



**FCC PART 22H  
TEST AND MEASUREMENT REPORT**

For

**M & V COMMSAT LDA.**

RUA JOAQUIM KAPANGO NR.20-22 LUANDA, ANGOLA

**FCC ID: XDI-ANGMVGC01C**

<b>Report Type:</b> Original Report	<b>Product Type:</b> CDMA & GSM Mobile Phone
<b>Test Engineer:</b> <u>Xiao Ming Hu</u> 	
<b>Report Number:</b> <u>R0905087-22</u>	
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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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## GENERAL INFORMATION

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

This Bay Area Compliance Laboratories Corp. test report has been prepared on behalf of *M & V COMMSAT LDA.* and their product, model: GC01C (FCCID: *XDI-ANGMVGC01C*) or the EUT (Equipment Under Test) as referred to in the rest of this report.

The EUT is a CDMA Mobile phone that operates from 824 to 849 MHz.

### Mechanical Description

The product, FCCID: *XDI-ANGMVGC01C* measures approximately 115 mmL x 50 mmW x 17 mmH.

*\* The test data gathered are from typical production sample, serial numbers: B1838 and B1839 provided by the manufacturer.*

### EUT Photo



*Additional photos in Exhibit C*

### Objective

This type approval report is prepared on behalf of M & V COMMSAT LDA. in accordance with Part 2, Subpart J, Part 22 Subpart H, of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF Output Power, Modulation Characteristic, Occupied Bandwidth, Spurious Emission at Antenna Terminal, Field Strength of Spurious Radiation, Frequency Stability, Band Edge, and Conducted and Radiated margin.

This report is provided on behalf of M & V COMMSAT LDA. for confirmation of regulatory compliance. The manufacturer declares that the model: GC01C, serial number: *B1838 & B1839 provided* for testing is identical in construction and electrical operation with the post production product. Retesting is recommended for any changes to the model that might affect compliance including those with respect to software, circuitries, PCB layout, RF module, features and functionality.

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

No Related Submittals

### **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 - Public Mobile Services

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

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

### **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  $\pm 2.0$  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.

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

### **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/Standards/scopes/2001670.htm>

## SYSTEM TEST CONFIGURATION

### Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with test software provided by the manufacturer.

### Equipment Modifications

No modifications were made to the EUT.

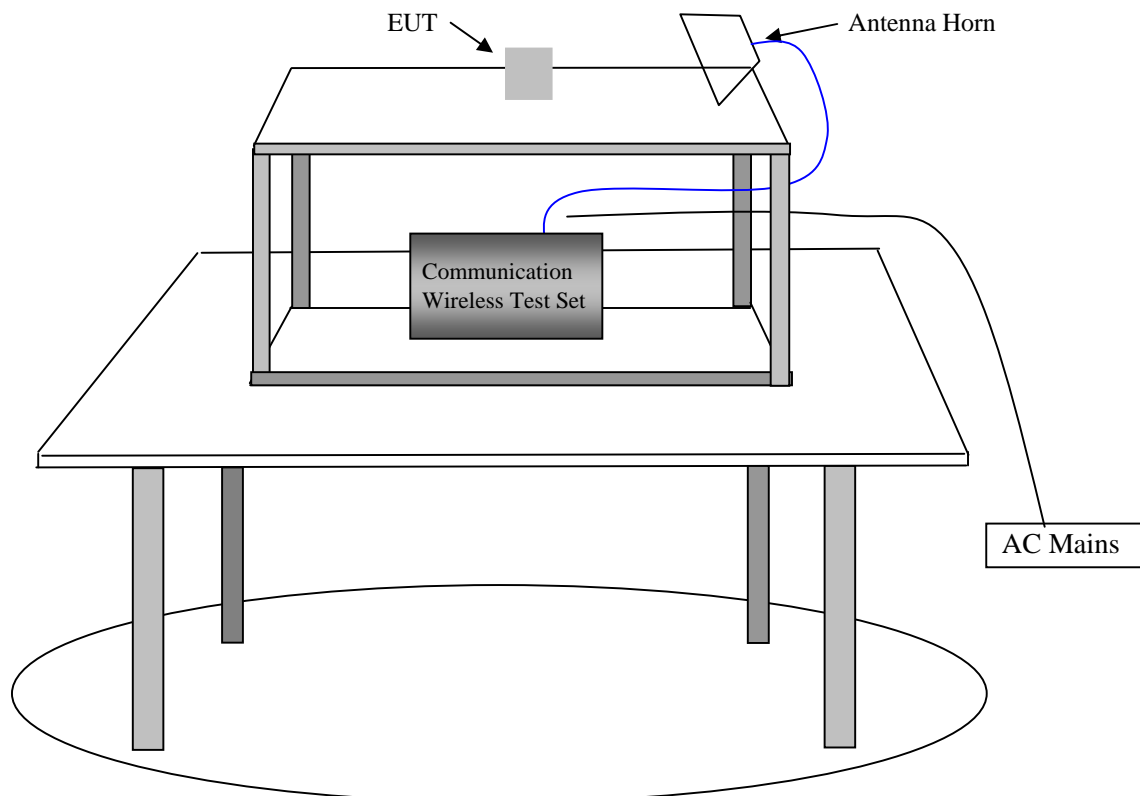
### Local Support Equipment List and Details

