Lab Code: 200167-0

FCC PART 15.249

TEST AND MEASUREMENT REPORT

For

CentraLite Systems, Inc.

6420 Wall Street,
Mobile, AL 36695, USA

FCC ID:T3L-JS002
Model: 4255050-RZHA

Report Type:	**Product Type:**
Original Report	802.15.4/Zigbee Appliance Module

Test Engineer:	Dennis Huang
Report Number:	R1009162-249
Report Date:	2010-09-30
Reviewed By:	Victor Zhang RF Lead
Prepared By: (84)	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1009162-249	Original Report	2010-09-30

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *CentraLite Systems Inc.,* product: *FCC ID: T3LJS002, model: 4255050-RZHA,* which will be henceforth in this report referred to as the EUT (Equipment under Test). The EUT is a 802.15.4/Zigbee appliance module operates in the 2.4 GHz band.

1.2 Mechanical Description of EUT

The EUT measures approximately *50mm* **(L)** x *45mm* **(W)** *x 120***(H)** and weighs approximately *161* g.

The data gathered are from a typical production sample provided by the manufacturer with S/N: R1009162-1 assigned by BACL.

1.3 Objective

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

The objective is to determine compliance with FCC rules for section 15.203, 15.205, 15.209 and 15.249.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, 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.

1.6 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 values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

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

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have 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 C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2001670.htm

2 System Test Configuration

2.1 Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

Channel	Low Channel	Middle Channel	High Channel
802.15.4	2405 MHz	2440 MHz	2480 MHz

2.3 Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 EUT Internal Configuration

Manufacturers	Descriptions	Models	Serial Numbers
Centralite Systems, Inc	Main PCB	Hammerhead-Rev A	-

2.6 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
Power Cable	1	Ac Main	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Compliant
§15.249(a)	Field Strength of Fundamental & Harmonics	Compliant
§15.249, §15.209	Out of Band Emissions	Compliant
§15.249	99% Occupied Bandwidth	Compliant

4 FCC §15.203 – Antenna Requirement

4.1 Applicable Standard

According to FCC §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. 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 this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

4.2 Antenna Connector Construction

The EUT antenna is integrated into the PCB construction, which in accordance to FCC §15.203, is considered sufficient to comply with the provisions of this section.

Result: Compliant.

5 FCC §15.207 - Conducted Emissions

5.1 Applicable Standard

As per FCC §15.107: Conducted Limits

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Table 2- Limits for conducted disturbance at the mains ports of class B ITE

Frequency range (MHz)	Limits (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

5.2 EUT Setup

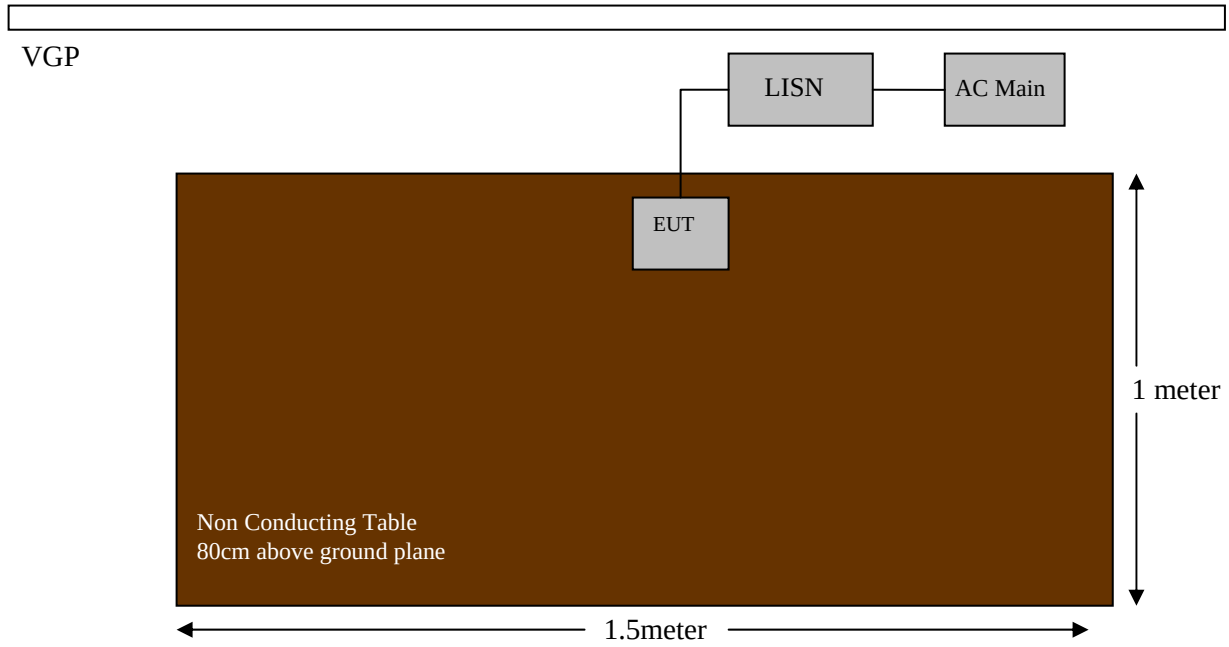
The conducted emissions tests were performed in the 10-meter test chamber, using the setup in accordance with ANSI C63.4-2003 measurement procedures. The specifications used were in accordance with FCC Part 15C limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The host system was connected to a 120 V, 60 Hz AC line power source.

