

FC

Test Report

Product Name	2.4GHz ZigBee Module
Model No	WZ400T
FCC ID.	DoC

Applicant	Lite-On Technology Corp.
Address	4F,90,Chien 1 Road,Chung-Ho,Taipei Hsien 235,Taiwan,R.O.C.

Date of Receipt	Mar. 02, 2010
Issue Date	Mar. 15, 2010
Report No.	103063R-RFUSP37V02
Report Version	V1.0

The test results relate only to the samples tested.
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Test Report Certification

Issue Date: Mar. 15, 2010

Report No.: 103063R-RFUSP37V02



Accredited by NIST (NVLAP)
NVLAP Lab Code: 200533-0

Product Name	2.4GHz ZigBee Module
Applicant	Lite-On Technology Corp.
Address	4F,90,Chien 1 Road,Chung-Ho,Taipei Hsien 235,Taiwan,R.O.C.
Manufacturer	DONG GUAN G-COM COMPUTER CO., LTD.
Model No.	WZ400T
FCC ID.	DoC
EUT Rated Voltage	DC 3V
EUT Test Voltage	DC 3V
Trade Name	Lite-On
Applicable Standard	FCC CFR Title 47 Part 15 Subpart B: 2008 ANSI C63.4: 2003
Test Result	Complied



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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	2.4GHz ZigBee Module
Trade Name	Lite-On
Model No.	WZ400T
FCC ID.	DoC
Frequency Range	2405-2475MHz
Number of Channels	15CH
Type of Modulation	DSSS (O-QPSK)
Antenna Type	Monopole Antenna
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	DONG GUAN G-COM COMPUTER	N/A	1.5dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2405 MHz	Channel 02:	2410 MHz	Channel 03:	2415 MHz	Channel 04:	2420 MHz
Channel 05:	2425 MHz	Channel 06:	2430 MHz	Channel 07:	2435 MHz	Channel 08:	2440 MHz
Channel 09:	2445 MHz	Channel 10:	2450 MHz	Channel 11:	2455 MHz	Channel 12:	2460 MHz
Channel 13:	2465 MHz	Channel 14:	2470 MHz	Channel 15:	2475 MHz		

Note:

1. The EUT is a 2.4GHz ZigBee Module.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample for demonstrating the compliance of ZigBee receiver with Part 15 Subpart B.
4. Part 15 Subpart C compliance for spread spectrum devices is shown on the report no. 103063R-RFUSP29V01 and certified under FCC ID: PPQ-WZ400T.

Test Mode:	Mode 1: Receive
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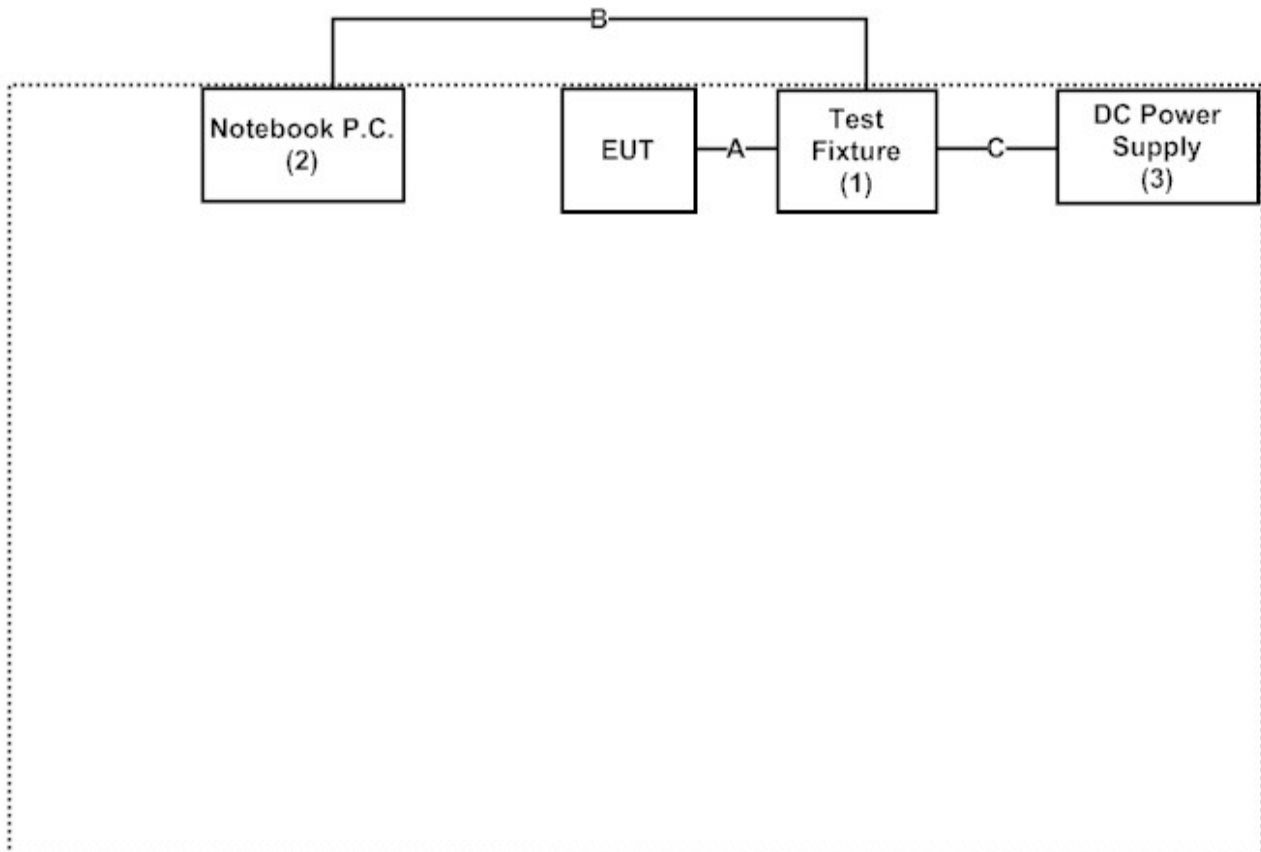
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Test Fixture	DONG GUAN G-COM	N/A	N/A	N/A
2 Notebook P.C.	DELL	PPT	N/A	Non-Shielded, 0.8m
3 DC Power Supply	Agilent	E3646A	MY40003414	Non-Shielded, 1.8m