N/A

### Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
N/A	AC Adapter	N/A	N/A

### Test setup Block Diagram for ERP & Radiated Emissions Tests



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Results
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1093	RF Exposure	Compliant *
§ 2.1046, § 22.913	RF Output Power	Compliant
§ 2.1053 § 22.917	Spurious Radiated Emissions	Compliant
§ 15.109	Receive Radiated Emissions	Compliant
§ 2.1049 § 22.917	Occupied Bandwidth	Compliant
§ 2.1053, § 22.917	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1055, § 22.355	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 22.917	Band Edge	Compliant

Note: \* Please refer to SAR Report R0905087-SAR



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## **§2.1047 - MODULATION CHARACTERISTICS**

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### **Applicable Standard**

Requirement: FCC § 2.1047(d). FCC parts 22H do not have any specific digital modulation requirements; therefore modulation characteristics are not presented.

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## **§1.1307(b) (1) & §2.1093 - RF EXPOSURE**

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### **Applicable Standard**

CFR47 §1.1310 and §2.1093.

### **Test Result**

Compliant, The EUT is a hand portable device and thus requires SAR evaluation; please refer to BACL SAR report R0905087-SAR for measurement and testing details.

## §2.1046, §22.913 – RF OUTPUT POWER

### Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

### Test Procedure

#### *Conducted Output Power:*

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

#### *Effective Radiated Power (ERP):*

TIA 603-C section 2.2.17

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Signal Generator	83650B	3614A00276	2008-05-10
A.R.A.	Horn Antenna	DRG-118/A	1132	2007-06-18
Sunol Sciences	Antenna	JB1	A103105-3	2008-03-25
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08

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

### Test Environmental Conditions

<b>Temperature:</b>	20 ° C
<b>Relative Humidity:</b>	59 %
<b>ATM Pressure:</b>	102.0 kPa

\* The testing was performed by Xiao Ming Hu on 2008-06-10 ~2008-06-12.

## Test Results

### 1) Conducted Output Power

Radio Configure	Output Power ( dBm )		
	Low CH (824.7 MHz)	Middle CH (836.52 MHz)	High CH (848.31 MHz)
RC1, S02	25.50	25.50	25.00
RC2, S09	25.51	25.83	25.55
RC3, S055	25.96	25.56	25.59
RC4, S055	25.98	25.77	24.95
RC5, S055	25.57	25.82	24.88

