



## FCC PART 22H

### TEST AND MEASUREMENT REPORT

For

**M&V COMMSAT LDA.**

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**FCC ID: XDI-ANGMVGC12C**

<b>Report Type:</b> Original Report	<b>Product Type:</b> CDMA &GSM Mobile Phone
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<b>Report Number:</b> <u>R0906172-22</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)

## TABLE OF CONTENTS

<b>1</b>	<b>GENERAL INFORMATION</b>	<b>5</b>
1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2	MECHANICAL DESCRIPTION.....	5
1.3	EUT PHOTO .....	5
1.4	OBJECTIVE .....	5
1.5	RELATED SUBMITTAL(S)/GRANT(S).....	6
1.6	TEST METHODOLOGY .....	6
1.7	MEASUREMENT UNCERTAINTY.....	6
1.8	TEST FACILITY.....	6
<b>2</b>	<b>SYSTEM TEST CONFIGURATION</b> .....	<b>8</b>
2.1	JUSTIFICATION .....	8
2.2	EUT EXERCISE SOFTWARE .....	8
2.3	SPECIAL ACCESSORIES.....	8
2.4	EQUIPMENT MODIFICATIONS .....	8
2.5	REMOTE SUPPORT EQUIPMENT .....	8
2.6	LOCAL SUPPORT EQUIPMENT.....	8
2.7	POWER SUPPLY AND LINE FILTERS .....	8
2.8	INTERFACE PORTS AND CABLING.....	8
2.9	TEST SETUP BLOCK DIAGRAM FOR RADIATED EMISSIONS TESTS.....	9
<b>3</b>	<b>SUMMARY OF TEST RESULTS</b> .....	<b>10</b>
<b>4</b>	<b>§2.1046 &amp;§22.913(A) – RF OUTPUT POWER</b> .....	<b>11</b>
4.1	APPLICABLE STANDARD .....	11
4.2	TEST PROCEDURE .....	11
4.3	TEST EQUIPMENT LIST AND DETAILS.....	11
4.4	SUMMARY OF TEST RESULTS .....	12
<b>5</b>	<b>§2.1047 - MODULATION CHARACTERISTIC</b> .....	<b>13</b>
5.1	APPLICABLE STANDARD .....	13
<b>6</b>	<b>§2.1049, §22.917 &amp; §22.905 - OCCUPIED BANDWIDTH</b> .....	<b>14</b>
6.1	APPLICABLE STANDARD .....	14
6.2	TEST PROCEDURE .....	14
6.3	TEST EQUIPMENT LIST AND DETAILS.....	14
6.4	SUMMARY OF TEST RESULTS .....	14
6.5	TEST DATA & PLOTS .....	15
<b>7</b>	<b>§2.1051, §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS</b> .....	<b>17</b>
7.1	APPLICABLE STANDARD .....	17
7.2	TEST PROCEDURE .....	17
7.3	TEST EQUIPMENT LIST AND DETAILS.....	17
7.4	ENVIRONMENTAL CONDITIONS.....	17
7.5	TEST DATA & PLOTS .....	17
<b>8</b>	<b>§2.1053 - RADIATED SPURIOUS EMISSIONS</b> .....	<b>19</b>
8.1	APPLICABLE STANDARD .....	19
8.2	TEST PROCEDURE .....	19
8.3	TEST EQUIPMENT LIST AND DETAILS.....	19

