Lab Code: 200167-0

FCC PART 22H, 24E

TEST AND MEASUREMENT REPORT

For

Mobile Communications, Inc.

230 Earl Steward Dr.

Aurora, Ontario L4G 6V8, Canada

FCC ID: S4RBRB8191

Report Type:	Product Type:
CIIPC Report	Dual Band Wireless Booster

Test Engineer: Vasily Koudymov

Report Number: R1111225-2224

Report Date: 2011-12-05

Reviewed By: Victor Zhang
EMC/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	R1111225-2224	CIIPC Report	2011-12-05

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report has been complied on behalf of *Mobile Communications, Inc.* and their product model: BRM220-53, FCC ID: S4RBRB8191, which will be henceforth in this report referred to as the EUT (Equipment Under Test). The EUT is a Cellular/PCS Dual-band, bi-directional booster/amplifier.

EUT Description	Dual-Band, Bi-Directional Wireless Booster/Amplifier
FCC ID	S4RBRB8191
Operation Frequency	Cellular Band: 824-849 MHz, 869-894 MHz PCS Band: 1850-1910 MHz, 1930-1990 MHz
Modulation (s)	CDMA, WCDMA, LTE, HSPA, GSM, GPRS, EDGE
Type of Equipment	Mobile and Fixed

1.2 Mechanical Description

The EUT measures approximately 190mm (L) x 90mm (W) x 25mm (H), and weighs approximately 354g.

The test data gathered are from typical production sample, serial number: 300252 provided by the Manufacturer.

1.3 Objective

This type approval report is prepared on behalf of *Mobile Communications, 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 by the modification below compare to the original model:

The permissive change is to provide 2 models which are same as BRB819 but with less gain than the BRB8191 originally type. As such we have removed some LNA's and changed some attenuation pads in the schematic of the approved DUT's to create these 2 new models. There is no RF parameter change.

1.4 Related Submittal(s)/Grant(s)

FCC ID: S4RBRB8191

1.5 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 - PCS

Applicable Standards: TIA/EIA603-C, ANSI C63.4-2003.

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.

1.6 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 CISPR16-4-2:2003, 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 BACL Corp.

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 site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have 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 test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-3729, C-4176, G-469, and T-1206. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. 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 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

N/A

2.5 Internal Configuration

Manufacturer	Description	Model	Serial Number
Mobile Communications, Inc.	PCB Main	-	-

2.6 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Hewlett-Packard	Signal Generator	83650B	3614A00276

2.7 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
Smooth Talker	AC Power Adapter	BLC24063000WU	517E0E

2.8 Interface Ports and Cabling

Cable Description	Length (m)	To	From
RF Cable	< 1	Signal Generator	EUT
RF Cable	< 1	Spectrum Analyzer	EUT

3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§2.1047	Modulation Characteristics	Note[1]
§2.1053 §22.917(a), §24.238(a)	Field Strength of Spurious Radiation	Compliant
§2.1093	RF Exposure Information	Compliant
§2.1046 §22.913, §24.232	RF Output Power	Note[2]
§2.1049 §22.917, §24.238	Out of Band Emissions, Occupied Bandwidth	Note[2]
§2.1051, §22.917, §24.238(a)	Spurious Emissions at Antenna Terminals	Note[2]
§2.1055 §22.355, §24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Note[1]
§22.917, §24.238	Band Edge	Note[2]

Note[1]*:* EUT is an amplifier.
Note[2]*:* Please refer to original report of FCC ID: S4RBR8191.