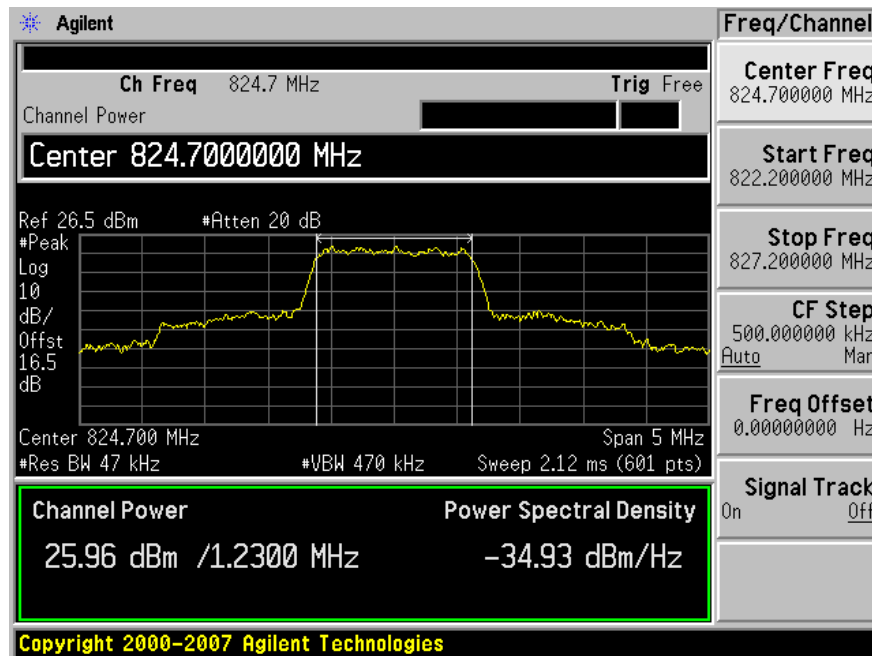
### 2) ERP

Indicated		Table Angle (Degree)	Test Antenna		Substituted				Absolute Level (dBm)	FCC Part 22H	
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
824.70	88.81	238	1.12	V	824.70	22.81	0.00	0.50	22.31	38.45	-16.14
836.52	89.06	229	1.06	V	836.52	23.52	0.00	0.50	23.02	38.45	-15.43
848.31	88.90	239	1.05	V	848.31	22.90	0.00	0.50	22.40	38.45	-16.05

