



FCC PART 22H AND 24E TEST AND MEASUREMENT REPORT

For

Coulomb Technologies, Inc.

1692 Dell Avenue, Campbell, CA95008, USA

FCC ID: W38-17-001003-01

Report Type: Class II Permissive Change	Product Type: Dual-Band CDMA Wireless Module
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (Rev.2)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0901165-2224	Original	2009-02-09

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

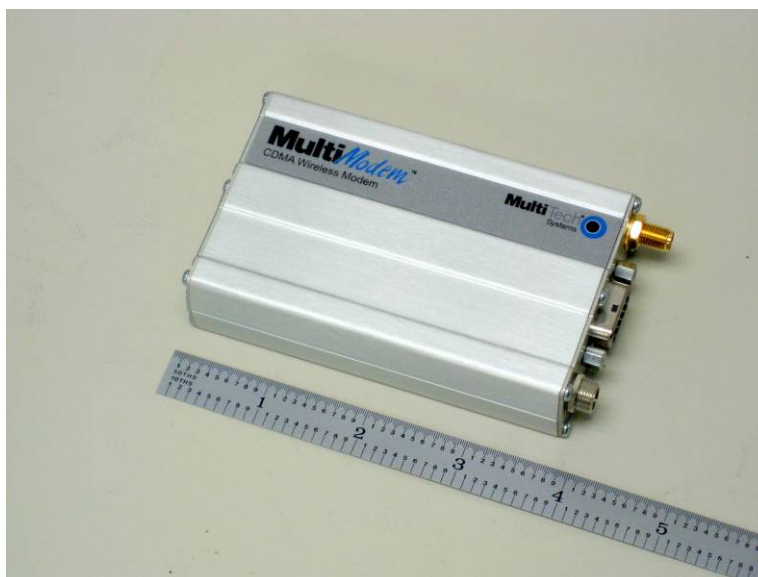
This test and measurement report has been compiled on behalf of *Coulomb Technologies, Inc.* and their product *FCC ID: W38-17-001003-01* which is a Dual Band CDMA Wireless Module. The EUT is a transceiver.

1.2 Mechanical Description

The *Coulomb Technologies Inc. FCC ID: W38-17-001003-01* or the "EUT" as referred to in this report is a mobile phone. The EUT measures approximately 110mm (L) x 50 mm (W) x 18mm (H). Weight: 0.12 kg.

* *The test data gathered are from typical production sample, serial number: 6065683K 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 is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin. The purpose of this Class II Permissive Change report is to provide co-location testing of the 850 MHz CDMA transmitter with the RFID transmitter.

1.5 Related Submittal(s)/Grant(s)

Report: EMC_609FCC22-24_2004_MTCBA-C was issued on 2004-01-30 by Cetecom with FCC ID: AU792U04A22760.

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/EIA603-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 ± 2.0 dB for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BAACL Corp.

Detailed instrumentation measurement uncertainties can be found in BAACL 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: 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/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	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	Please refer to FCC ID: AU792U04A22760
§ 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	Please refer to FCC ID: AU792U04A22760
§ 2.1049; § 22.917; § 24.238	Occupied Bandwidth	Please refer to FCC ID: AU792U04A22760
§ 2.1051; § 22.917; § 24.238(a)	Spurious Emissions at Antenna Terminals	Please refer to FCC ID: AU792U04A22760
§ 2.1055 (a); § 2.1055 (d); § 22.355 § 24.235	Frequency Stability vs. Temperature Frequency Stability vs. Voltage	Please refer to FCC ID: AU792U04A22760
§ 22.917 §24.238	Band Edge	Please refer to FCC ID: AU792U04A22760

4 §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.

