 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
AMBIT	Laptop	KT5	None	DOC
Citizen	Printer	LSP-10	5047999-82	DLK66TLSP-10
EVEREX	Modem	EV-945	None	E3E5UVE-945

1.9 External Cable List and Details

Manufacturer	Length (M)	From	To
Shielded Parallel Cable	2.0	Parallel Port/Laptop	Printer
Shielded Serial Cable	1.5	Serial Port/Laptop	Modem

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing in a typical fashion (as a normally used by a typical user).

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, terminal.exe, provided by the customer, is started the Windows 98 terminal program under the Windows 98 operating system. Once loaded, the program sequentially exercises each system component.

The sequence used is as follows:

1. Lines of Hs scroll across the notebook monitor.
2. The modem(s) receives Hs.
3. The printer output Hs.

This process is continuous throughout all tests.

2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied by INMAC and their respective support equipment manufacturers. The host pc and other peripherals featured shielded metal connectors.

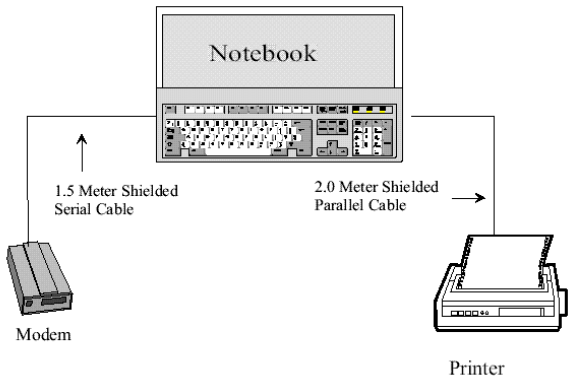
2.4 Schematics / Block Diagram

Please refer to Exhibit D.

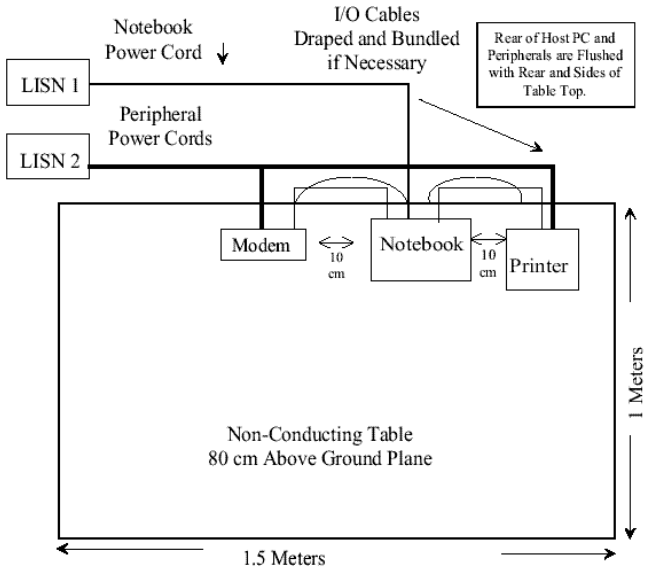
2.5 Equipment Modifications

No modifications were made by BACL Corporation to ensure the EUT to comply with the applicable limits and requirements.

2.6 Configuration of Test System



2.7 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 15.205	Restricted Bands	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emission	Compliant
§15.209 (a)	Radiated Emission	Compliant

Attestation: The testing was performed or supervised by BACL Corp. that the test measurements were made in accordance with the referred department standard(s); and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the department standards and all of the requirement standards have been met.

4 - SPURIOUS RADIATED EMISSIONS

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-2000. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The notebook was connected with 110Vac/60Hz power source.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 26GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	26GHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

4.4 Test Procedure

For the radiated emissions test, the notebook and all support equipment power cords were connected to the AC floor outlet since the notebook power supply did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBµV of specification limits), and are distinguished with a "**Qp**" in the data table.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Subpart C. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Subpart C Limit

4.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.247, and had the worst margin of:

BM1 Antenna Port J1, Intentional Emission, 1 ~ 26GHz, 3 Meters

-12.9 dBμV at 7236.00 MHz in the Vertical polarization, Low Frequency
-13.26 dBμV at 7311.00 MHz in the Vertical polarization, Middle Frequency
-13.6 dBμV at 7386.00 MHz in the Vertical polarization, High Channel

BM1Antenna Port J1, Unintentional Emission, 30 ~ 1000MHz, 3 Meters

-2.1 dBμV at 528.01 MHz in the Horizontal polarization

BM1 Antenna Port J2, Intentional Emission, 1 ~ 26GHz, 3 Meters

-11.3 dBμV at 4824.00 MHz in the Horizontal polarization, Low Frequency
-9.9 dBμV at 7311.00 MHz in the Vertical polarization, Middle Frequency
-10.7 dBμV at 7386.00 MHz in the Vertical polarization, High Channel