8.4	ENVIRONMENTAL CONDITIONS.....	20
8.5	TEST DATA & PLOTS .....	20
<b>9</b>	<b>§22.917 – BAND EDGE.....</b>	<b>21</b>
9.1	APPLICABLE STANDARD .....	21
9.2	TEST PROCEDURE .....	21
9.3	TEST EQUIPMENT LIST AND DETAILS.....	21
9.4	ENVIRONMENTAL CONDITIONS.....	21
9.5	TEST DATA & PLOTS .....	21
<b>10</b>	<b>§2.1055 (A), §2.1055 (D) &amp; §22.355 - FREQUENCY STABILITY.....</b>	<b>23</b>
10.1	APPLICABLE STANDARD .....	23
10.2	TEST PROCEDURE .....	23
10.3	TEST EQUIPMENT LIST AND DETAILS.....	23
10.4	ENVIRONMENTAL CONDITIONS.....	24
10.5	TEST DATA & PLOTS .....	24
<b>11</b>	<b>§1.1307(B) (1) &amp; §2.1093 - RF EXPOSURE.....</b>	<b>25</b>
11.1	APPLICABLE STANDARD .....	25
11.2	TEST RESULT .....	25
<b>12</b>	<b>EXHIBIT A - FCC ID LABELING AND WARNING STATEMENT.....</b>	<b>26</b>
12.1	FCC ID LABEL REQUIREMENT .....	26
12.2	PROPOSED FCC ID LABEL .....	26
12.3	PROPOSED LABEL LOCATION ON EUT .....	27
<b>13</b>	<b>EXHIBIT B - TEST SETUP PHOTOGRAPHS .....</b>	<b>28</b>
13.1	RADIATED EMISSIONS BELOW 1 GHZ- FRONT VIEW.....	28
13.2	RADIATED EMISSIONS BELOW 1 GHZ- REAR VIEW.....	28
13.3	RADIATED EMISSIONS ABOVE 1 GHZ - FRONT VIEW .....	29
13.4	RADIATED EMISSIONS ABOVE 1 GHZ - REAR VIEW .....	29
<b>14</b>	<b>EXHIBIT C - EUT PHOTOGRAPHS.....</b>	<b>30</b>
14.1	EUT- FRONT SIDE VIEW.....	30
14.2	EUT- BACK SIDE VIEW .....	30
14.3	EUT INTERNAL – BOARD ASSEMBLY TOP (WITH RF SHEILDING) VIEW.....	31
14.4	EUT INTERNAL – BOARD ASSEMBLY TOP (SHIELDING AND CASE REMOVED) VIEW.....	31
14.5	EUT INTERNAL – BOARD ASSEMBLY BOTTOM VIEW (WITH ANTENNA AND RF SHEILDING) .....	32
14.6	EUT INTERNAL – RF BOARD ASSEMBLY TOP (ANTENNA AND RF SHEILDING REMOVED) VIEW .....	32
14.7	EUT INTERNAL – KEY BOARD ASSEMBLY TOP VIEW.....	33
14.8	EUT INTERNAL – KEY BOARD ASSEMBLY BOTTOM VIEW .....	33
14.9	BATTERY .....	34
14.10	AC/DC ADAPTOR.....	34

### **DOCUMENT REVISION HISTORY**

<b>Revision Number</b>	<b>Report Number</b>	<b>Description of Revision</b>	<b>Date of Revision</b>
0	R0906172-22	Original Report	2009-07-17

## 1 GENERAL INFORMATION

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

This test and measurement report has been compiled on behalf of *M&V COMMSAT LDA.* and their product, model: *GC12C, FCC ID: XDI-ANGMVG12C.* This EUT is a CDMA mobile phone which operates in the cellular spectrum band 824 to 849MHz and supports CDMA2000 (1xRTT).

### 1.2 Mechanical Description

The EUT measures approximately 104 mm (L) x 45 mm (W) x 15.5 mm (H), and weighs approximately 70 g.

*\* The test data gathered are from typical production sample, serial number: R0906172-1 provided by the BACL.*

### 1.3 EUT Photo



*Additional Photos in Exhibit C*

### 1.4 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 emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

This measurement and test report only pertains to the cellular band 850 MHz, CDMA 1xRTT portion of the EUT.

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

N/A

## 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

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.

## 1.7 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: 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**

Agilent 8960 (E5155C) Wireless Communication test set was used as a base station simulator during CDMA 1xRTT measurements.

