Lab Code: 200167-0

FCC PART 22H AND 24E
TEST AND MEASUREMENT REPORT

For

Coulomb Technologies, Inc.

1692 Dell Avenue, Campbell, CA95008, USA

FCC ID: W38-17-001004-01

Report Type:	**Product Type:**
Class II Permissive Change	Dual-Band GSM/GPRS Wireless Module

Test Engineer(s):	Victor Zhang
Report Number:	R1001051-2224
Report Date:	2010-01-20
Reviewed By:	Boni Baniqued EMC/RF Supervisor
Prepared By: **(84)**	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1001051-2224	Original Report	2010-01-20

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report has been compiled on behalf of *Coulomb Technologies, Inc.* and their product *FCC ID: W38-17-001004-01* which is a Dual Band GSM/GPRS Wireless Module transceiver.

1.2 Mechanical Description

The *Coulomb Technologies Inc. FCC ID: W38-17-001004-01* or the "EUT" as referred to in this report measures approximately 110mm (L) x 50 mm (W) x 18mm (H). Weight: 0.11 kg.

** The test data gathered are from typical production sample, serial number: 5030219U provided by the Manufacturer.*

1.3 EUT Photo

1.4 Objective

This type approval report is prepared on behalf of *Coulomb Technologies Inc.* in accordance with Part 2, Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC rules for field strength of spurious radiation (Inter-modulation Spurious Emission) compliance with FCC rules, Part 22 and Part 24.

The purpose of this Class II Permissive Change report is to provide co-location testing of the GSM/GPRS transmitter with Zigbee transmitter (FCC ID: W38-17-001002-01) and the RFID transmitter (FCC ID: W38CT1H00) in Coulomb Smartlet host.

1.5 Related Submittal(s)/Grant(s)

Report: MULTI_018_07002_FCC22_24 was issued on 2007-05-09 by Cetecom with FCC ID: AU792U07A31817.

1.6 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 22 Subpart H - Cellular Radiotelephone Service
Part 24 Subpart E – Broadband PCS

Applicable Standards: TIA/EIA-603-C, ANSI C63.4-2003.

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

1.7 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.

1.8 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 TIA/EIA-603-C.

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 Interface Ports and Cabling

Cable Description	Length (m)	From	To
Power Cable	< 3m	EUT	AC line Power Source

3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§ 2.1047	Modulation Characteristics	N/A
§ 2.1053; § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliant
§2.1091	RF Exposure (MPE)	Compliant
§ 2.1046; § 22.913; § 24.232	RF Output Power	N/A
§ 2.1049; § 22.917; § 24.238	Occupied Bandwidth	N/A
§ 2.1051; § 22.917; § 24.238(a)	Spurious Emissions at Antenna Terminals	N/A
§ 2.1055 § 22.355; § 24.235	Frequency Stability vs. Temperature Frequency Stability vs. Voltage	N/A
§ 22.917; §24.238	Band Edge	N/A

4 FCC §2.1053 - SPURIOUS RADIATED EMISSIONS

4.1 Applicable Standard

Requirements: CFR 47, §2.1053, §22.917, §24.238.

4.2 Test Procedure

TIA/EIA-603-C Section 2.2.12 – Unwanted Emission: Radiated Spurious

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the testing, the antenna height, polarization, and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

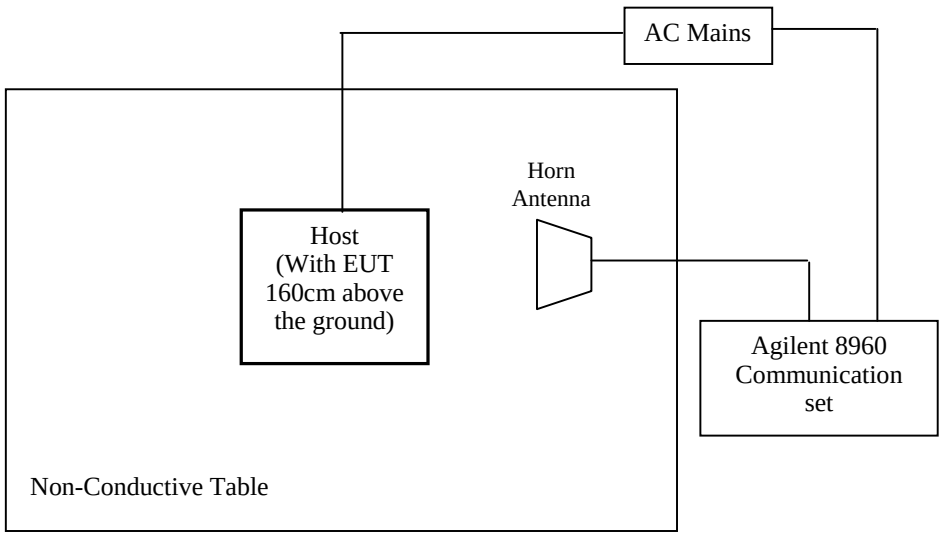
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Removed the EUT and replaced it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