BM1 Antenna Port J2, Unintentional Emission, 30 ~ 1000MHz, 3 Meters

-3.4 dBμV at 218.40 MHz in the Horizontal polarization

BM1 Antenna Port 1, Intentional Emission, 30MHz ~ 26 GHz, 3 Meters

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB	
Low Channel											
7236.00	30.4	90	1.5	V	35.1	5.6	30.0	41.1	54	-12.9	AVG
4824.00	32.9	90	1.8	V	32.5	4.9	30.0	40.3	54	-13.7	AVG
7236.00	28.6	225	1.2	H	35.1	5.6	30.0	39.3	54	-14.7	AVG
4824.00	31.7	110	1.2	H	32.5	4.9	30.0	39.1	54	-14.9	AVG
Middle Channel											
7311.00	30.1	90	1.2	V	35.1	5.6	30.0	40.8	54	-13.2	AVG
7311.00	29.40	60	1.4	H	35.1	5.6	30.0	40.1	54	-13.9	AVG
4874.00	32.7	250	1.2	V	32.5	4.9	30.0	40.1	54	-13.9	AVG
4874.00	31.2	220	1.5	H	32.5	4.9	30.0	38.6	54	-15.4	AVG
High Channel											
7386.00	29.7	330	1.5	V	35.1	5.6	30.0	40.4	54	-13.6	AVG
4924.00	31.8	90	1.5	V	32.5	4.9	30.0	39.2	54	-14.8	AVG
7386.00	28.20	0	1.5	H	35.1	5.6	30.0	38.9	54	-15.1	AVG
4924.00	30.4	110	1.2	H	32.5	4.9	30.0	37.8	54	-16.2	AVG
Unintentional Emission											
528.01	46.2	60	1.2	H	19.8	2.9	25.0	43.9	46	-2.1	/
263.00	45.9	0	1.2	H	13.3	4.9	25.0	39.1	46	-6.9	/
175.50	41.2	330	1.2	V	13.4	3.9	25.0	33.5	43.5	-10.0	/
210.64	40.8	150	1.5	H	12.5	4.7	25.0	33.0	43.5	-10.5	/
439.77	38.4	270	1.5	H	17.5	2.9	25.0	33.8	46	-12.2	/
131.99	39.6	90	1.5	V	12.6	2.0	25.0	29.2	43.5	-14.3	/

* There was no apparent emission after the second harmonics.

BM1 Antenna Port 2, Intentional Emission, 30MHz ~ 26 GHz, 3 Meters

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB	
Low Channel											
4824.00	35.3	45	1.2	V	32.5	4.9	30.0	42.7	54	-11.3	AVG
7236.00	31.7	60	1.5	V	35.1	5.6	30.0	42.4	54	-11.6	AVG
7236.00	29.8	45	1.5	H	35.1	5.6	30.0	40.5	54	-13.5	AVG
4824.00	32.6	180	1.2	H	32.5	4.9	30.0	40.0	54	-14.0	AVG
Middle Channel											
7311.00	33.3	90	1.0	V	35.1	5.6	30.0	44.1	54	-9.9	AVG
4874.00	35.2	135	1.0	H	32.5	4.9	30.0	42.6	54	-11.4	AVG
7311.00	30.00	135	1.0	H	35.1	5.6	30.0	40.7	54	-13.3	AVG
4874.00	32.7	90	1.0	V	32.5	4.9	30.0	40.1	54	-13.9	AVG
High Channel											
7386.00	32.6	150	1.4	V	35.1	5.6	30.0	43.3	54	-10.7	AVG
4924.00	35.2	45	1.5	V	32.5	4.9	30.0	42.6	54	-11.4	AVG
4924.00	34.7	60	1.5	H	32.5	4.9	30.0	42.1	54	-11.9	AVG
7386.00	28.50	180	1.4	H	35.1	5.6	30.0	39.2	54	-14.8	AVG
Unintentional Emission											
218.40	50.4	160	1.5	H	12.5	4.7	25.0	42.6	46	-3.4	/
658.53	40.6	320	1.5	H	20.7	3.4	25.0	39.7	46	-6.3	/
310.00	44.2	280	1.0	H	15.9	3.7	25.0	38.8	46	-7.2	/
88.00	43.7	270	2.2	V	9.7	2.2	25.0	30.6	40	-9.4	/
395.10	39.8	60	1.2	H	16.5	2.8	25.0	34.1	46	-11.9	/
131.50	41.9	210	1.5	V	12.6	2.0	25.0	31.5	43.5	-12.0	/
825.64	32.7	90	1.5	H	22.9	3.7	26.0	33.3	46	-12.7	
172.76	40.1	160	1.5	V	13.3	1.4	25.0	29.8	43.5	-13.7	

* There was no apparent emission after the second harmonics.

