Lab Code: 200167-0

# FCC PART 15.247
# TEST AND MEASUREMENT REPORT

For

## Coulomb Technologies, Inc.

1692 Dell Avenue, Campbell, CA 95008, USA

## FCC ID: W38-17-001002-01

| **Report Type:** | **Product Type:** |
|---|---|
| Class II Permissive Change | 802.15.4 Radio Transceiver |

| | |
|---|---|
| **Test Engineer:** | Kevin Li |
| **Report No.:** | R1008201-247 |
| **Report Date:** | 2010-11-04 |
| **Reviewed By:** | Victor Zhang<br>Test Engineer, RF Lead |
| **Prepared By:**<br>**(SP)** | Bay Area Compliance Laboratories Corp. (BACL)<br>1274 Anvilwood Avenue,<br>Sunnyvale, CA 94089, USA<br>Tel: (408) 732-9162<br>Fax: (408) 732-9164 |

# TABLE OF CONTENTS

## DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | R1008201-247 | Original Report | 2010-11-04 |

# 1 General Description

## 1.1 Product Description for Equipment under Test (EUT)

The *Coulomb Technologies Inc's P/N: 17-001002-01, FCC ID: W38-17-001002-01* is a 2.4 GHz transceiver providing a solution for data links and wireless networks. The module is based on the Ember EM260 network processor providing an IEEE 802.15.4 radio transceiver with a SPI base interface. The SPI interface gives the flexibility to choose the external microprocessor to best fit the application.

## 1.2 Mechanical Description of EUT

The *Coulomb Technologies, Inc.* EUT measures approximately *40 mm L x 40 mm and 0.025 kg*

*The test data gathered is from production samples, serial number:* 016490, *provided by the manufacturer.*

## 1.3 Objective

This report is prepared on behalf of *Coulomb Technologies Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Antenna Requirements, RF Exposure, and Radiated Spurious Emissions with the new additional antenna.

## 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 and ANSI C63.10-2009, American National Standard for Testing Unlicensed Wireless Devices.

## 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 +2.0 for Conducted Emissions tests and +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: R-2463 and C-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 EUT and its host were configured for testing according to ANSI C63.4-2003 & ANSI C63.10-2009.

## 2.2 EUT Exercise Software

N/A

## 2.3 Special Accessories

N/A

## 2.4 Equipment Modifications

No modifications were made to the EUT

## 2.5 Remote Support Equipment

N/A

## 2.6 Local Support Equipment

N/A

## 2.7 Internal Configurations

Host: CT500 Internal configuration

| Cable Description | Manufacture | Model No. | Serial No. |
|---|---|---|---|
| RFID Board | Uniform Industrial Corp | UIC680-RD1SNNNNC4B | 00005968 |
| VF Display Board | Coulomb Technologies Inc | CL28-002022-01LFREV :4 | CTS2610CL8254 |
| Smartlet Combined Main Board | Coulomb Technologies Inc | CL28-001061-05LF REV : A | CTS2310CL7505 |
| Smartlet Pilot Board | Coulomb Technologies Inc | CL28-001092-07LF REV : 1 | CTS3010CL0659 |
| Zigbee Module | CEL | AZLM-301-1 | 016490 |
| Safety Supervisor Module | Coulomb Technologies Inc | CL28-001152-02LFR REV : 6 | CTS2810CL9196 |

## 2.8 Interface Ports and Cabling

N/A

# 3 Summary of Test Results

Results reported relate only to the product tested.

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.247 (i) & §2.1091 | RF Exposure | Compliant |
| §15.203 | Antenna Requirement | Compliant |
| § 15.207 (a) | Conducted Emissions | Compliant |
| § 15.247 (d) | Spurious Emissions at Antenna Port | N/A[1] |
| §15.205, §15.209 & §15.247(d) | Radiated Spurious Emissions | Compliant |
| §15.247 (a)(2) | 6 dB Bandwidth | N/A[1] |
| §15.247 (b)(3) | Maximum Peak Output Power | N/A[1] |
| § 15.247 (d) | 100 kHz Bandwidth of Frequency Band Edge | N/A[1] |
| §15.247 (e) | Power Spectral Density | N/A[1] |