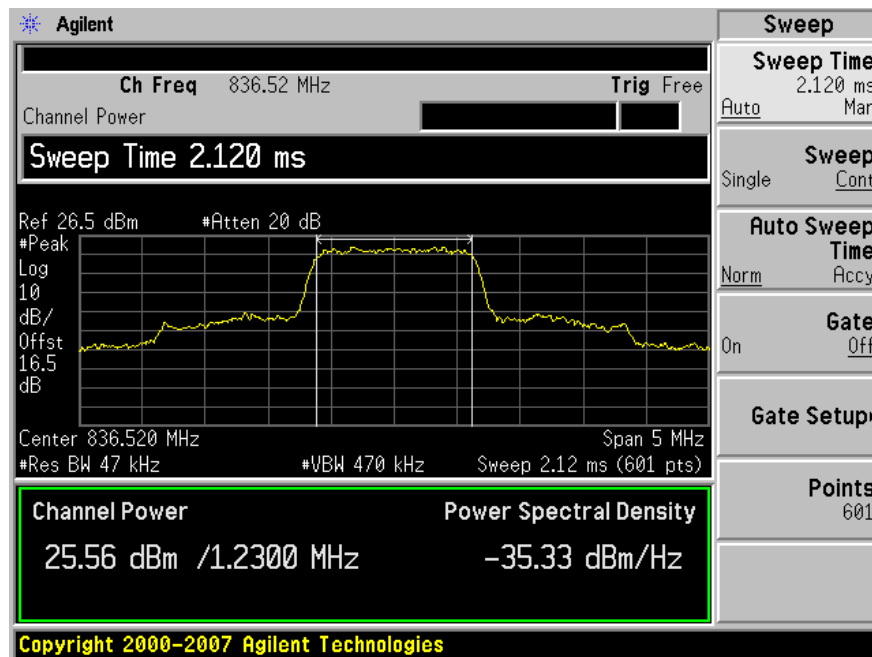
*\*Note: Data Measured Without Pre-Amp*

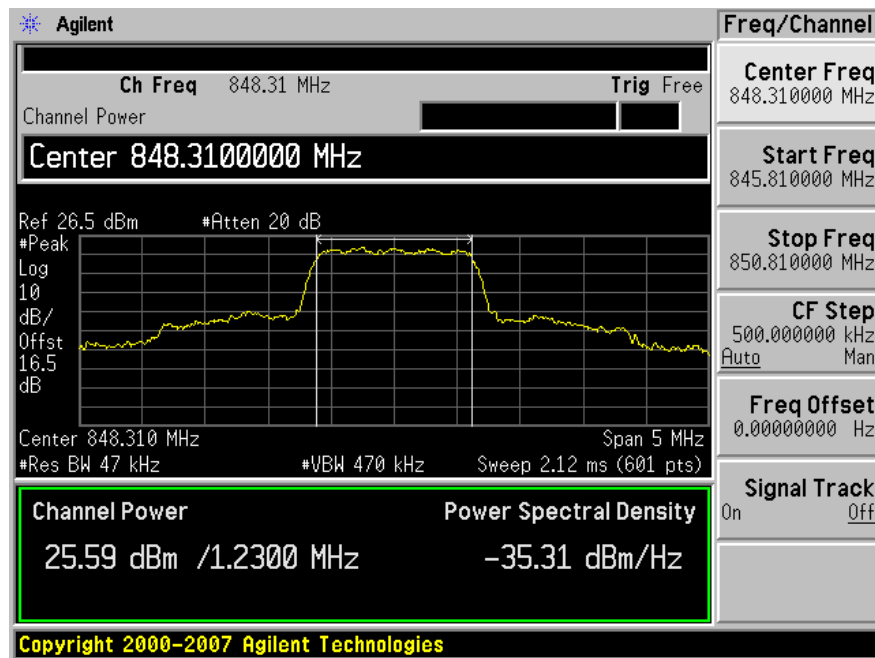
## Plots of Conducted Output Power for RC3

## Low Channel



## Middle Channel



**High Channel**

## §2.1053 & §22.917- SPURIOUS RADIATED EMISSIONS

### Applicable Standard

Requirements: CFR 47, § 2.1053, § 22.917.

### 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 =  $10 \lg(\text{TXpwr in Watts}/0.001)$  – the absolute level

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

### Test Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	59 %
ATM Pressure:	102.0 kPa

\* The testing was performed by Xiao Ming Hu on 2008-06-12.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Pre-Amplifier	8447D	2944A10198	2007-12-19
HP	Pre-Amplifier	8449B	3147A00400	2007-08-27
A. H. Systems	Horn Antenna	SAS-200/571	261	2007-06-20
HP	Signal Generator	83650B	3614A00276	2008-05-10
A.R.A.	Horn Antenna	DRG-118/A	1132	2007-06-18
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08

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

**Test Results**

Worst case readings as follows:

-17.98 dB at 1673.04 MHz

Run # 1: 30 MHz -10 GHz - Mid Channel 836.52 MHz

Indicated		Table Angle (Degree)	Test Antenna		Substituted				Absolute Level (dBm)	FCC Part 22H	
Frequency (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
1673.04	56.20	347	1.00	H	1673.04	-39.00	8.90	0.88	-30.98	-13	-17.98
1673.04	66.89	202	1.84	V	1673.04	-40.00	8.90	0.88	-31.98	-13	-18.98
3346.08	51.16	172	1.94	H	3346.08	-48.70	9.80	1.30	-40.20	-13	-27.20
3346.08	48.21	212	1.46	V	3346.08	-54.30	9.80	1.30	-45.80	-13	-32.80
2509.56	44.16	205	1.00	V	2509.56	-55.49	9.00	1.13	-47.62	-13	-34.62
2509.56	41.60	0	1.13	H	2509.56	-57.12	9.00	1.13	-49.25	-13	-36.25



## §2.1049 & §22.917 – OCCUPIED BANDWIDTH

### Applicable Standards

Requirements: CFR 47, Section 2.1049, Section 22.917.

### Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 30 kHz (Cellular /PCS) and the -26 dB Bandwidth was recorded.

### Test Environmental Conditions

Temperature:	20 ° C
Relative Humidity:	58 %
ATM Pressure:	101.8 kPa

\* The testing was performed by Xiao Ming Hu on 2008-06-13.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08

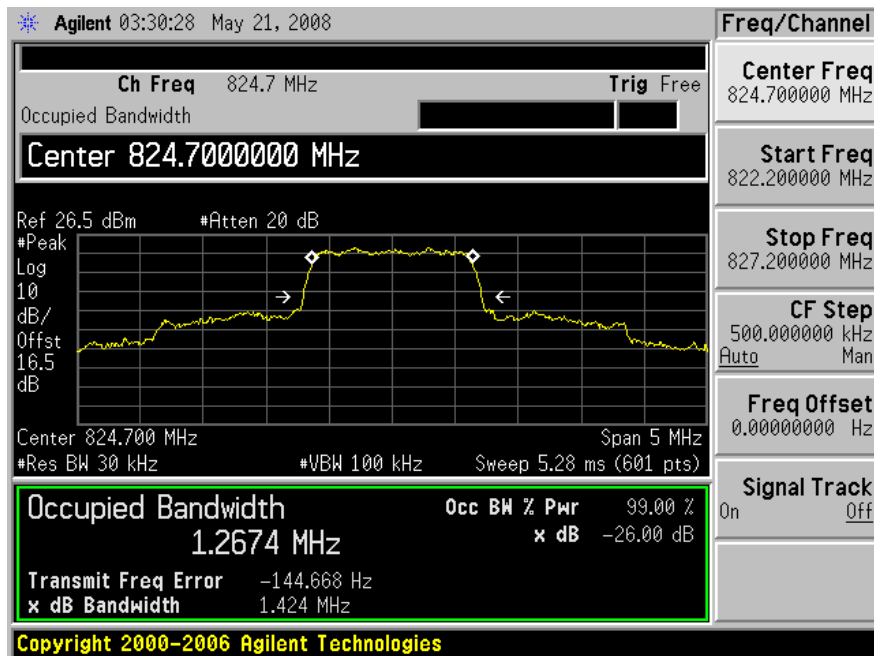
\* **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Summary of Test Results

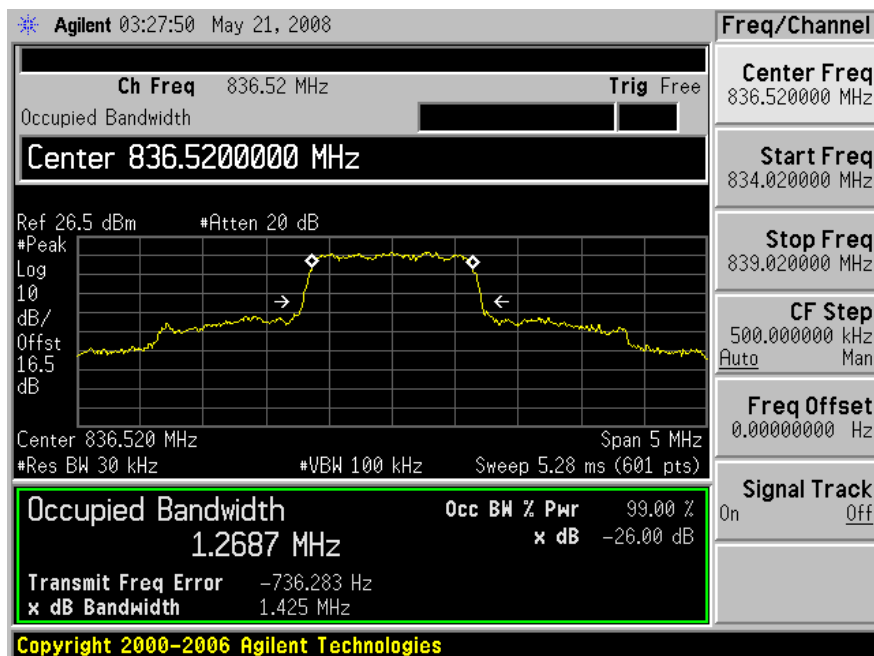
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
Low	824.70	1.2674	1.424
Middle	836.52	1.2687	1.425
High	848.30	1.2746	1.421