4 FCC §1.1307(b) (1) & §2.1091 - RF EXPOSURE INFORMATION

4.1 Applicable Standard

According to §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

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 (minute)
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

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

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

Cellular Band

Downlink:

Maximum peak output power at antenna input terminal (dBm):	10.49
Maximum peak output power at antenna input terminal (mW):	11.19
Prediction distance (cm):	40
Prediction frequency (MHz):	881.5
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.0056
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5877

Uplink:

Maximum peak output power at antenna input terminal (dBm):	29.33
Maximum peak output power at antenna input terminal (mW):	857.04
Prediction distance (cm):	40
Prediction frequency (MHz):	836.5
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.4263
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5577

PCS Band

Downlink:

Maximum peak output power at antenna input terminal (dBm):	8.98
Maximum peak output power at antenna input terminal (mW):	7.91
Prediction distance (cm):	40
Prediction frequency (MHz):	1960
Antenna Gain, typical (dBi):	12
Maximum Antenna Gain (numeric):	15.85
Power density at predication frequency and distance (mW/cm^2):	0.00624
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Uplink:

Maximum peak output power at antenna input terminal (dBm):	28.10
Maximum peak output power at antenna input terminal (mW):	645.65
Prediction distance (cm):	40
Prediction frequency (MHz):	1880
Antenna Gain, typical (dBi):	12
Maximum Antenna Gain (numeric):	15.85
Power density at predication frequency and distance (mW/cm^2):	0.509
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

4.3 Test Result

The device complies with the MPE requirements by providing a safe separation distance of 40 cm between the antenna, including any radiating structure, and any persons when normally operated based on a 12 dBi antenna. The proposed RF exposure safety information has been included in the User's Manual.

5 FCC §2.1053, §22.917 & §24.2383 - RADIATED SPURIOUS EMISSIONS

5.1 Applicable Standard

Requirements: FCC §2.1053, §22.917, §24.238.

5.2 Test Procedure

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 tests, the antenna height and polarization as well as 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.

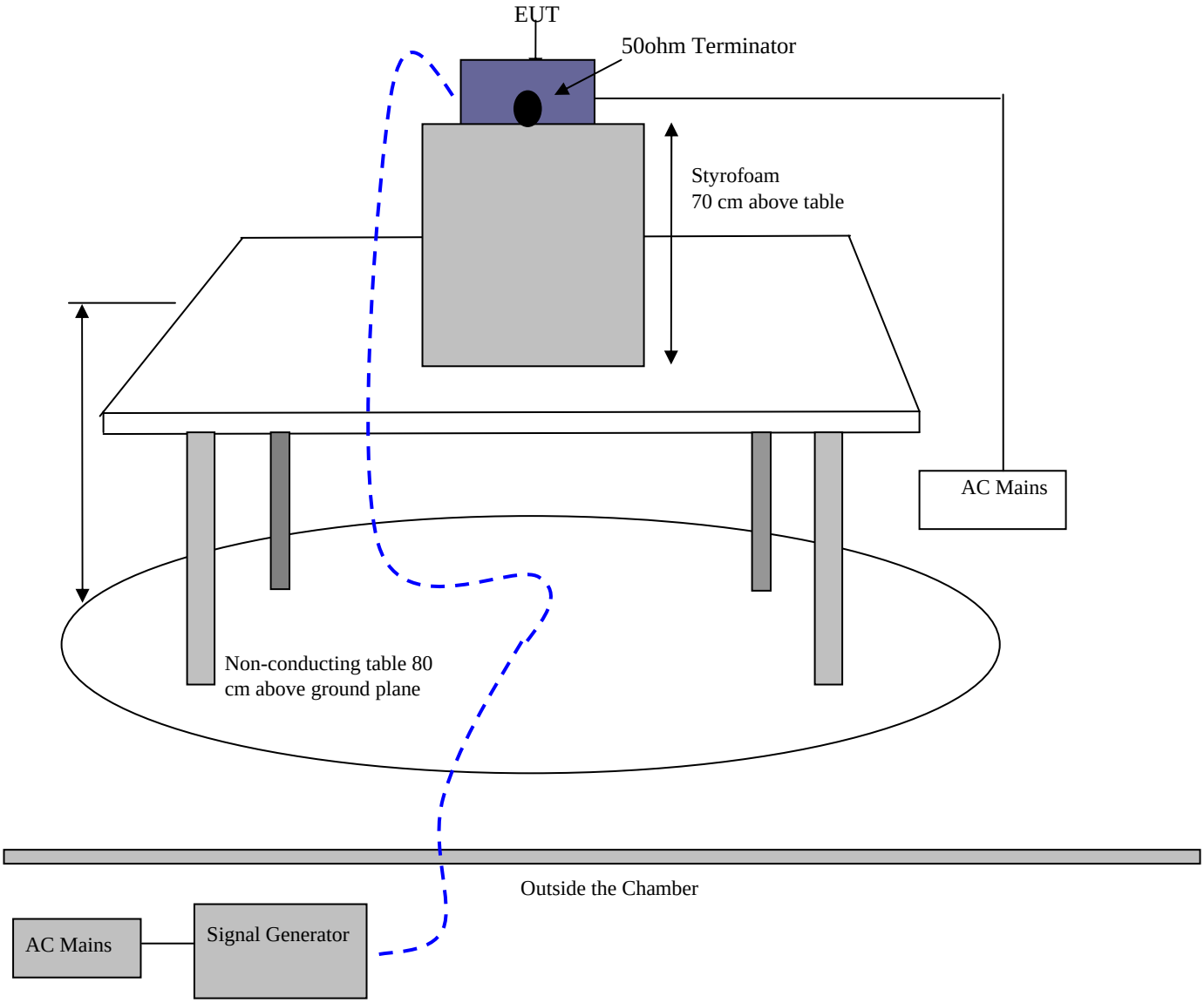
The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace 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 lg (TXpwr in Watts/0.001) – the absolute level