N/A: [1] Refers to FCC ID: TFB-APEXLT

# 4 FCC §15.247 (i) & § 2.1091 - RF Exposure

## 4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Averaging Time (minutes) |
|---|---|---|---|---|
| Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *($180/f^2$) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | f/1500 | 30 |
| 1500-100,000 | / | / | 1.0 | 30 |

f = frequency in MHz
* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

## 4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

## 4.3 MPE Results

| Frequency Band | MPE Distance (cm) | Output Power (dBm) | Antenna Gain (dBi) | Power Density ($mw/cm^2$) | Result |
|---|---|---|---|---|---|
| 2.4 GHz | 20 | 18.56 | 1.09 | 0.018 | Compliance |

The predicted power density level at 20 cm is $0.018 mw/cm^2$ which is below the uncontrolled exposure limit of 1.0 $mW/cm^2$. The EUT is used at least 20 cm away from user's body. It is determined as mobile equipment and complies with the MPE limit.

# 5 FCC §15.203 – Antenna Requirement

## 5.1 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.

And according to FCC §15.247 (b) (4), 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.

## 5.2 Antenna Connector Construction

The peak gain of the antenna for Zigbee module is 1.09 dBi, compliant.

Antenna Photo

# 6 FCC §15.207 - Conducted Emissions

## 6.1 Applicable Standard

According to FCC §15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 μH/50 ohms line impedance stabilization network (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 frequencies ranges.

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

** Decreases with the logarithm of the frequency.*

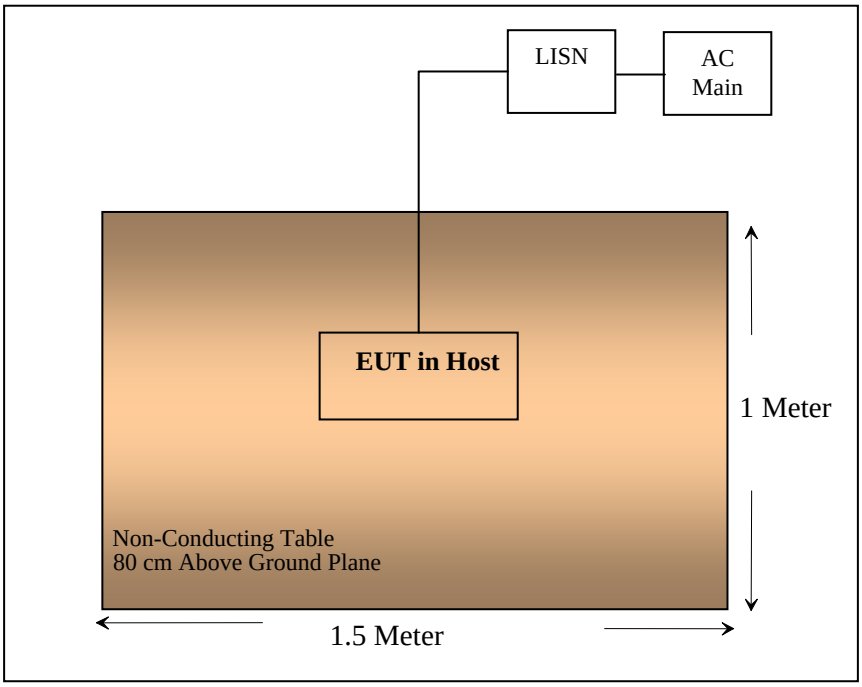
## 6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC Part15.207 limits.

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

The EUT was built into the host; the host was connected to LISN-1.

## 6.3 Test Setup Block Diagram




## 6.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date |
|---|---|---|---|---|
| TTE | Filter, High Pass | H9962-150K-50-21378 | K7133 | 2010-06-10 |
| Rohde & Schwarz | EMI Test Receiver | ESCI 1166.5950K03 | 100338 | 2010-06-24 |
| 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.*

## 6.5 Test Procedure

During the conducted emissions test, the power cord of the host was connected to the mains outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in peak detection, quasi-peak and average modes. Quasi-Peak readings are distinguished with a “QP”. Average readings are distinguished with an “Ave”.