Please refer to the following plots for detailed test results.

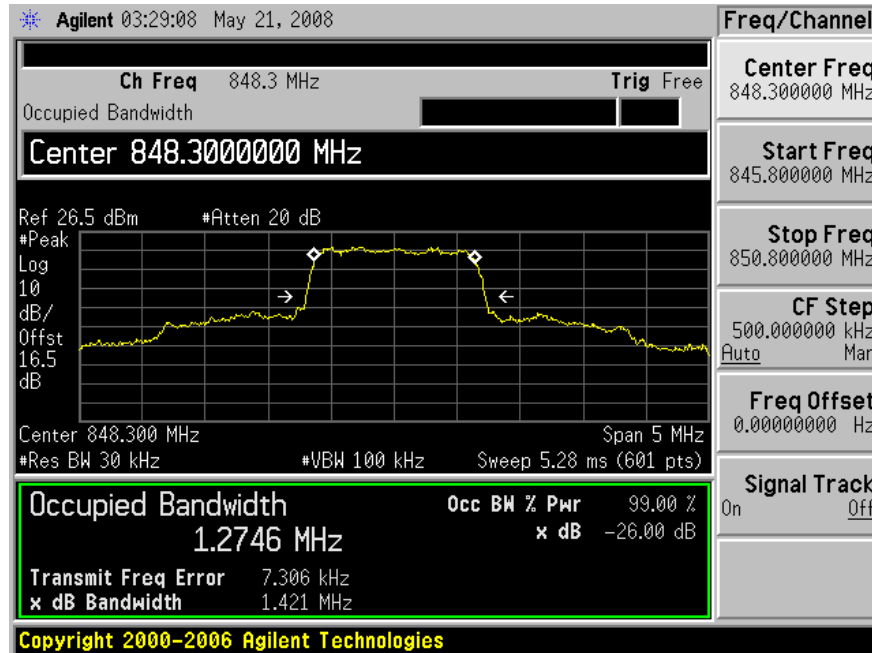
## Low Channel



## Mid Channel



## High Channel



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**§2.1053 & §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

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**Applicable Standards**

As per FCC §2.1053:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

As per FCC §22.917, Emissions Limitations for Cellular Equipment:

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(c) *Alternative out of band emission limit.* Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) *Interference caused by out of band emissions.* If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