### **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**

N/A

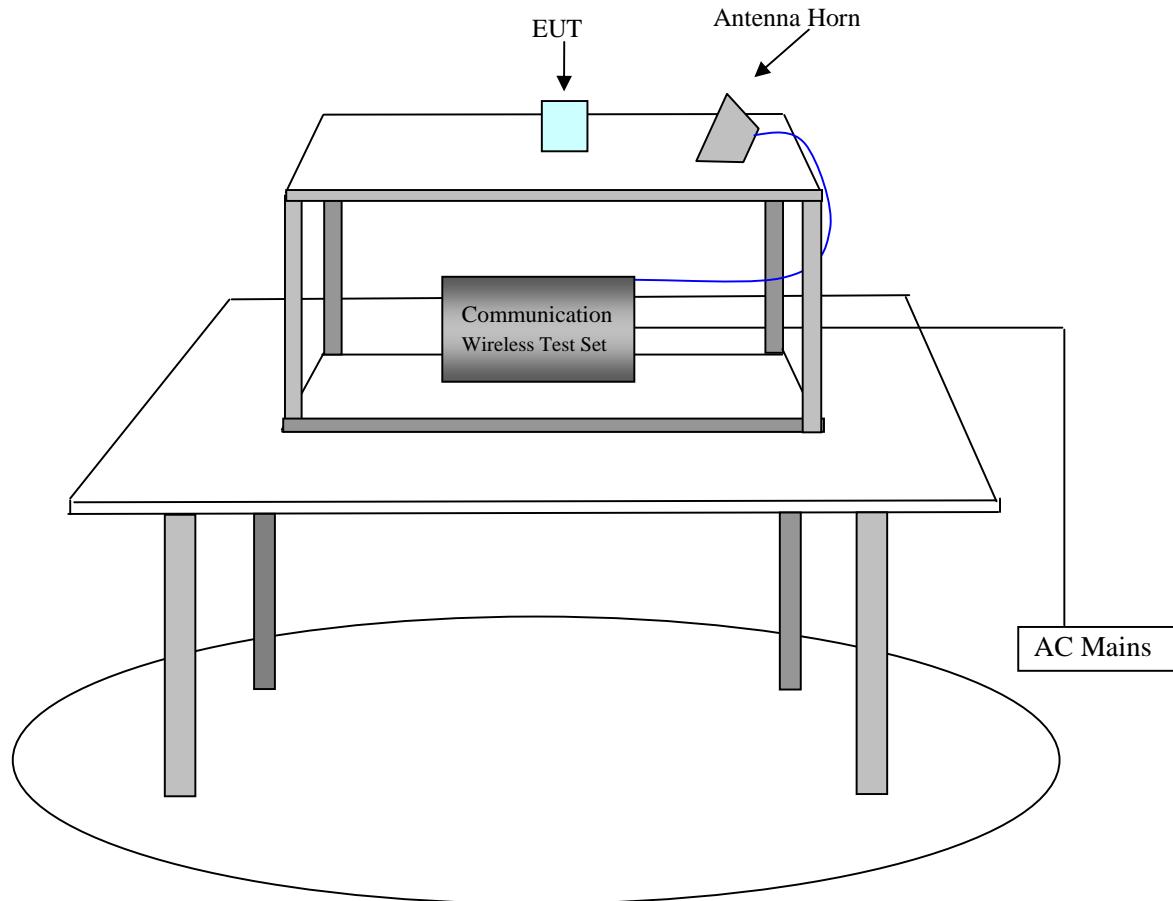
### **2.7 Power Supply and Line Filters**

N/A

### **2.8 Interface Ports and Cabling**

N/A

## 2.9 Test setup Block Diagram for radiated emissions tests



### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 2.1046 § 22.913	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	N/A
§ 2.1049 § 22.917	Out of Band Emissions, Occupied Bandwidth	Compliant
§ 2.1051, § 22.917	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1053 § 22.917 (a)	Field Strength of Spurious Radiation	Compliant
§ 22.917	Band Edge	Compliant
§ 2.1055 (a) § 2.1055 (d) § 22.355	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§2.1093	RF Exposure (SAR)	Compliant *

Note: \* Please refer to SAR report (Report Number: R0906172-SAR)