### 6.6 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.3 °C |
| **Relative Humidity:** | 42 % |
| **ATM Pressure:** | 100.7 kPa |

*The testing was performed by Kevin Li on 09-09-2010 in 10 meter chamber 1.*

### 6.7 Summary of Test Results

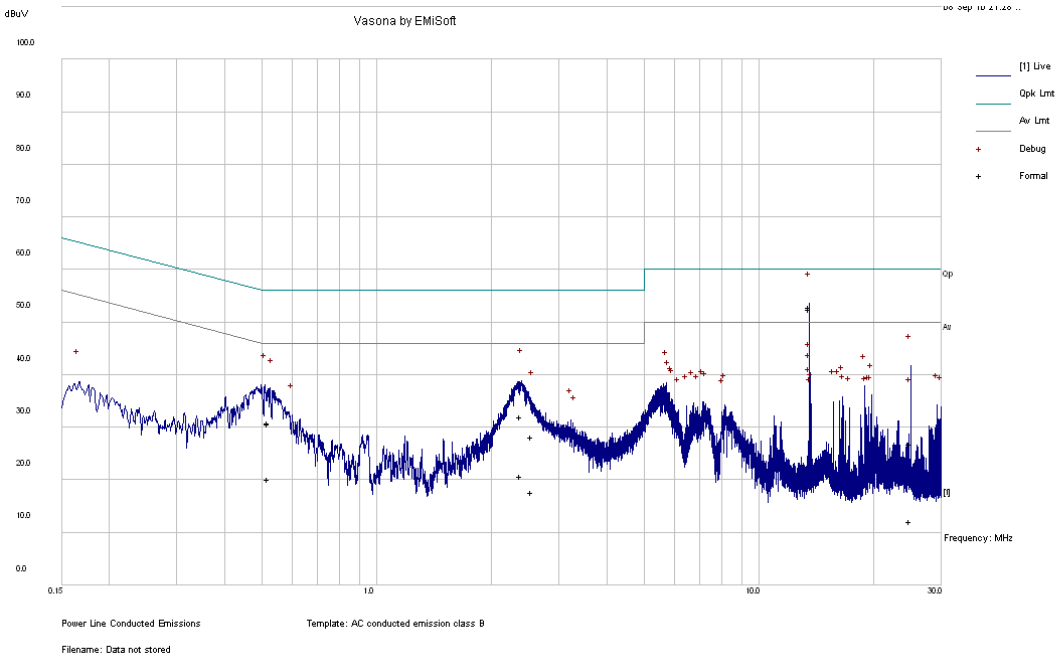
According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits for Class B devices, with the *worst* margin reading of:

**-0.54 dB** at 13.56081**MHz** in the **Line 1** Conductor mode

Please refer to the following plots and tables for complete test results

**13.56 MHz RFID Antenna Attached:**

**208 V, 60 Hz-Line 1**



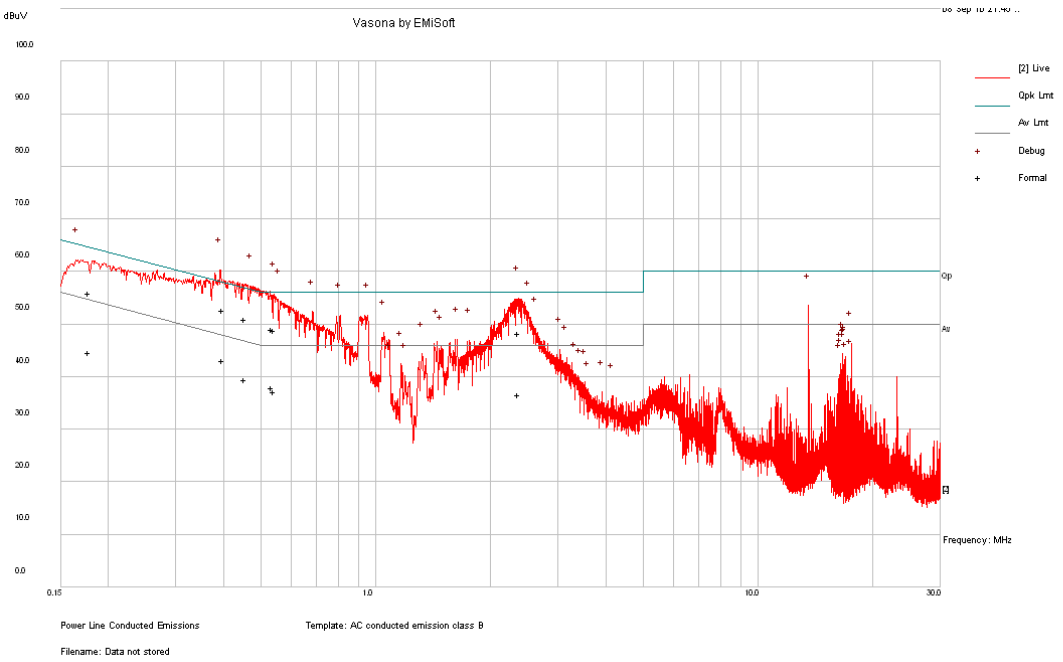

**Quasi-Peak Measurement:**

| Frequency (MHz) | Corrected Amplitude (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|
| 13.56081 | 52.96 | Quasi Peak | Line 1 | 60 | -7.04 |
| 2.381862 | 31.98 | Quasi Peak | Line 1 | 56 | -24.02 |
| 0.520218 | 30.80 | Quasi Peak | Line 1 | 56 | -25.20 |
| 24.90819 | 26.94 | Quasi Peak | Line 1 | 60 | -33.06 |
| 0.521349 | 30.72 | Quasi Peak | Line 1 | 56 | -25.28 |
| 2.544632 | 28.25 | Quasi Peak | Line 1 | 56 | -27.75 |

**Average Measurements:**

| Frequency (MHz) | Corrected Amplitude (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|
| 13.56081 | 49.46 | Average | Line 1 | 50 | -0.54 |
| 2.381862 | 20.82 | Average | Line 1 | 46 | -25.18 |
| 0.520218 | 20.09 | Average | Line 1 | 46 | -25.91 |
| 24.90819 | 12.18 | Average | Line 1 | 50 | -37.82 |
| 0.521349 | 20.15 | Average | Line 1 | 46 | -25.85 |
| 2.544632 | 17.75 | Average | Line 1 | 46 | -28.25 |

**208 V, 60 Hz-Line 2**




**Quasi-Peak Measurements:**

| Frequency (MHz) | Corrected Amplitude (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|
| 0.397965 | 52.59 | Quasi Peak | Line 2 | 57.9 | -5.31 |
| 0.454818 | 51.04 | Quasi Peak | Line 2 | 56.79 | -5.75 |
| 0.536406 | 49.08 | Quasi Peak | Line 2 | 56 | -6.92 |
| 2.368657 | 48.29 | Quasi Peak | Line 2 | 56 | -7.71 |
| 0.543453 | 48.77 | Quasi Peak | Line 2 | 56 | -7.23 |
| 0.178173 | 55.90 | Quasi Peak | Line 2 | 64.57 | -8.67 |

**Average Measurements:**

| Frequency (MHz) | Corrected Amplitude (dBuV) | Measurement Type | Line/Neutral | Limit (dBuV) | Margin (dB) |
|---|---|---|---|---|---|
| 0.397965 | 43.18 | Average | Line 2 | 47.90 | -4.72 |
| 0.454818 | 39.43 | Average | Line 2 | 46.79 | -7.36 |
| 0.536406 | 37.89 | Average | Line 2 | 46.00 | -8.11 |
| 2.368657 | 36.67 | Average | Line 2 | 46.00 | -9.33 |
| 0.543453 | 37.19 | Average | Line 2 | 46.00 | -8.81 |
| 0.178173 | 44.64 | Average | Line 2 | 54.57 | -9.94 |

# 7 FCC §15.205, §15.209 & §15.247(d) - Spurious Radiated 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) and RSS-210: 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 | 3.332 – 3.339 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 167.72 – 173.2 | 3 3458 – 3 358 | 23.6 – 24.0 |
| 12.29 – 12.293 | 240 – 285 | 3.600 – 4.400 | 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 | | |

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c).

### 7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

### 7.3 EUT Setup

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

### 7.4 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date |
|---|---|---|---|---|
| Hewlett Packard | Pre-amplifier | 8447D | 2944A07030 | 2010-04-16 |
| Rohde & Schwarz | EMI Test Receiver | ESCI 1166.5950K03 | 100338 | 2010-06-24 |
| Sunol Science Corp | System Controller | SC99V | 122303-1 | N/R |
| Sunol Science Corp | Combination Antenna | JB1 | A020106-1 | 2010-05-28 |
| COM-POWER | Loop Antenna | AL-130 | 17043 | 2010-06-01 |
| A.R.A Inc | Horn antenna | DRG-1181A | 1132 | 2009-10-27 |
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2010-05-09 |
| HP | Pre Amplifier | 8449B | 3147A00400 | 2010-02-01 |

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

### 7.5 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, 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

### 7.6 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 – Pre-amplifier Gain

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Pre-amplifier Gain (10dB)