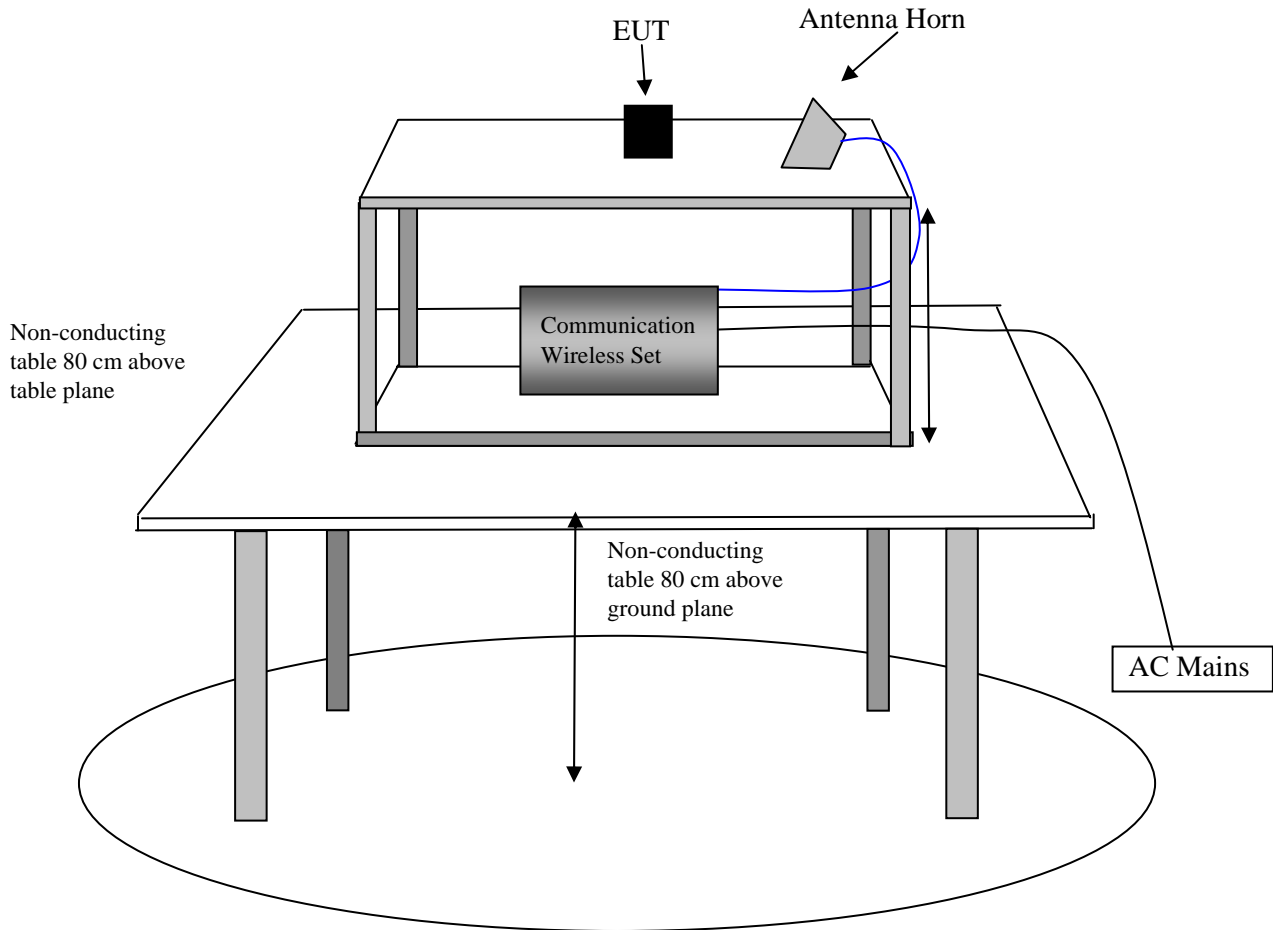
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

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 = $10 \log (\text{TX Power in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

4.3 Test setup Block Diagram for radiated emissions tests



4.4 Test Equipment List and Details

Manufacturers	Description	Models	Serial Numbers	Calibration Dates
Antenna Research Association	Transmitting Horn Antenna	DRG-1181A	1132	2008-07-28
AH Systems	Receiving Horn Antenna	SAS200/571	261	2008-07-01
Agilent	1-18GHz Pre-Amplifier	8449B	3008A01978	2008-10-21
Agilent	Series Spectrum Analyzer	E4440A	US45303156	2008-05-31
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	100044	2008-03-26

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

4.5 Environmental Conditions

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

*The testing was performed by Victor Zhang from 2009-01-29.