## 4 §2.1046 &§22.913(a) – RF OUTPUT POWER

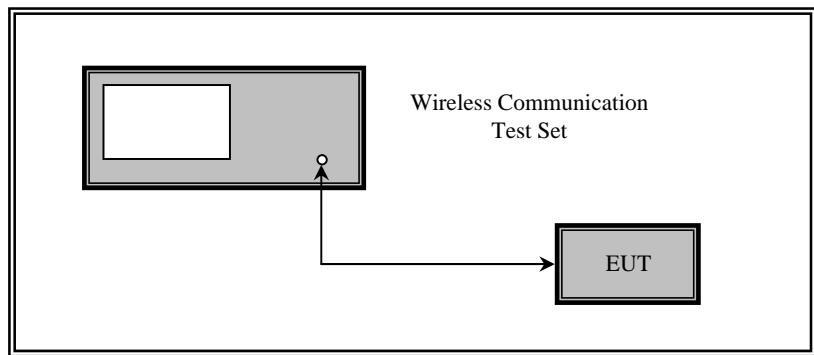
### 4.1 Applicable Standard

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

### 4.2 Test Procedure

#### Conducted:

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



#### Radiated (ERP and EIRP):

TIA-603-C §2.2.17

### 4.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-05-31
Agilent	Analyzer, Communications	E5155C	GB44051221	2010-04-23
Sunol Sciences	Antenna	JB1	A020106-1	2010-04-17
A.R.A	Horn Antenna	DRG-118/A	1132	2009-07-28
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2009-07-01
Ducommun	Pre-Amplifier	ALN-09173030-01	99-297-01R	2010-03-04
HP	Pre-Amplifier	8447D	2944A06639	2009-12-19

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

## 4.4 Summary of Test Results

### Environmental Conditions

#### Conducted

<b>Temperature:</b>	22~25 °C
<b>Relative Humidity:</b>	35~40 %
<b>ATM Pressure:</b>	101.5kPa

\* Testing performed by Victor Zhang on 2009-07-02 and by Jack Liu on 2009-07-09 to 2009-07-10

### Conducted Power

Mode	FED	REV	Low CH (824.7 MHz)	Middle CH (836.52 MHz)	High CH (848.31MHz)	Limit (dBm)
CDMA 1xRTT	RC1	RC1(S02)	24.29	24.63	23.66	38.45
		RC1(S055)	24.27	24.59	23.61	38.45
	RC2	RC2(S09)	24.15	24.68	23.52	38.45
		RC2(S055)	24.11	24.64	23.41	38.45
	RC3	RC3(S02)	24.35	24.75	23.89	38.45
		RC3(S055)	24.30	24.70	23.73	38.45
	RC4	RC4(S02)	24.08	24.62	23.58	38.45
		RC4(S055)	24.05	24.57	23.49	38.45
	RC5	RC5(S09)	24.11	24.43	23.37	38.45
		RC5(S055)	24.06	25.32	23.28	38.45

Note: Limit = 7 Watts = 38.45 dBm

### ERP

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	FCC Part 22H	
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
824.70	87.56	55	112	H	824.70	11.95	0	0.21	11.74	38.45	-26.71
824.70	98.88	187	156	V	824.70	23.62	0	0.21	23.41	38.45	-15.04
836.52	83.41	67	108	H	836.52	9.89	0	0.21	9.68	38.45	-28.77
836.52	95.68	187	155	V	836.52	23.32	0	0.21	23.11	38.45	-15.34
848.31	85.48	58	105	H	848.31	12.06	0	0.22	11.84	38.45	-26.61
848.31	97.83	186	154	V	848.31	24.86	0	0.22	24.64	38.45	-13.81

## **5 §2.1047 - MODULATION CHARACTERISTIC**

### **5.1 Applicable Standard**

According to FCC § 2.1047(d) and Part 22H, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## **6 §2.1049, §22.917 & §22.905 - OCCUPIED BANDWIDTH**

### **6.1 Applicable Standard**

Requirements: CFR 47, Section 2.1049, Section 22.901 and Section 22.917.