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

### 7.7 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 18~21 °C |
| **Relative Humidity:** | 30~35 % |
| **ATM Pressure:** | 101.2-102.2kPa |

*The testing was performed by Kevin Li from 2010-09-03 to 2010-09-05 in 5 meter chamber 3.*

## 7.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247 standard's radiated emissions limits, and had the worst margin of:

| **Mode: Transmitting** | | | |
|---|---|---|---|
| **Margin (dB)** | **Frequency (MHz)** | **Polarization (Horizontal/Vertical)** | **Channel, Range** |
| -15.88 | 1770 | Horizontal | 30 MHz to 25 GHz |

*Please refer to the following table and plots for specific test result details*

## 7.9 Radiated Emissions Test Result Data

**Radiated Emission at 3 meters, 30 MHz – 1 GHz:**

Worst Channel: Middle channel

**Quasi-Peak Measurements**

| Frequency (MHz) | Corrected Amplitude (dB) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 131.3295 | 13.14 | 298 | V | 66 | 43.5 | -30.36 |
| 329.8080 | 22.05 | 115 | V | 27 | 46 | -24.45 |
| 117.6925 | 11.85 | 259 | V | 152 | 43.5 | -31.65 |
| 119.1928 | 14.53 | 112 | V | 36 | 43.5 | -28.97 |
| 253.9908 | 21.17 | 142 | V | 66 | 46 | -25.33 |
| 250.7650 | 12.73 | 311 | V | 32 | 46 | -33.77 |

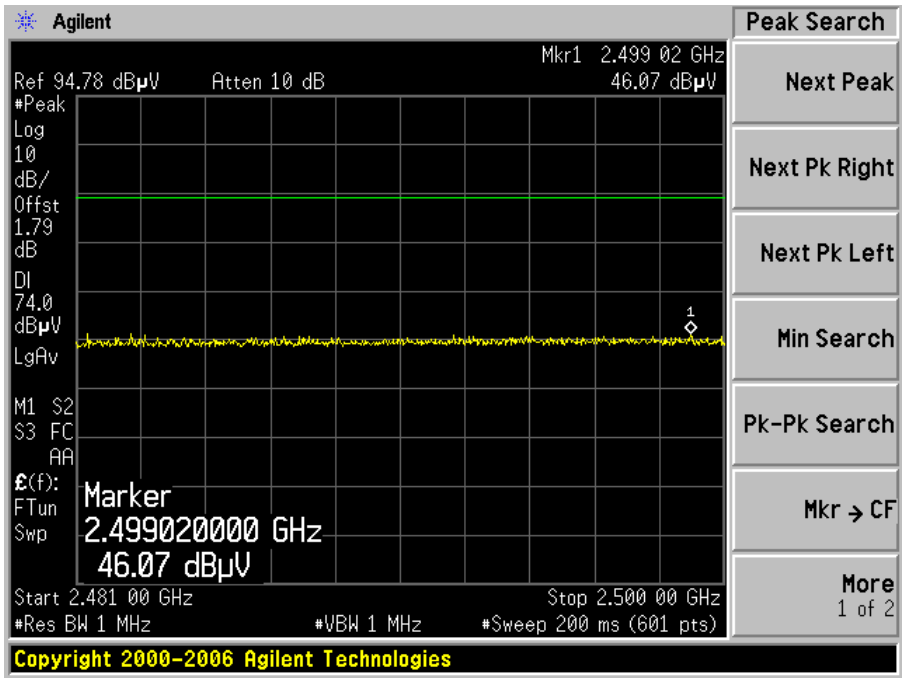
**Radiated Emission at 3 meters, 1 GHz – 25 GHz:**

| Frequency (MHz) | S.A. Reading (dBµV) | Turntable Azimuth (degrees) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. (dB) | Cord. Reading (dBµV/m) | Part 15C | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polarity (H/V) | Factor (dB/m) | | | | Limit (dBµV/m) | Margin (dB) | |
| Low Channel | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | - | - | - | -[1] |
| Middle Channel | | | | | | | | | | | |
| 1770 | 54.81 | 343 | 175 | V | 25.56 | 2.61 | 27.5 | 55.48 | 74 | -18.52 | peak |
| 1770 | 56.18 | 323 | 121 | H | 25.56 | 2.61 | 27.5 | 56.85 | 74 | -17.15 | peak |
| 1770 | 35.48 | 343 | 175 | V | 25.56 | 2.61 | 27.5 | 36.15 | 54 | -17.85 | Ave |
| 1770 | 37.45 | 323 | 121 | H | 25.56 | 2.61 | 27.5 | 38.12 | 54 | -15.88 | Ave |
| High Channel | | | | | | | | | | | |
| - | - | - | - | - | - | - | - | - | - | - | -[1] |