Signal Cable Type	Signal cable Description
A Signal Cable	Non-Shielded, 0.3m
B USB Cable	Non-Shielded, 1.2m
C DC Power Cable	Non-Shielded, 0.8 m

1.3. Configuration of Tested System



1.4. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.3
- (2) Execute the "Smart RF" program (Ver 6.13.0.0) on the notebook.
- (3) Setup the test mode, and channel.
- (4) Press OK to start the transmission.
- (5) Verify that the EUT works correctly.

1.5. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site : <http://tw.quietek.com/tw/emc/accreditations/accreditations.htm>
 The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on
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 FCC Engineering Laboratory
 7435 Oakland Mills Road
 Columbia, MD 21046
 Registration Number: 92195



Accreditation on NVLAP
 NVLAP Lab Code: 200533-0



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FCC Accreditation Number: TW1014



2. Conducted Emission

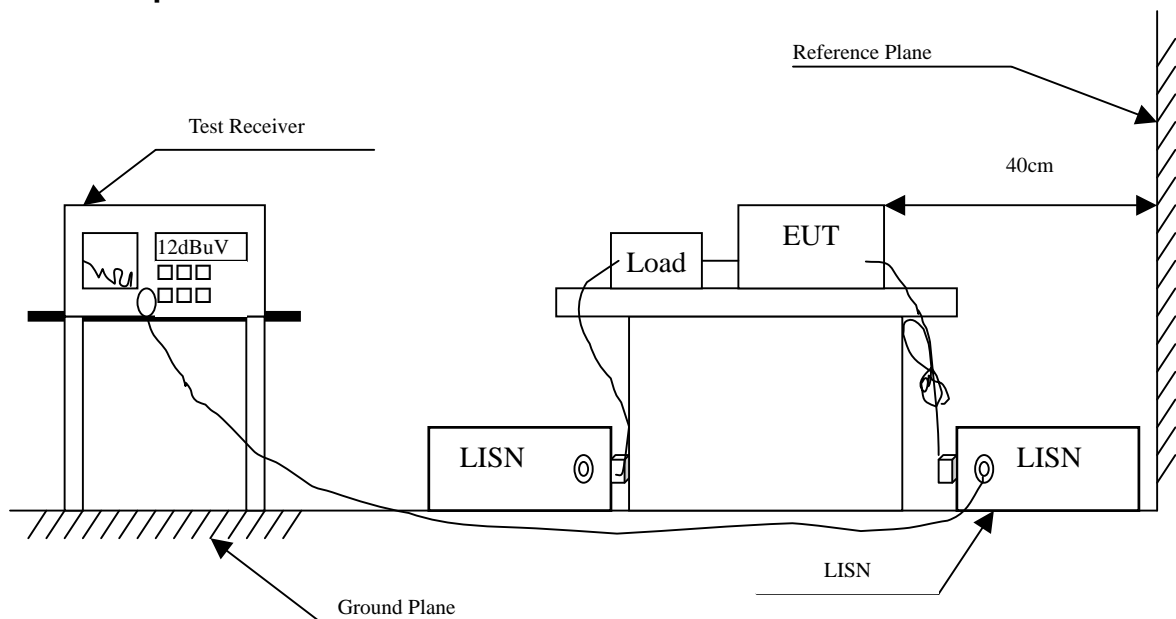
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2009	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2009	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart B Paragraph 15.107 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). 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. (Please refers to the block diagram of the test setup and photographs.) Both sides of A.C. 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: 2003 on conducted measurement. Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : 2.4GHz ZigBee Module
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Receive (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 1					
Quasi-Peak					
0.916	9.670	23.570	33.240	-22.760	56.000
1.607	9.680	23.070	32.750	-23.250	56.000
2.228	9.680	27.650	37.330	-18.670	56.000
4.127	9.700	31.080	40.780	-15.220	56.000
5.677	9.720	40.270	49.990	-10.010	60.000
9.681	9.830	33.250	43.080	-16.920	60.000
Average					
0.916	9.670	13.430	23.100	-22.900	46.000
1.607	9.680	17.230	26.910	-19.090	46.000
2.228	9.680	11.380	21.060	-24.940	46.000
4.127	9.700	21.210	30.910	-15.090	46.000
5.677	9.720	29.140	38.860	-11.140	50.000
9.681	9.830	25.680	35.510	-14.490	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 2.4GHz ZigBee Module
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Receive(2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
Line 2					
Quasi-Peak					
1.619	9.680	23.810	33.490	-22.510	56.000
2.330	9.680	26.520	36.200	-19.800	56.000
4.033	9.700	30.120	39.820	-16.180	56.000
5.584	9.720	38.890	48.610	-11.390	60.000
9.599	9.820	34.150	43.970	-16.030	60.000
15.869	10.000	24.380	34.380	-25.620	60.000
Average					
1.619	9.680	18.070	27.750	-18.250	46.000
2.330	9.680	8.420	18.100	-27.900	46.000
4.033	9.700	21.650	31.350	-14.650	46.000
5.584	9.720	28.610	38.330	-11.670	50.000
9.599	9.820	25.610	35.430	-14.570	50.000
15.869	10.000	17.310	27.310	-22.690	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Radiated Emission