### **6.2 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 3 kHz and the -26 dB bandwidth was recorded.

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

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-03-25
Agilent	Analyzer, Communications	E5155C	GB44051221	2009-04-28

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

### **6.4 Summary of Test Results**

#### **Environmental Conditions**

<b>Temperature:</b>	24 ~25 °C
<b>Relative Humidity:</b>	35~40 %
<b>ATM Pressure:</b>	101.1~101.3kPa

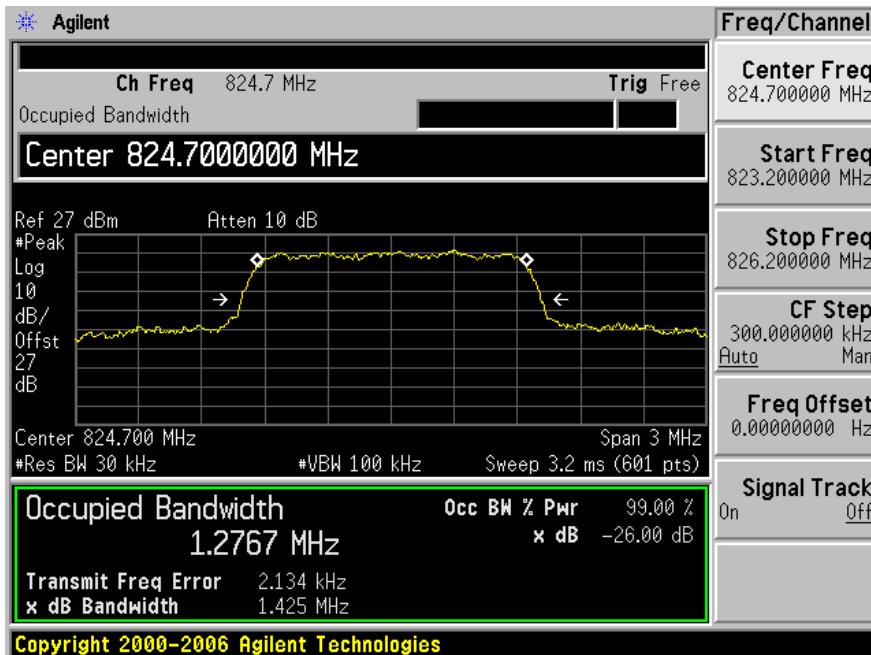
*\*Testing performed by Jack Liu on 2009-07-09 to 2009-07-10*