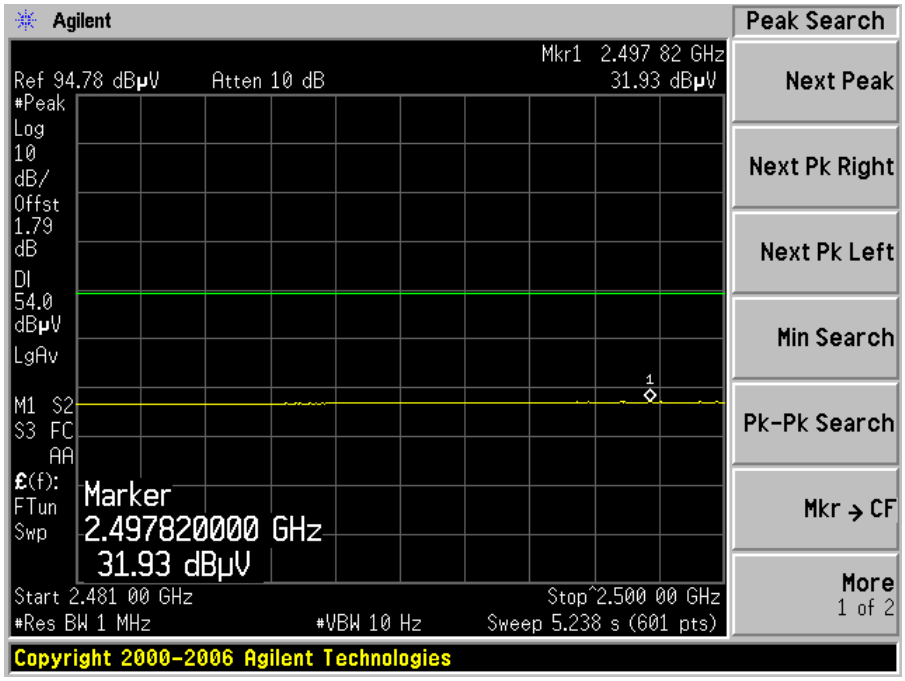
Note: [1]all emissions are below the noise floor and/or 20 dB under the limit.