5.3 Test Setup Block Diagram



5.5 Test Procedure

During the conducted emissions test, the power cord of the EUT was connected to the main outlet of the LISN.

Maximization procedure was performed on the six (6) highest emission readings from the EUT.

5.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Solar Electronics	LISN	9252-R-24-BNC	511205	2010-06-25

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

5.6 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	38%
ATM Pressure:	101.1kPa

Testing was performed by Dennis Huang on 2010-9-22 in chamber 3.

5.7 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Cable Loss + Attenuator Factor

For example, a Corrected Amplitude of 34.08 dBuV = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10 dB)

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

Margin = Corrected Amplitude - Limit

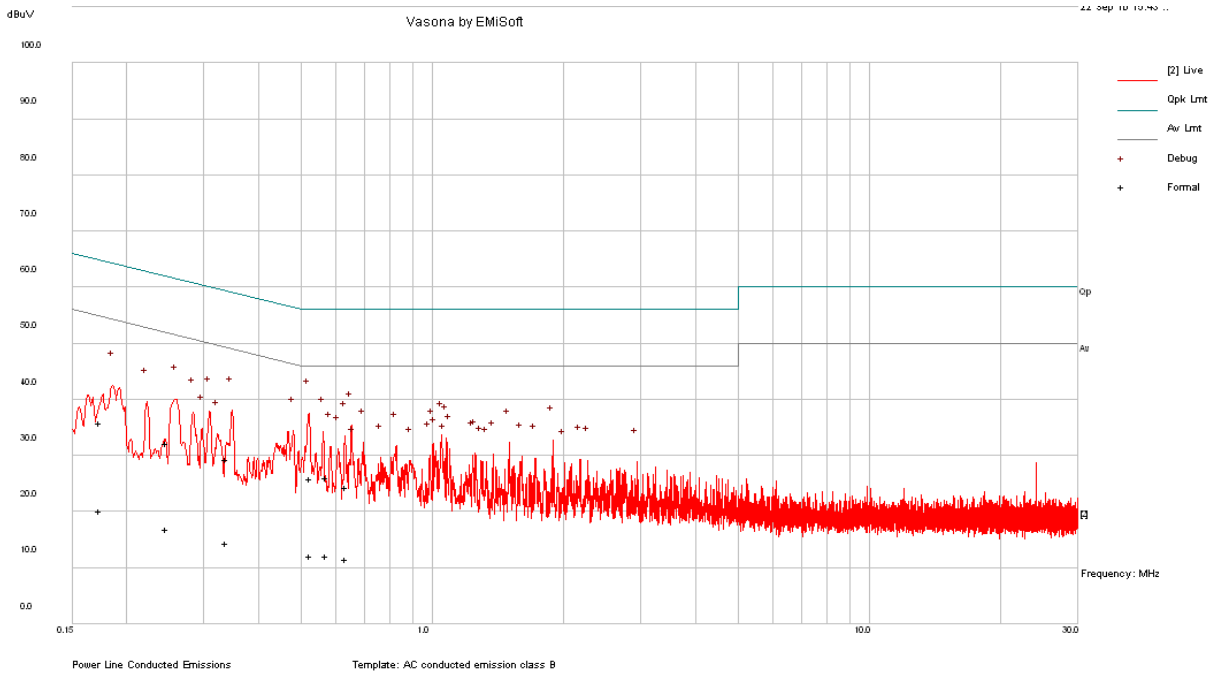
5.8 Summary of Test Results

According to the recorded data, the EUT complied with FCC Part 15C limits, and had the worst margin reading of:

Mode: 120 V/ 60 Hz			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-28.92	0.173574	Line	0.15 to 30

5.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



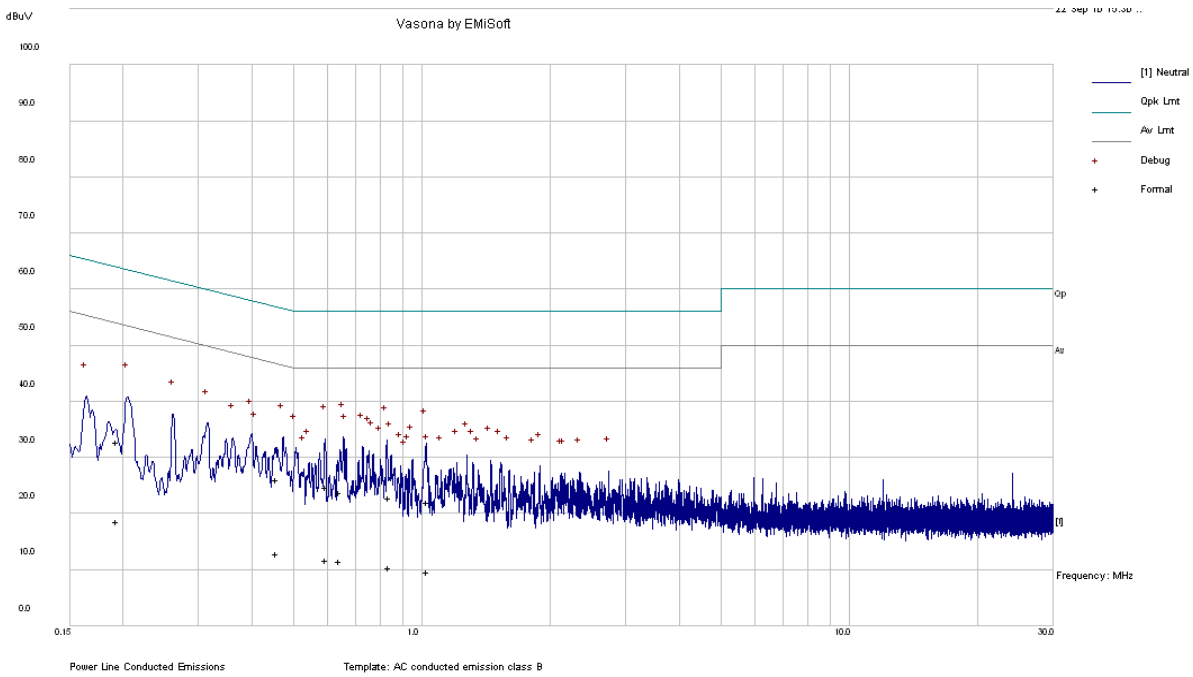
Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
0.526824	25.84	Quasi-Peak	L	56	-30.16
0.63579	24.36	Quasi-Peak	L	56	-31.64
0.339174	29.39	Quasi-Peak	L	59.22	-29.83
0.246489	32.2	Quasi-Peak	L	61.87	-29.68
0.573636	26.02	Quasi-Peak	L	56	-29.98
0.173574	35.87	Quasi-Peak	L	64.79	-28.92

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
0.526824	12.2	Average	L	46	-33.8
0.63579	11.57	Average	L	46	-34.43
0.339174	14.49	Average	L	49.22	-34.73
0.246489	16.88	Average	L	51.87	-34.99
0.573636	12.1	Average	L	46	-33.9
0.173574	20.11	Average	L	54.79	-34.67