**Test Procedure**

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08

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

**Test Environmental Conditions**

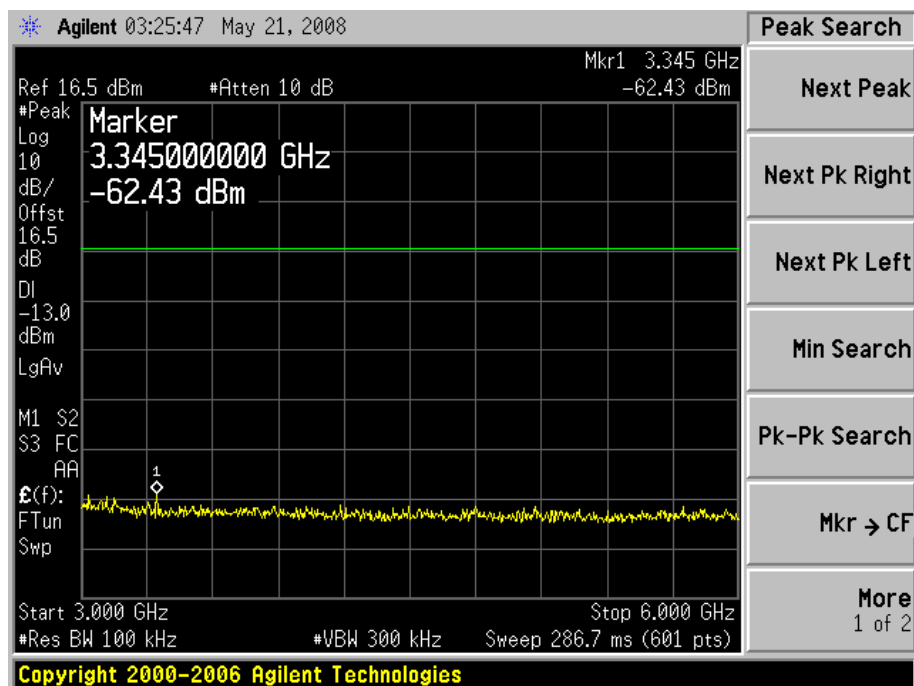
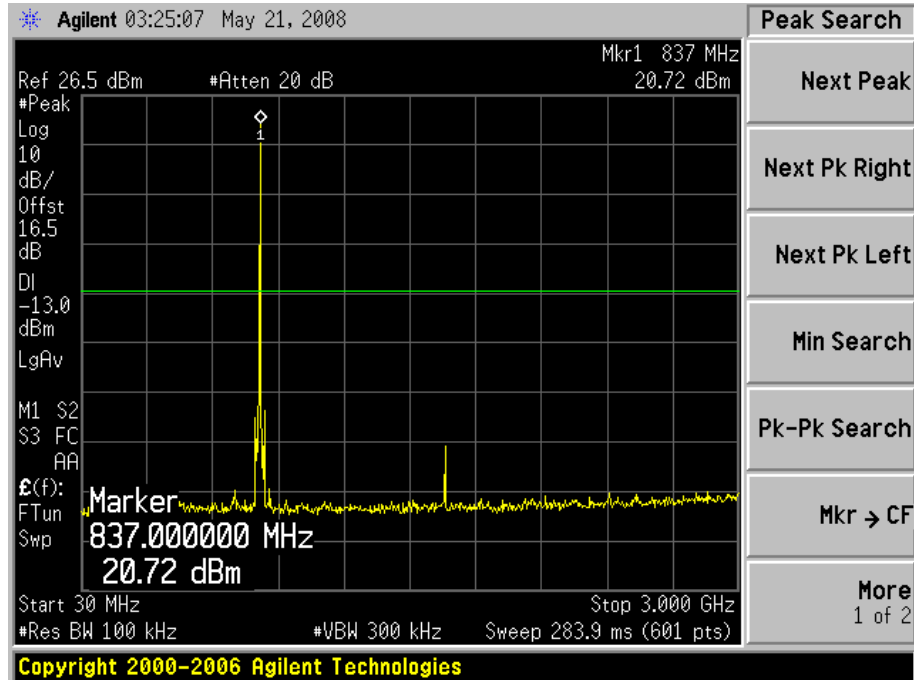
Temperature:	20 ° C
Relative Humidity:	58 %
ATM Pressure:	101.8 kPa

\* *The testing was performed by Xiao Ming Hu on 2008-06-13.*

**Test Results**

Please refer to the following plots.