4.3 Test setup Block Diagram



4.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
HP	Generator, Signal	83650B	3614A00276	2009-03-25
Ducommun Technologies	Amplifier, Pre	1-18GHz	9909297-01R	2009-03-04
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2009-09-07
A.R.A.	Antenna, Horn	DRG-118/A	1132	2009-10-27

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

4.5 Test Environmental Conditions

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

**The testing was performed by Victor Zhang on 2010-01-11.*

4.6 Summary of Test Results

Worst case reading as follows:

Mode: GSM/GPRS 850			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-24.24	1648.4	Vertical	Low
-24.79	1673.2	Vertical	Middle
-24.28	1697.6	Vertical	High

Mode: GSM/GPRS 1900			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-29.73	3700.4	Vertical	Low
-31.14	3760	Vertical	Middle
-24.88	3819.6	Vertical	High

Run # 1: 30 MHz -10 GHz GPRS 850 Low Channel (824.2 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
1648.4	61.11	341	2.33	V	1648.4	-46.19	9.3	0.35	-37.24	-13	-24.24
1648.4	57.77	126	1.78	H	1648.4	-49.53	9.3	0.35	-40.58	-13	-27.58

Run # 2: 30 MHz -10 GHz GPRS 850 Middle Channel (836.6 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
1673.2	61.77	360	2.04	V	1673.2	-46.73	9.3	0.36	-37.79	-13	-24.79
1673.2	57.97	123	2.58	H	1673.2	-50.53	9.3	0.36	-41.59	-13	-28.59

Run # 3: 30 MHz -10 GHz GPRS 850 High Channel (848.8 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
1697.6	60.88	360	1.98	V	1697.6	-46.32	9.4	0.36	-37.28	-13	-24.28
1697.6	57.36	133	2.26	H	1697.6	-49.84	9.4	0.36	-40.8	-13	-27.8

Run # 4: 30 MHz -20GHz GPRS 1900 Low Channel (1850.2 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
3700.4	48.55	299	1.24	V	3819.6	-52.65	10.5	0.58	-42.73	-13	-29.73
3700.4	46.87	0	1.69	H	3819.6	-54.33	10.5	0.58	-44.41	-13	-31.41

Run # 5: 30 MHz -20GHz GPRS 1900 Middle Channel (1880 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
3760	49.45	333	1.11	V	3819.6	-54.25	10.7	0.59	-44.14	-13	-31.14
3760	48.3	145	1.5	H	3819.6	-55.4	10.7	0.59	-45.29	-13	-32.29

Run # 6: 30 MHz -20GHz GPRS 1900 High Channel (1909.8 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
3819.6	52.61	332	1.45	V	3819.6	-48.19	10.9	0.59	-37.88	-13	-24.88
3819.6	51	181	1.49	H	3819.6	-49.8	10.9	0.59	-39.49	-13	-26.49

5 FCC §2.1091 – RF EXPOSURE

5.1 Applicable Standards

According to §1.1307(b)(1) and §1.1307(b)(2), systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

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)**
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

5.2 MPE Prediction

Prediction of MPE limit at a given distance, Equation from of 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

GSM/GPRS 850 Band

Maximum peak output power at antenna input terminal (dBm):	31.8
Maximum peak output power at antenna input terminal (mw):	1513.6
Prediction distance (cm):	20
Prediction frequency (MHz):	848.8
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1.0
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.3013
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.5659

GSM/GPRS 1900 Band

Maximum peak output power at antenna input terminal (dBm):	29.9
Maximum peak output power at antenna input terminal (mw):	977.24
Prediction distance (cm):	20
Prediction frequency (MHz):	1880
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1.0
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.1945
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

Conclusion: EUT meets the MPE at 20 cm distance.