120 V, 60 Hz – Neutral



Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
0.642384	23.8	Quasi-Peak	N	56	-32.2
0.193617	32.72	Quasi-Peak	N	63.88	-31.16
0.599907	24.84	Quasi-Peak	N	56	-31.16
0.458559	26.06	Quasi-Peak	N	56.72	-30.66
0.84246	22.87	Quasi-Peak	N	56	-33.13
1.035477	22.14	Quasi-Peak	N	56	-33.86

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Measurement Type	Conductor (L/N)	Limit (dBuV)	Margin (dB)
0.642384	11.51	Average	N	46	-34.49
0.193617	18.53	Average	N	53.88	-35.35
0.599907	11.78	Average	N	46	-34.22
0.458559	12.8	Average	N	46.72	-33.91
0.84246	10.34	Average	N	46	-35.66
1.035477	9.61	Average	N	46	-36.39

6 FCC §15.249(a) – Field Strength of Fundamental & Harmonics

6.1 Applicable Standard

As Per FCC §15.249(a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation

6.2 Test Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C.

The spacing between the peripherals was 10 centimeters.

6.3 Test Procedure

For the radiated emissions test, the EUT was performed using a new battery.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meters away from the testing antenna, which is varied from 1-4 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz, VBW = 300 kHz, Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz, VBW = 1MHz, Sweep = Auto
(2) Average: RBW = 1MHz, VBW = 10Hz, Sweep = Auto

6.4 Corrected Amplitude & Margin Calculation

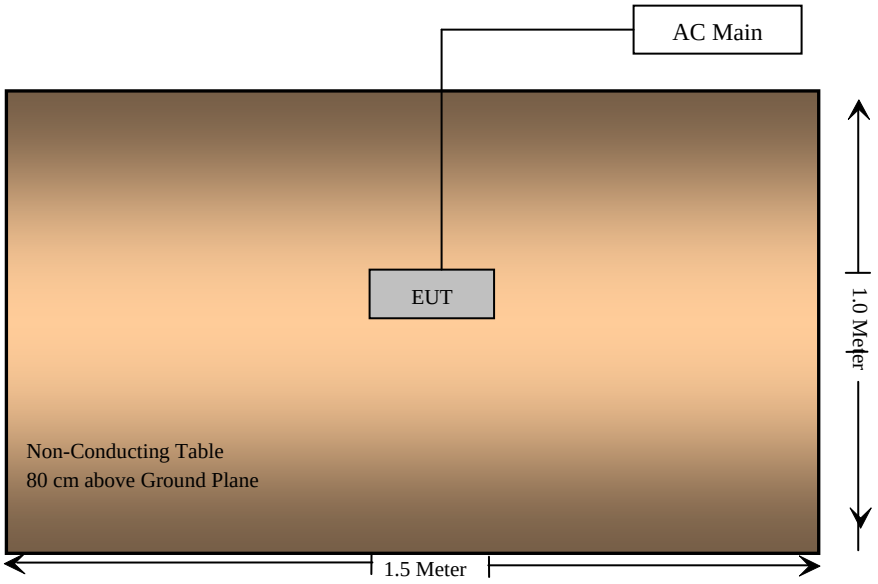
The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = 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 -7 dB means the emission is 7 dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

6.5 Test Setup Block Diagram



6.6 Test Equipment List and Details

Manufacturers	Descriptions	Model No.	Serial No.	Calibration Dates
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2010-05-28
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Agilent	Pre amplifier	8447D	2944A10187	2010-03-26
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-09
Mini-Circuit	Pre-Amp. 1 to 18GHz	ZVA-183-S	570400946	2010-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.7 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	38%
ATM Pressure:	101.1kPa

The testing was performed by Dennis Huang on 2010-09-22 in 5m chamber 3.