3.1. Test Equipment

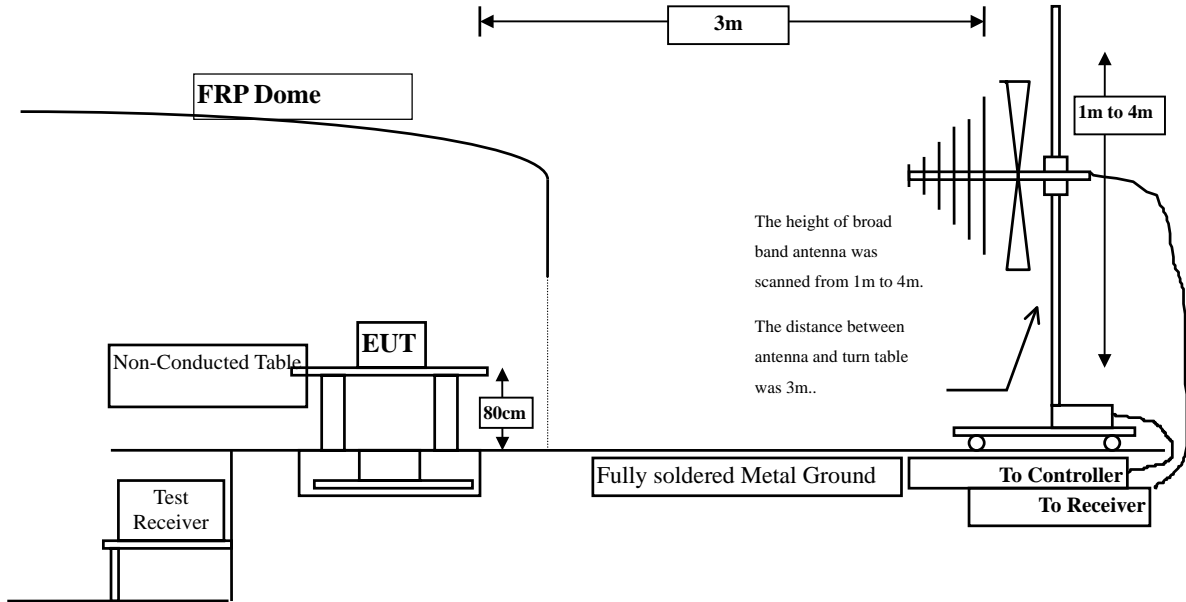
The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2009
	X	Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X	Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	X	Coaxial Cable	Quietek	QTK-CABLE/ CAB5	Feb., 2010
	X	Controller	Quietek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