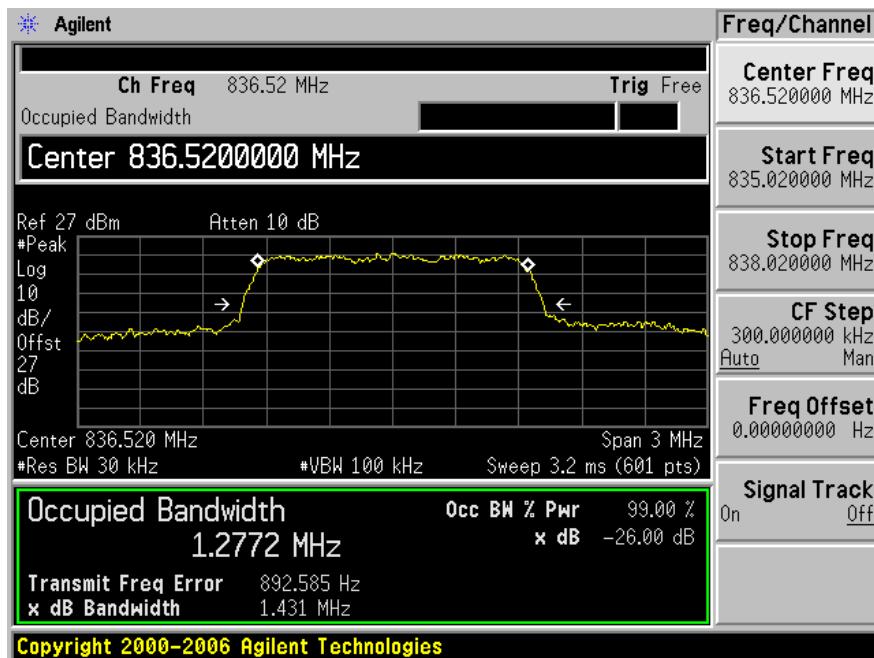
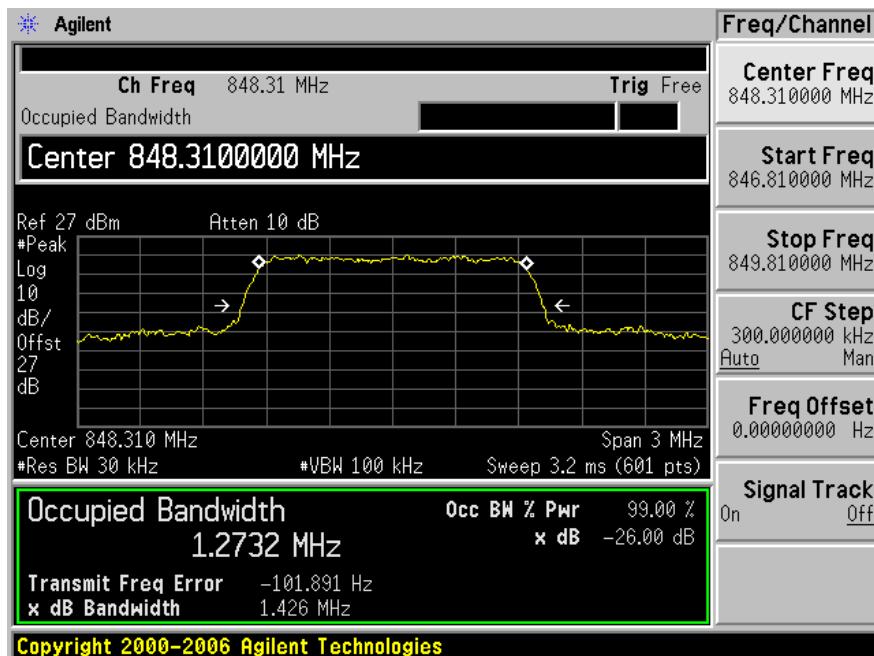
## 6.5 Test Data & Plots

Please refer to the following table and plots.

Channel	Frequency (MHz)	26 dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Low	824.70	1.425	1.2767
Middle	836.52	1.431	1.2772
High	848.31	1.426	1.2732

### Low Channel



**Middle Channel****High Channel**

## **7 §2.1051, §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **7.1 Applicable Standard**

Requirements: CFR 47, § 2.1051 and § 22.917.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

### **7.2 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.

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

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-03-25
Agilent	Analyzer, Communications	E5155C	GB44051221	2009-04-28

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

### **7.4 Environmental Conditions**

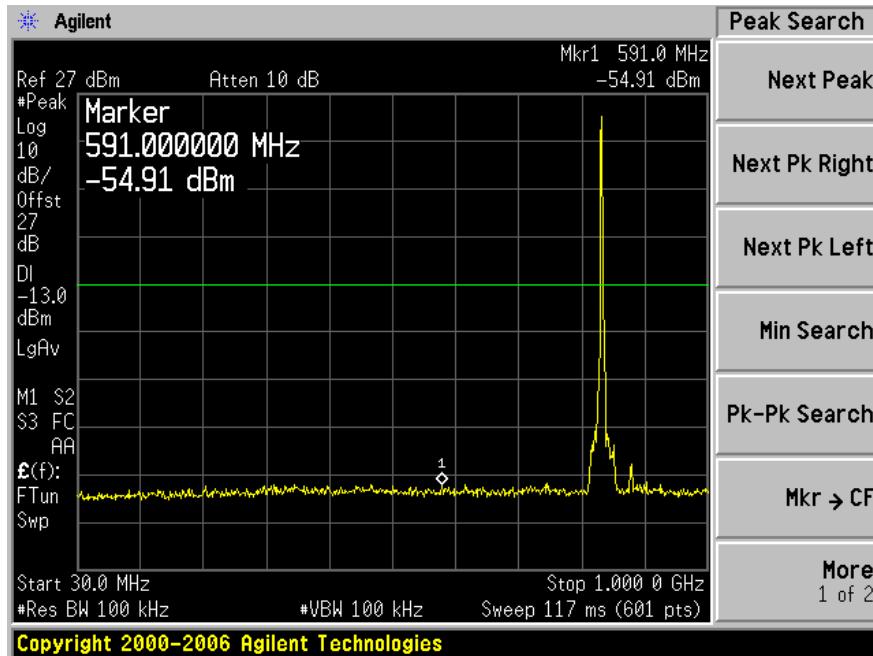
<b>Temperature:</b>	24 ~25 °C
<b>Relative Humidity:</b>	35~40 %
<b>ATM Pressure:</b>	101.1~101.3kPa