**Restricted Band Emissions**

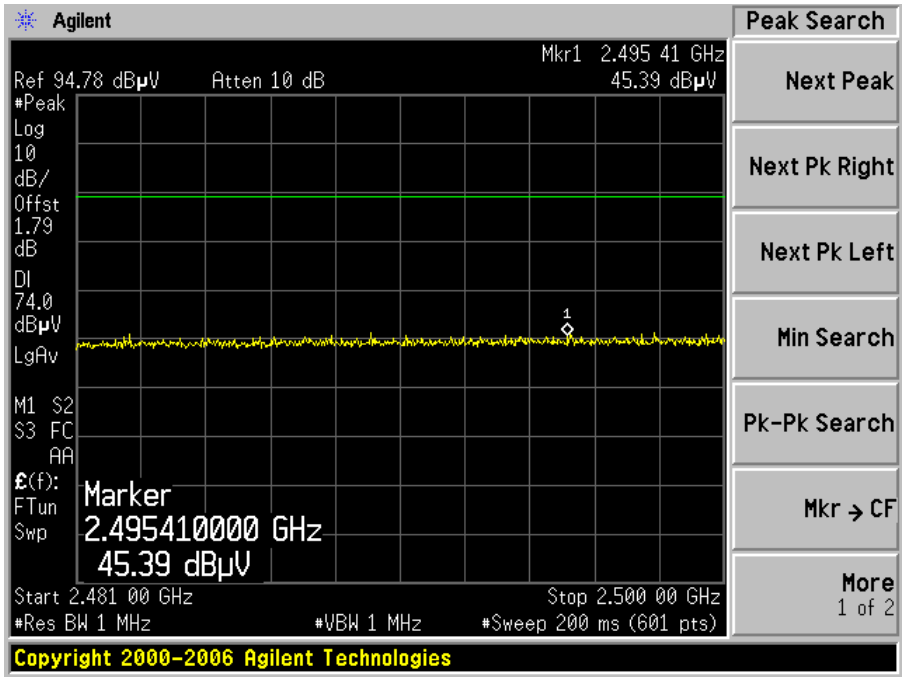
Lowest Channel at Horizontal, Peak



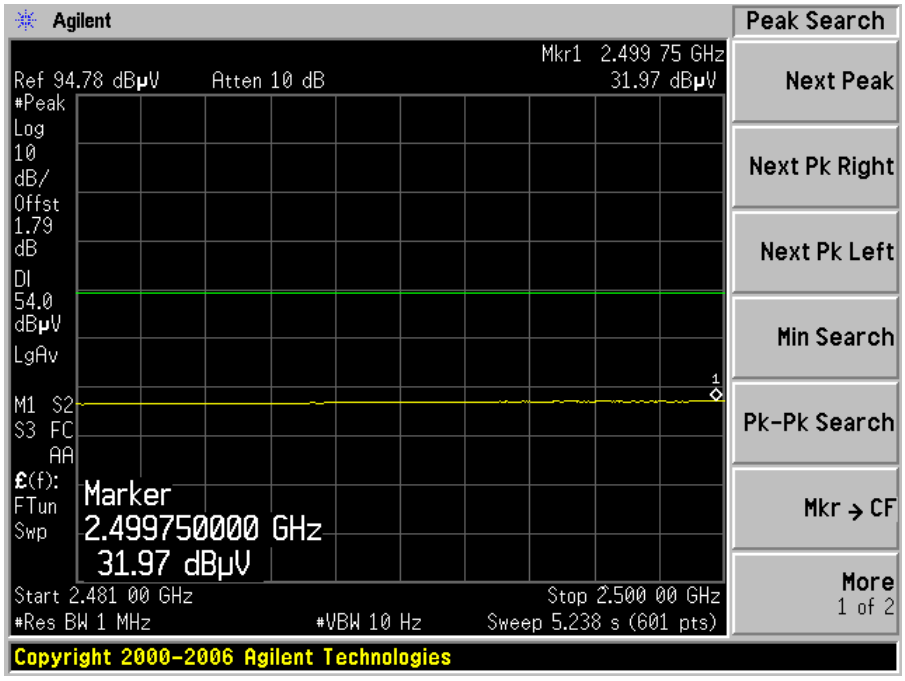

Lowest Channel at Horizontal, Average



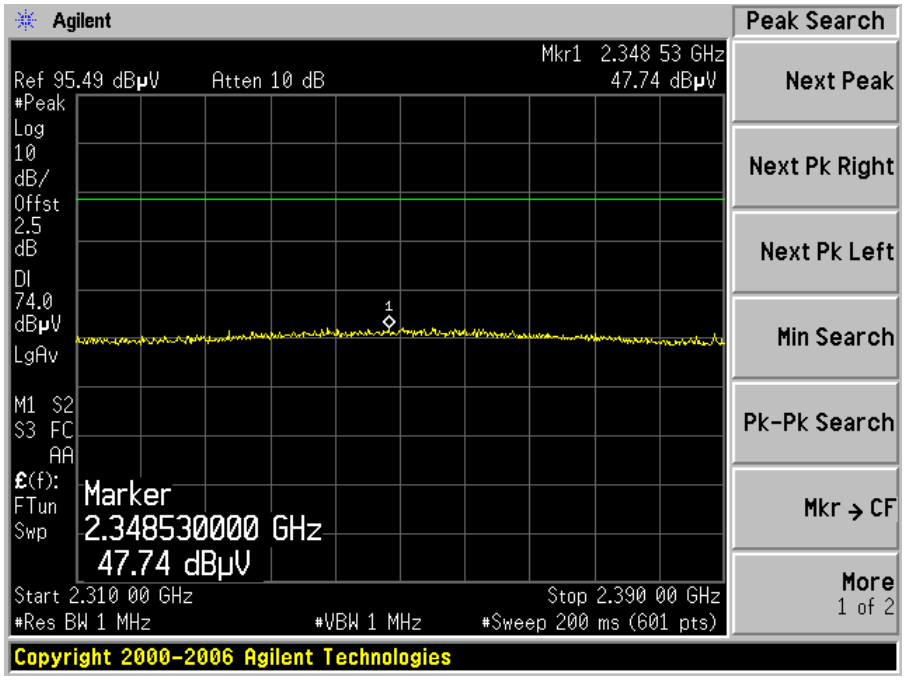
Lowest Channel at Vertical, Peak