## Plots of Spurious Emission at Antenna Port (Middle Channel)



## **§2.1055 & §22.355 - FREQUENCY STABILITY**

### **Applicable Standard**

FCC §2.1055(a), FCC§2.1055(d) and FCC §22.355

According to FCC §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1\_Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, Fixed (ppm)	Mobile < 3 watts (ppm)	Mobile < 3 watts (ppm)
25 to 50	20.0	20.0	50.00
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

### **Test Procedure**

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 110% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08
ESPEC	Oven, Temperature	ESL-4CA	18010	N/A

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

## Test Environmental Conditions

<b>Temperature:</b>	20 ° C
<b>Relative Humidity:</b>	58 %
<b>ATM Pressure:</b>	101.8 kPa

\* The testing was performed by Xiao Ming Hu on 2008-06-13.

## Test Results

### 1) Frequency Stability versus Temperature

Reference Frequency: 836.52 MHz, Limit: 2.5 ppm				
Environment		Frequency Measured (MHz)	Frequency Error with Time Elapsed	
Temperature (°C)	Power Supplied (Vdc)		Error (ppm)	Limit (ppm)
50	3.7	836.52100	1.195428681	2.5
30	3.7	836.52200	2.390857361	2.5
20	3.7	836.52200	2.390857361	2.5
0	3.7	836.52100	1.195428681	2.5
-20	3.7	836.52100	1.195428681	2.5
-30	3.7	836.52000	0.0	2.5

### 2) Frequency Stability versus Voltage

Environment		Frequency Measured (MHz)	Frequency Error with Time Elapsed	
Temperature (°C)	Power Supplied (Vdc)		Error (ppm)	Limit (ppm)
20	3.15	836.52200	2.390857361	2.5



## §22.917 – BAND EDGE

### Applicable Standard

According to § 22.917, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency, RBW set to 10 kHz.

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
Agilent	Wireless Communication Test Set	8960 Series 10	GB44051221	2007-08-08

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

### Test Environmental Conditions

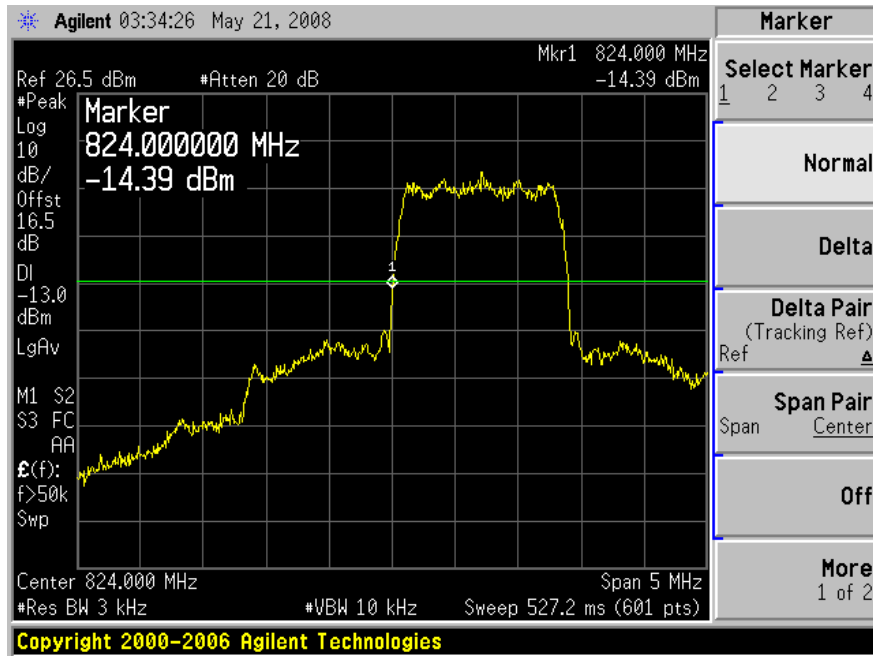
Temperature:	20 ° C
Relative Humidity:	58 %
ATM Pressure:	101.8 kPa

\* *The testing was performed by Xiao Ming Hu on 2008-06-13.*

### Test Results

Please refer to the following plots.

## Lowest Channel



## Highest Channel