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the limits presented in FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.249, and had the worst margin of:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Comments
-0.3	7320	Vertical	Middle Channel

6.9 Test Plot & Data

Low Channel: 2405 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Detector PK/AV	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249/15.209		
				Height (m)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
2405	96.32	Peak	333	1.87	H	28.2	3.12	27.8	99.84	114	-14.16	Fund.
2405	94.7	Peak	30	1.0	V	28.2	3.12	27.8	98.22	114	-15.78	Fund.
2405	84.8	Ave	333	1.87	H	28.2	3.12	27.8	88.32	94	-5.68	Fund.
2405	83.29	Ave	30	1.0	V	28.2	3.12	27.8	86.81	94	-7.19	Fund.
4810	44.86	Peak	124	1.21	H	33.3	4.56	27.5	55.22	74	-18.78	Harmonic
4810	42.48	Peak	113	2.41	V	33.3	4.56	27.5	52.84	74	-21.16	Harmonic
4810	32.41	Ave	124	1.21	H	33.3	4.56	27.5	42.77	54	-11.23	Harmonic
4810	30.79	Ave	113	2.41	V	33.3	4.56	27.5	41.15	54	-12.85	Harmonic
7215	45.32	Peak	43	1.0	H	38.9	5.49	26.8	62.91	74	-11.09	Harmonic
7215	44.15	Peak	157	1.2	V	38.9	5.49	26.8	61.74	74	-12.26	Harmonic
7215	31.73	Ave	157	1.2	H	38.9	5.49	26.8	49.32	54	-4.68	Harmonic
7215	32.9	Ave	43	1.0	V	38.9	5.49	26.8	50.49	54	-3.51	Harmonic

Middle Channel: 2440 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Detector PK/AV	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249/15.209		
				Height (m)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
2440	94.07	Peak	360	1.52	H	30.3	3.12	27.8	99.69	114	-14.31	Fund.
2440	94.9	Peak	328	1.32	V	30.3	3.12	27.8	100.52	114	-13.48	Fund.
2440	83.24	Ave	360	1.52	H	30.3	3.12	27.8	88.86	94	-5.14	Fund.
2440	84.15	Ave	328	1.32	V	30.3	3.12	27.8	89.77	94	-4.23	Fund.
4880	43.29	Peak	260	1.0	H	32.3	4.54	27.5	52.63	74	-21.37	Harmonic
4880	44.4	Peak	126	1.3	V	32.3	4.54	27.5	53.74	74	-20.26	Harmonic
4880	30.77	Ave	260	1.0	H	32.3	4.54	27.5	40.11	54	-13.89	Harmonic
4880	31.3	Ave	126	1.3	V	32.3	4.54	27.5	40.64	54	-13.36	Harmonic
7320	47.61	Peak	201	1.27	H	39.1	5.57	26.9	65.38	74	-8.62	Harmonic
7320	48.82	Peak	56	1.27	V	39.1	5.57	26.9	66.59	74	-7.41	Harmonic
7320	34.53	Ave	201	1.27	H	39.1	5.57	26.9	52.3	54	-1.7	Harmonic
7320	35.93	Ave	56	1.27	V	39.1	5.57	26.9	53.7	54	-0.3	Harmonic

High Channel: 2480 MHz

Freq. (MHz)	S.A. Reading (dBuV)	Detector PK/AV	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.249/15.209		
				Height (m)	Polar. (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Comment
2480	90.87	Peak	360	1.83	H	30.3	3.12	27.8	96.49	114	-17.51	Fund.
2480	91.72	Peak	326	1.3	V	30.3	3.12	27.8	97.34	114	-16.66	Fund.
2480	80.77	Ave	360	1.83	H	30.3	3.12	27.8	86.39	94	-7.61	Fund.
2480	81.63	Ave	326	1.3	V	30.3	3.12	27.8	87.25	94	-6.75	Fund.
4960	45.92	Peak	231	1.22	H	32.3	4.52	27.4	55.34	74	-18.66	Harmonic
4960	46	Peak	148	1.15	V	32.3	4.52	27.4	55.42	74	-18.58	Harmonic
4960	33.33	Ave	231	1.22	H	32.3	4.52	27.4	42.75	54	-11.25	Harmonic
4960	32.89	Ave	148	1.15	V	32.3	4.52	27.4	42.31	54	-11.69	Harmonic
7440	43.97	Peak	230	1.35	H	39.1	5.66	26.8	61.93	74	-12.07	Harmonic
7440	43.58	Peak	149	1.05	V	39.1	5.66	26.8	61.54	74	-12.46	Harmonic
7440	30.57	Ave	230	1.35	H	39.1	5.66	26.8	48.53	54	-5.47	Harmonic
7440	29.86	Ave	149	1.05	V	39.1	5.66	26.8	47.82	54	-6.18	Harmonic