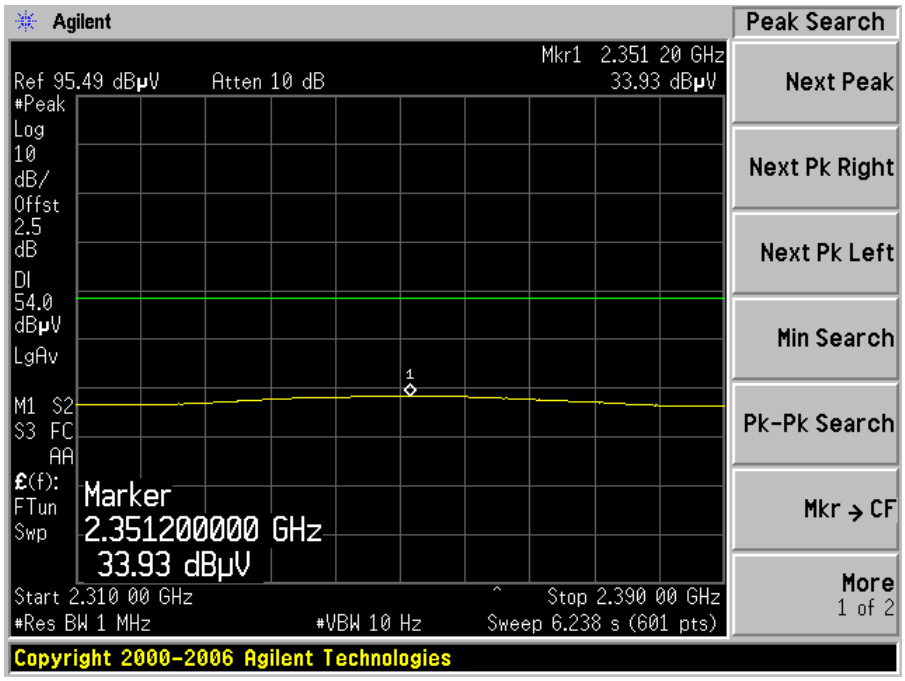

Lowest Channel at Vertical, Average



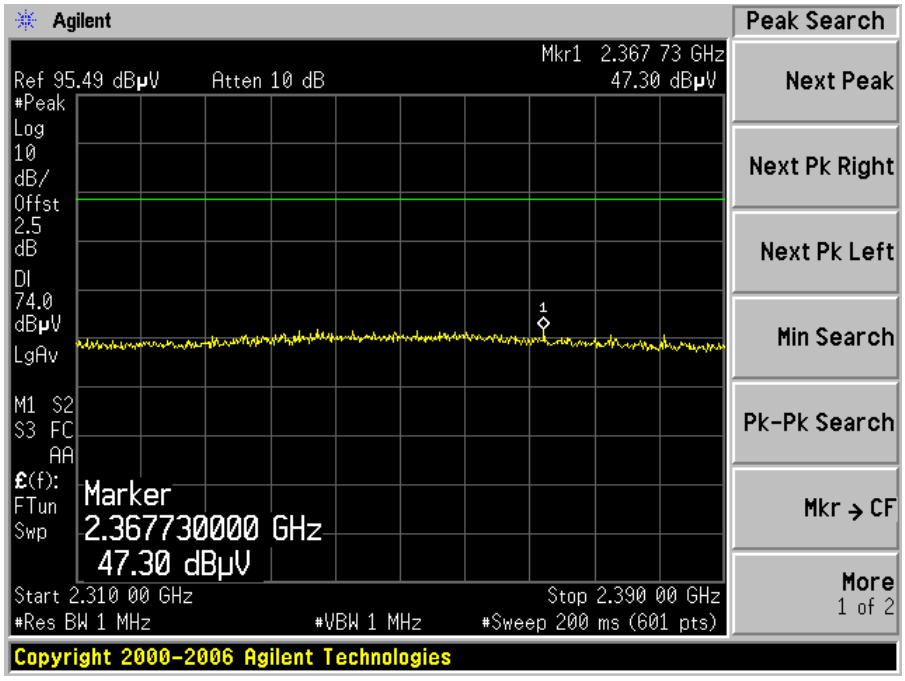
Highest Channel at Horizontal, Peak




Highest Channel at Horizontal, Average



Highest Channel at Vertical, Peak




Highest Channel at Vertical, Average