Lab Code: 200167-0

# FCC PART 15C

# TEST AND MEASUREMENT REPORT

For

## Coulomb Technologies, Inc.

1692 Dell Avenue,

Campbell, CA95008, USA

## FCC ID: W38-CT21002000-01

| **Report Type:** | **Product Type:** |
|---|---|
| Class II Permissive Change | Electric Vehicle Charging Station |

| | |
|---|---|
| **Test Engineer(s):** | Kevin Li |
| **Report Number:** | R1010123-225 |
| **Report Date:** | 2010-11-09 |
| **Reviewed By:** | Victor Zhang<br>RF Lead |
| **Prepared By:**<br>**(84)** | Bay Area Compliance Laboratories Corp.<br>1274 Anvilwood Avenue,<br>Sunnyvale, CA 94089<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

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## DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | R1010123-225 | Original Report | 2010-11-09 |

# 1 GENERAL INFORMATION

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

The *Coulomb Technologies Inc.'s* product model: CT2100 and CT2000, FCC ID: W38-CT21002000-01 is an Electric Vehicle Charging Station with remote monitoring and control via ZigBee/CDMA/GSM backhaul. It contains an internal RFID reader. Integrated RFID reader recognizes and identifies subscriber key fobs and smart cards.

## 1.2 Mechanical Description

The EUT (CT2100) measures approximately 210 mm (L) x 310 mm (W) x 1280 mm (H).

*The test data gathered is from production samples, serial number:* R1010123-*1, assigned by BACL*

## 1.3 Objective

The objective of the manufacturer is to determine compliance with FCC/IC rules for field strength of spurious radiation (Co-Location with Zigbee, RFID and CDMA Modem) compliance with FCC Part 15C rules.

The purpose of this Class II Permissive Change report is to provide co-location testing of the CDMA transmitter with Zigbee transmitter (FCC ID: W38-001008-01*, IC: 125A-0034*) in Coulomb Smartlet host.

## 1.4 Related Submittal(s)/Grant(s)

FCC ID: W38-CT21002000-01, IC: 8854A-21002000 original report.

## 1.5 Test Methodology

All measurements contained in this report were conducted 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.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratory, Corp.

## 1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 ranging from $\pm$2.0 dB 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 Corp.

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

## 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/ts/htdocs/210/214/scopes/2001670.htm

# 2 SYSTEM TEST CONFIGURATION

## 2.1 Justification

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

The final qualification test was performed with the EUT operating at normal mode.

## 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

| Manufacturer | Description | Model Number | Serial Number |
|---|---|---|---|
| Agilent | Wireless Communication Test Set | 8960 Series 10 | GB44051221 |

## 2.7 Internal Configurations

| Cable Description | Manufacture | Model No. | Serial No. |
|---|---|---|---|
| RFID Board | Uniform Industrial Corp. | UIC681SGREVA | 00005698 |
| VF Display Board | Coulomb Technologies Inc | CL28-001012-04LFREV :4 | CTS0610CL4378 |
| Main Board | Coulomb Technologies Inc | CL28-001062-05LF REV : 1 | CTS0910CL4838 |
| Zigbee Module | Coulomb Technologies Inc | ZALM-300 | 016490 |
| Safety Supervisor Module | Coulomb Technologies Inc | CL28-001152-03LFR REV : 4 | CTS1410CL5536 |

## 2.8 Interface Ports and Cabling

| Cable Description | Length (m) | From | To |
|---|---|---|---|
| J1772 | 6 | EUT | Load |
| Power Cable | < 3 m | EUT | AC line Power Source |

# 3 SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|---|---|---|
| §15.205, §15.209 & §15.225 | Spurious Emission<br>RFID Co-Location with Zigbee and CDMA modem | Compliant |

# 4 FCC §15.205, §15.209 & §15.225 - SPURIOUS RADIATED EMISSIONS

## 3.1 Applicable Standard

As per FCC §15.205, §15.209 and §15.225

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

(e) The frequency tolerance of the carrier signal shall be maintained within  }0.01% of the operating frequency over a temperature variation of ¥20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

## 3.2 Test Procedure

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15 Subpart C and IC RSS-210 limits.