7 FCC §15.205, §15.209 & §15.249(d) – Out of Band Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3332 – 3339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3345.8 – 3358	23.6 – 24.0
12.29 – 12.293	240 – 285	3600 – 4400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

7.2 Test Procedure

For the radiated emissions test, the EUT was performed using a new battery.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meters away from the testing antenna, which is varied from 1-4 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:
RBW = 100 kHz, VBW = 300 kHz, Sweep = Auto

Above 1000 MHz:
(3) Peak: RBW = 1MHz, VBW = 1MHz, Sweep = Auto
(4) Average: RBW = 1MHz, VBW = 10Hz, Sweep = Auto

7.3 Corrected Amplitude & Margin Calculation

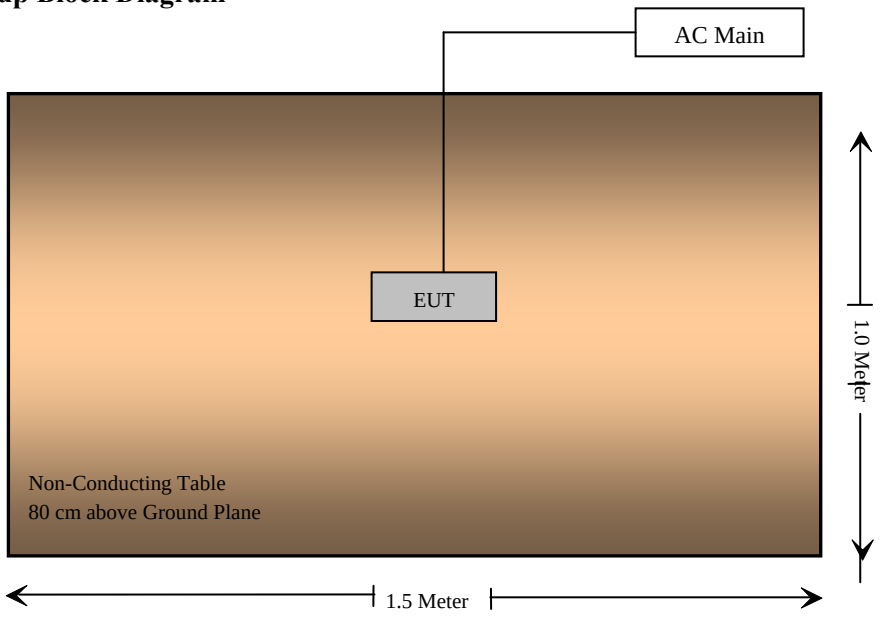
The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = 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 -7 dB means the emission is 7 dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

7.4 Test Setup Block Diagram



7.5 Test Equipment List and Details

Manufacturers	Descriptions	Model No.	Serial No.	Calibration Dates
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2010-05-28
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Agilent	Pre amplifier	8447D	2944A10187	2010-03-26
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-09
Mini-Circuit	Pre-Amp. 1 to 18GHz	ZVA-183-S	570400946	2010-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.6 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	38%
ATM Pressure:	101.1kPa

The testing was performed by Dennis Huang on 2010-09-22 in 5m chamber 3.