4.6 Summary of Test Results

Worst case reading as follows:

Mode: CDMA 850		
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)
-30.51	1673.04	Vertical

Mode: CDMA 1900		
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)
-14.48	3760	Vertical

Run # 1: 30MHz -10GHz CDMA 850 Middle Channel (836.52 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)	Antenna Gain Correction (dBi)	Cable Loss (dB)			
1673.04	52.16	47	1.52	H	1673.04	-52.45	9.3	0.36	-43.51	-13	-30.51
1400.00	56.54	109	2.38	H	1400.00	-51.61	8.0	0.32	-43.93	-13	-30.93
1673.04	52.83	196	1.11	V	1673.04	-54.88	9.3	0.36	-45.94	-13	-32.94
2509.56	43.81	103	1.49	V	2509.56	-55.51	9.4	0.44	-46.55	-13	-33.55
1400.00	53.63	36	1.00	V	1400.00	-55.77	8.0	0.32	-48.09	-13	-35.09
2509.56	43.97	180	1.39	H	2509.56	-57.87	9.4	0.44	-48.91	-13	-35.91
1200.00	51.03	121	2.08	H	1200.00	-57.73	6.9	0.29	-51.12	-13	-38.12
1200.00	51.95	176	1.97	V	1200.00	-58.58	6.9	0.29	-51.97	-13	-38.97
298.00	60.93	82	1.12	H	298.00	-52.32	0	0.11	-52.43	-13	-39.43
298.00	58.72	185	1.13	V	298.00	-52.45	0	0.11	-52.56	-13	-39.56
474.55	45.65	360	1.37	V	474.55	-62.27	0	0.14	-62.41	-13	-49.41
474.55	42.89	279	1.00	H	474.55	-66.75	0	0.14	-66.89	-13	-53.89

Run # 2: 30MHz -20GHz CDMA 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)	Antenna Gain Correction (dBi)	Cable Loss (dB)			
3760	61.32	55	2.20	V	3760	-37.69	10.8	0.59	-27.48	-13	-14.48
3760	60.48	167	1.77	H	3760	-41.11	10.8	0.59	-30.90	-13	-17.90
5640	40.13	192	1.00	H	5640	-54.25	10.7	0.74	-44.29	-13	-31.29
1400	55.65	109	1.68	H	1400	-52.90	8.0	0.32	-45.22	-13	-32.22
5640	39.87	164	1.00	V	5640	-55.84	10.7	0.74	-45.88	-13	-32.88
1400	53.16	38	1.00	V	1400	-57.09	8.0	0.32	-49.41	-13	-36.41
1200	50.37	119	2.10	H	1200	-58.29	6.9	0.29	-51.68	-13	-38.68
298	60.84	92	1.23	H	298	-52.41	0	0.11	-52.52	-13	-39.52
298	58.07	168	1.00	V	298	-53.10	0	0.11	-53.21	-13	-40.21
1200	51.04	173	2.03	V	1200	-59.99	6.9	0.29	-53.38	-13	-40.38
555.9	43.90	20	1.08	V	555.9	-62.36	0	0.15	-62.51	-13	-49.51
474.6	45.55	353	1.32	V	474.6	-62.37	0	0.14	-62.51	-13	-49.51

5 §2.1091 – RF EXPOSURE

5.1 Applicability

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

CDMA 850 Band

Maximum peak output power at antenna input terminal (dBm):	23.50
Maximum peak output power at antenna input terminal (mw):	224
Prediction distance (cm):	20
Prediction frequency (MHz):	836.52
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density of prediction frequency at 20.0 cm (mW/cm ²):	0.0446
MPE limit for uncontrolled exposure at prediction frequency (mW/cm ²):	0.558

CMDA 1900 Band

Maximum peak output power at antenna input terminal (dBm):	23.50
Maximum peak output power at antenna input terminal (mw):	224
Prediction distance (cm):	20
Prediction frequency (MHz):	1880
Maximum Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density of prediction frequency at 20.0 cm (mW/cm ²):	0.0446
MPE limit for uncontrolled exposure at prediction frequency (mW/cm ²):	1.0

Conclusion: EUT meets the MPE at 20 cm distance.