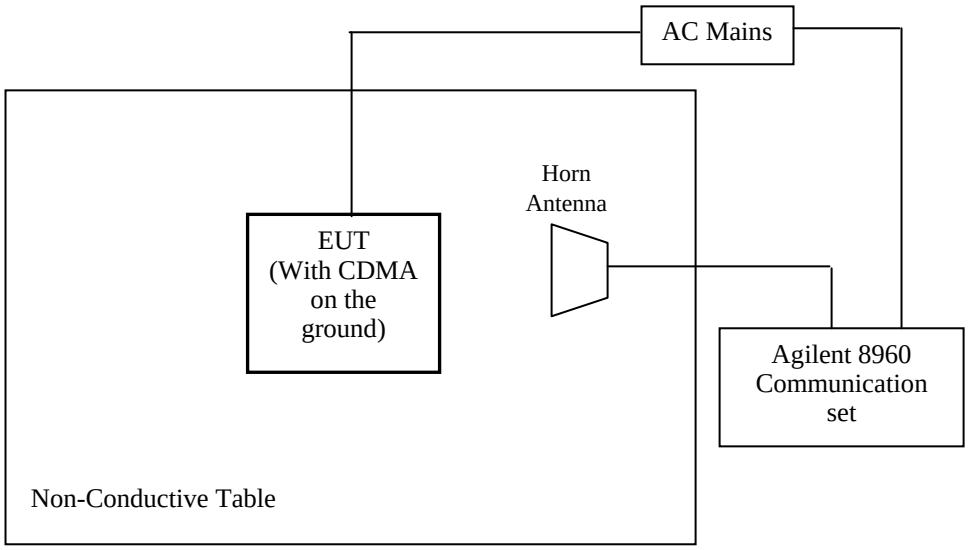
The spacing between the peripherals was 10 centimeters.

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

The EUT was placed on the turn table

The EUT was connected to a 208 V, 60 Hz 3-Phase AC line power source.

## 3.3 Test setup Block Diagram




## 3.4 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 |
| 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 Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

## 3.5 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23 °C |
| **Relative Humidity:** | 45 % |
| **ATM Pressure:** | 101.7kPa |

*The testing was performed by Kevin Li on 2010-10-22 in 5 meter chamber 3.*

## 3.6 Test Results

**1) Co-location with CDMA 850, RFID and Zigbee:**

Worst Configuration: CDMA Worst Channel: 836.52 MHz, Zigbee Worst Channel: 2440 MHz and RFID: 13.56 MHz

30 to 1000 MHz @ 3 meter distance

| Frequency (MHz) | Corrected Amplitude (dB) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 41.37052 | 32.47 | 121 | V | 224 | 40 | -7.53 |
| 601.2657 | 45.34 | 98 | V | 343 | 46 | -0.66 |
| 555.4727 | 22.83 | 296 | H | 136 | 46 | -23.17 |
| 609.5594 | 45.91 | 109 | V | 337 | 46 | -0.09 |
| 565.9046 | 42.25 | 190 | V | 339 | 46 | -3.75 |
| 614.4356 | 30.88 | 280 | V | 346 | 46 | -15.12 |

Above 1 G Hz @ 3 meter distance

| Frequency (MHz) | S.A. Reading (dBµV) | Turntable Azimuth (degrees) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. (dB) | Cord. Amp. (dBµV/m) | FCC | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polarity (H/V) | Factor (dB/m) | | | | Limit (dBµV/m) | Margin (dB) | |
| 1164 | 72.2 | 297 | 108 | V | 24.65 | 3.66 | 37.53 | 62.98 | 74 | -11.02 | peak |
| 1164 | 68.09 | 343 | 164 | H | 24.65 | 3.66 | 37.53 | 58.87 | 74 | -15.13 | peak |
| 1164 | 42.24 | 297 | 108 | V | 24.65 | 3.66 | 37.53 | 33.02 | 54 | -20.98 | Ave |
| 1164 | 38.23 | 343 | 164 | H | 24.65 | 3.66 | 37.53 | 29.01 | 54 | -24.99 | Ave |

**2) Co-location with CDMA 1900, RFID and Zigbee:**

Worst Configuration: CDMA Worst Channel: 1880 MHz, Zigbee Worst Channel: 2440 MHz and RFID: 13.56 MHz

30 to 1000 MHz @ 3 meter distance:

| Frequency (MHz) | Corrected Amplitude (dB) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 605.1548 | 45.67 | 212 | V | 325 | 46 | -0.33 |
| 571.1138 | 41.81 | 121 | V | 35 | 46 | -4.19 |
| 567.5794 | 40.78 | 134 | V | 312 | 46 | -5.22 |
| 611.7809 | 45.08 | 170 | V | 331 | 46 | -0.92 |
| 537.2166 | 31.83 | 175 | H | 319 | 46 | -14.17 |
| 613.2997 | 44.03 | 137 | V | 264 | 46 | -1.97 |

Above 1 GHz @ 3 meter distance:

| Frequency (MHz) | S.A. Reading (dBµV) | Turntable Azimuth (degrees) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. (dB) | Cord. Amp. (dBµV/m) | FCC | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (cm) | Polarity (H/V) | Factor (dB/m) | | | | Limit (dBµV/m) | Margin (dB) | |
| 1175 | 73.18 | 192 | 208 | V | 24.65 | 3.66 | 37.53 | 63.96 | 74 | -10.04 | peak |
| 1175 | 70.28 | 237 | 152 | H | 24.65 | 3.66 | 37.53 | 61.06 | 74 | -12.94 | peak |
| 1175 | 44.69 | 192 | 208 | V | 24.65 | 3.66 | 37.53 | 35.47 | 54 | -18.53 | Ave |
| 1175 | 39.57 | 237 | 152 | H | 24.65 | 3.66 | 37.53 | 30.35 | 54 | -23.65 | Ave |