7.7 Summary of Test Results

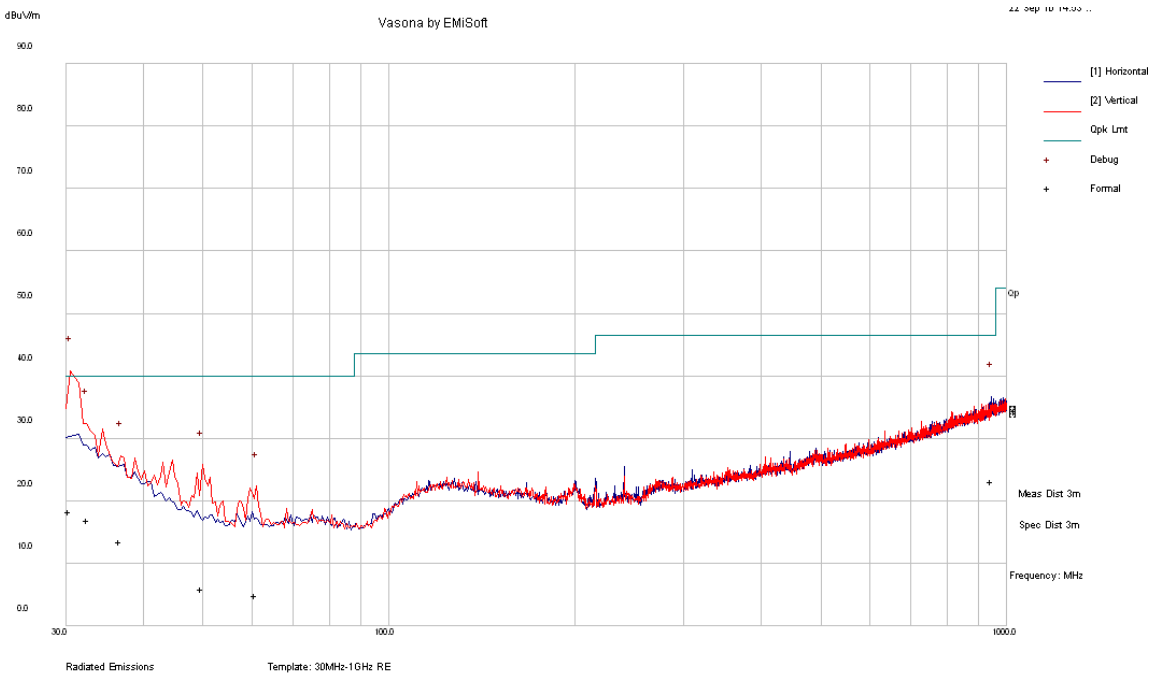
According to the data hereinafter, the EUT complied with the limits presented in FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.249, and had the worst margin of:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-21.7	30.4575	Vertical	30 to 20000

Please refer to the following tables for more detailed results

7.8 Radiated Emissions Test Plot & Data

30 MHz – 1 GHz, Measured at 3 meters, Worst Case – Low Channel 2405 MHz



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
30.4575	18.3	300	V	82	40	-21.7
32.5445	16.88	362	V	65	40	-23.12
944.1593	23.12	215	H	269	46.5	-23.38
36.73375	13.42	277	V	305	40	-26.58
49.81925	5.89	394	V	203	40	-34.11
60.806	4.84	296	V	311	40	-35.16

Above 1 GHz, Measured at 3 meters

Freq. (MHz)	S.A. Reading (dBuV)	Detector PK/AV	Turntable Azimuth Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Duty Cycle Factor (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.209		
				Height (cm)	Polar. (H/V)	Factor (dB/m)					Limit (dBuV/m)	Margin (dB)	Comment
Low Channel: 2405 MHz													
-	-	-	-	-	-	-	-	-	-	-	-	-	Spurious
Middle Channel: 2440 MHz													
-	-	-	-	-	-	-	-	-	-	-	-	-	Spurious
High Channel: 2480 MHz													
-	-	-	-	-	-	-	-	-	-	-	-	-	Spurious

Note: All emissions except harmonics are 20 dB lower then the limit and/or under the noise floor level.

8 FCC §15.215 - 20 dB Occupied Bandwidth

8.1 Applicable Standard

FCC §15.215.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument via radiated horn antenna. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emissions bandwidth. (20 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

8.3 Test Equipment List and Details

Manufacturers	Description	Model No.	Serial No.	Calibration Dates
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Agilent	Spectrum Analyzer	E4440A	MY44303352	2010-05-09
Mini-Circuit	Pre-Amp. 1 to 18 GHz	ZVA-183-S	570400946	2010-05-10

Statement of Traceability: **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	22°C
Relative Humidity:	38%
ATM Pressure:	101.1kPa