5 - CONDUCTED EMISSIONS

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

5.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4-2000 measurement procedure. The specification used was FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The host PC system was connected with 110Vac/60Hz power source.

5.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

Start Frequency	450 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	10 kHz
Video Bandwidth	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

5.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

5.5 Summary of Test Results

The EUT complied with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

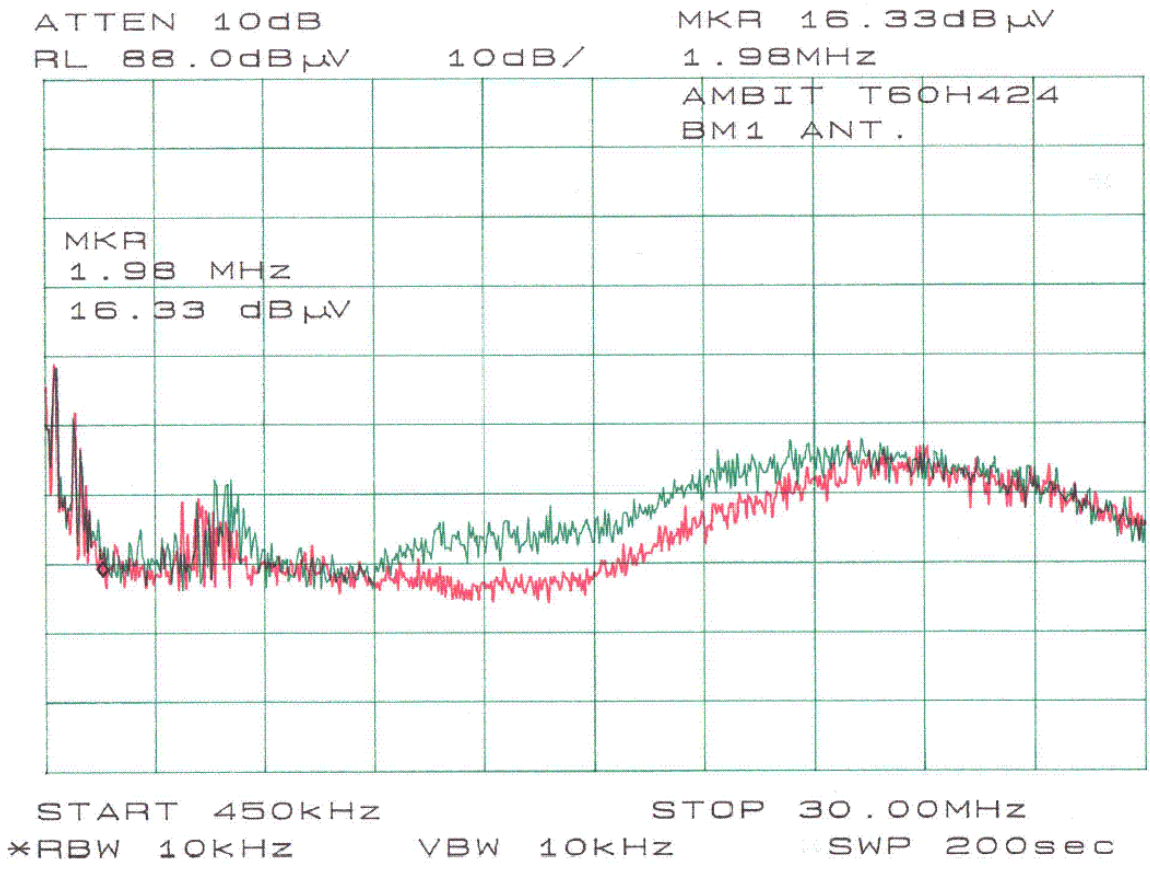
-1.2 dBμV at 0.680 MHz in the Neutral mode

5.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.68	46.8	QP	Neutral	48	-1.2
0.71	45.3	QP	Line	48	-2.7
1.24	39.8	QP	Neutral	48	-8.2
1.19	39.2	QP	Line	48	-8.8
22.42	35.8	QP	Line	48	-12.2
22.07	35.5	QP	Neutral	48	-12.5

5.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.



6 - ANTENNA REQUIREMENT

6.1 Standard Applicable

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (1), if transmitting antennas 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.

6.2 Antenna Connected Construction

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of the standard.

Please refer to the attached antenna information.