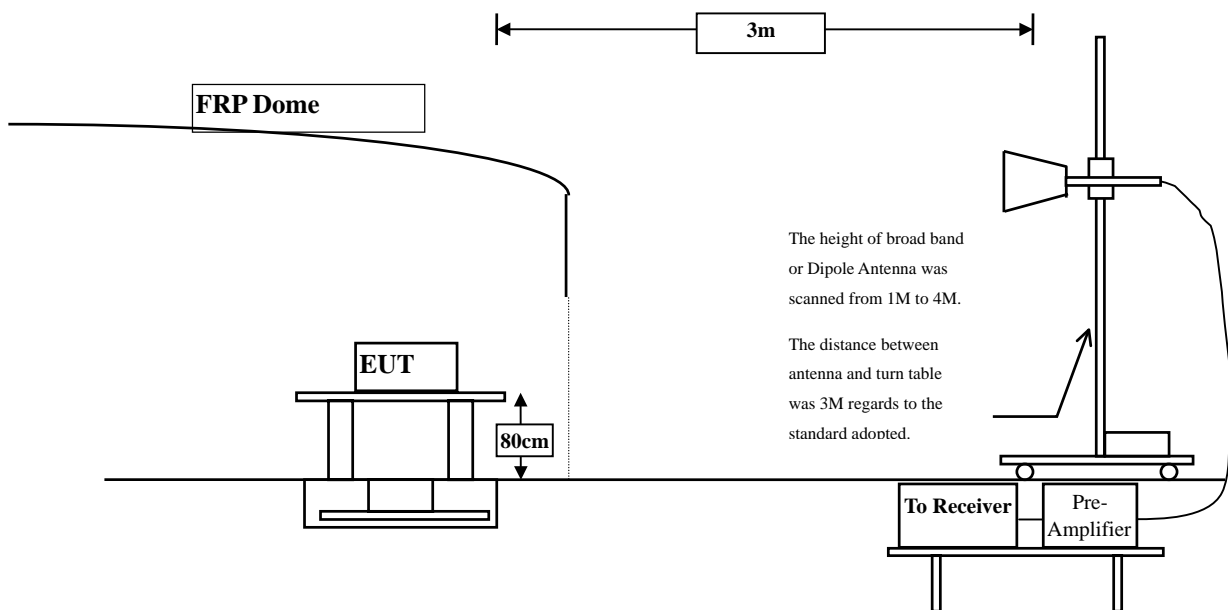
- Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

3.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.3. Limits

FCC Part 15 Subpart B Paragraph 15.109 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

- Remarks :
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 30MHz - 10th Harmonic of fundamental was investigated.

3.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

3.6. Test Result of Radiated Emission

Product : 2.4GHz ZigBee Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Receive(2405MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2405.000	-1.056	37.960	36.904	-37.096	74.000
4810.000	3.142	43.120	46.262	-27.738	74.000
7415.000	12.264	35.640	47.904	-26.096	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
2405.000	-1.722	42.250	40.527	-33.473	74.000
4810.000	6.410	42.320	48.730	-25.270	74.000
7215.000	11.056	36.690	47.747	-26.253	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz; Span:10MHz ◦
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:10MHz ◦
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 2.4GHz ZigBee Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Receive(2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2440.000	-0.836	37.560	36.724	-37.276	74.000
4880.000	2.896	40.300	43.196	-30.804	74.000
7320.000	11.769	35.390	47.159	-26.841	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
2440.000	-1.549	36.960	35.411	-38.589	74.000
4880.000	5.624	40.040	45.664	-28.336	74.000
7320.000	12.639	34.820	47.459	-26.541	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz; Span:10MHz ◦
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:10MHz ◦
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 2.4GHz ZigBee Module
 Test Item : Harmonic Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Receive(2475MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
2475.000	-0.612	37.580	36.968	-37.032	74.000
4950.000	2.741	37.760	40.501	-33.499	74.000
7425.000	12.337	35.230	47.567	-26.433	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
2475.000	-1.352	37.490	36.138	-37.862	74.000
4950.000	5.501	40.450	45.950	-28.050	74.000
7425.000	13.317	34.970	48.287	-25.713	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz; Span:10MHz ◦
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:10MHz ◦
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 2.4GHz ZigBee Module
 Test Item : General Radiated Emission Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Receive(2440 MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
30.000	2.120	30.326	32.446	-7.554	40.000
191.020	-10.040	46.784	36.744	-6.756	43.500
297.720	-3.633	36.978	33.346	-12.654	46.000
460.680	1.589	36.916	38.505	-7.495	46.000
544.100	3.512	34.854	38.366	-7.634	46.000
1000.000	9.119	29.539	38.658	-15.342	54.000
Vertical					
31.940	-0.487	34.241	33.755	-6.245	40.000
196.840	-8.766	43.102	34.336	-9.164	43.500
299.660	-6.855	35.094	28.239	-17.761	46.000
507.240	-0.471	33.546	33.075	-12.925	46.000
967.020	8.071	27.305	35.376	-18.624	54.000
1000.000	4.329	30.863	35.192	-18.808	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.