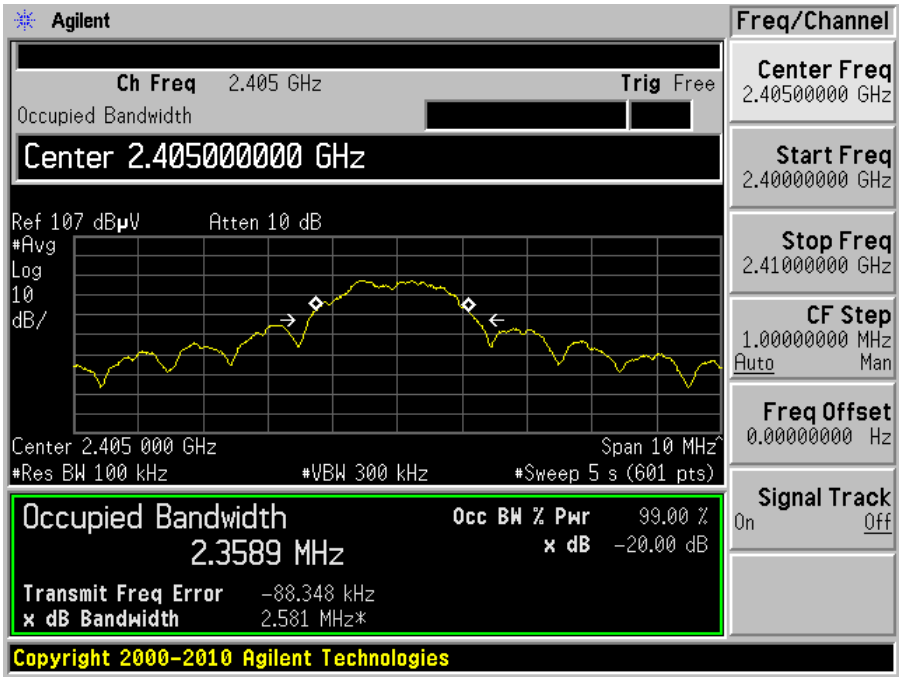
The testing was performed by Dennis Huang on 2010-09-22 in 5m chamber 3.

8.5 Test Results

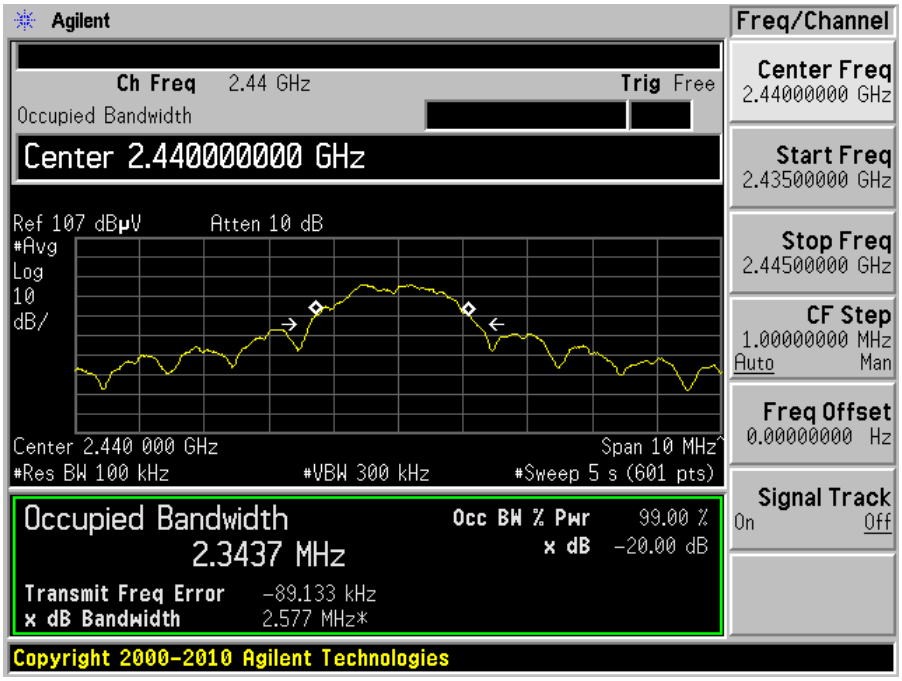
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
Low	2405	2581	2358.9
Middle	2440	2577	2343.7
High	2480	2575	2322.1

Please refer to the following plots for detailed test results

Low Channel – 2405 MHz



Middle Channel – 2440 MHz



High Channel – 2480 MHz