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

5.3 Test Setup Block Diagram



5.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Hewlett-Packard	Pre-amplifier	8447D	2944A10187	2011-03-08
Sunol Science Corp	Combination Antenna	JB1	A020106-1	2011-05-27
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Hewlett-Packard	Signal Generator	8648C	3426A00417	2011-08-18
Com-Power	Dipole Sub. Antenna	AD-100	2220	2010-06-13 Note 1
Com-Power	Dipole Sub. Antenna	AD-100	2228	2010-06-13 Note 1
Hewlett-Packard	Signal Generator > 3GHz	83650B	3614A00276	2010-06-21 Note 1
MiniCircuits	Pre-amplifier > 1GHz	ZVA-183-S	570400946	2011-05-09
A.H. Systems	Horn	SAS-200/571	261	2010-12-21

Note 1: Based on a two year calibration cycle

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

5.5 Test Environmental Conditions

Temperature:	25°C
Relative Humidity:	55%
ATM Pressure:	101.2 kPa

Testing was performed by Vasily Koudymov from 2011-12-01 to 2012-12-02 in 5 meter chamber 2.

5.6 Test Results

Worst case reading as follows:

Mode: Transmitting		
Margin (dB)	**Frequency (MHz)**	**Antenna Polarization (Horizontal/Vertical)**
-35.82	3760	Vertical

Cellular 850 MHz band Downlink (Input frequency = 881.6 MHz)

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
94.5	50.31	99	199	H	94.5	-63.95	0	0.15	-64.1	-13	-51.1
44.31	55.14	101	100	V	44.31	-54.84	0	0.1	-54.94	-13	-41.94

Cellular 850 MHz band Uplink (Input frequency = 836.6 MHz)

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
96.82	49.25	98	175	H	96.82	-67.57	0	0.15	-67.72	-13	-54.72
43.76	54.7	226	100	V	43.76	-54.27	0	0.1	-54.37	-13	-41.37

PCS 1900 MHz band Downlink (Input frequency = 1960 MHz)

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
95.1	49.04	113	177	H	95.1	-65.34	0	0.15	-65.49	-13	-52.49
46.7	58.14	0	100	V	46.7	-52.38	0	0.1	-52.48	-13	-39.48

PCS 1900 MHz band Uplink (Input frequency = 1880 MHz

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
58	48.96	150	299	H	58	-63.25	0	0.1	-63.35	-13	-50.35
42.95	55.18	140	100	V	42.95	-53.75	0	0.1	-53.85	-13	-40.85
3760	38.47	281	121	H	3760	-58.79	9.539	1.3	-50.551	-13	-37.551
3760	39.75	0	151	V	3760	-57.01	9.449	1.3	-48.861	-13	-35.861