*\*Testing performed by Jack Liu on 2009-07-09 to 2009-07-10*

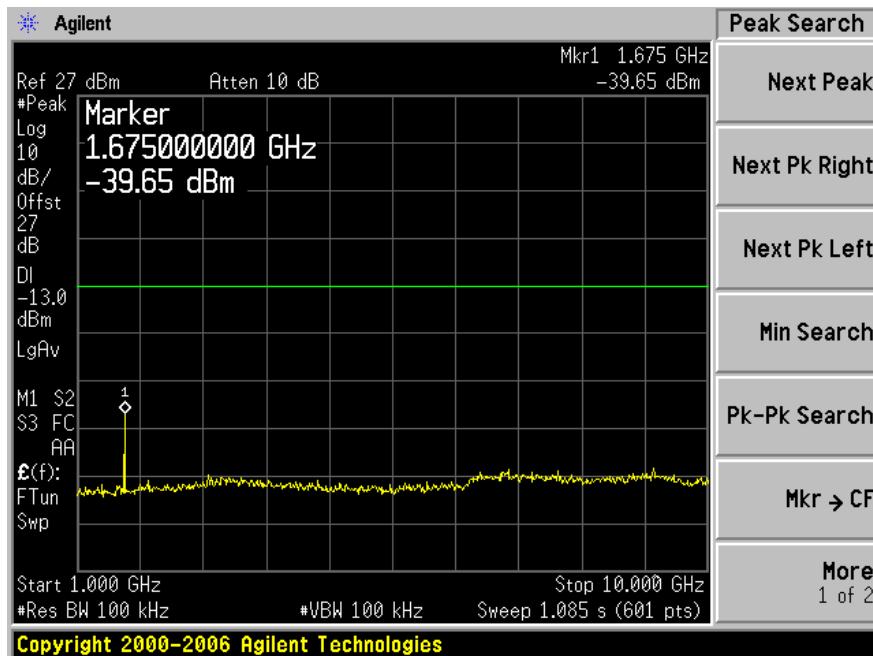
### **7.5 Test Data & Plots**

Please refer to the following plots.

## Middle Channel (f = 836.52 MHz)



Plot 1a: 30 MHz – 1 GHz



Plot 2a: 1 – 10 GHz

## 8 §2.1053 - RADIATED SPURIOUS EMISSIONS

### 8.1 Applicable Standard

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

### 8.2 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 =  $10 \log (\text{TX Power in Watts}/0.001)$  – the absolute level

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

### 8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-03-25
Agilent	Analyzer, Communications	E5155C	GB44051221	2009-04-28
Sunol Sciences	Antenna	JB1	A020106-1	2009-06-02
A.R.A	Horn Antenna	DRG-118/A	1132	2008-08-07
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2008-07-14
Ducommun	Pre-Amplifier	ALN-09173030-01	990297-01R	2009-06-03
HP	Pre-Amplifier	8447D	2944A06639	2009-06-26

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

## 8.4 Environmental Conditions

<b>Temperature:</b>	24 ~25 °C
<b>Relative Humidity:</b>	35~40 %
<b>ATM Pressure:</b>	101.1~101.3 Pa

\*Testing performed by Jack Liu on 2009-07-09 to 2009-07-10

## 8.5 Test Data & Plots

Worst case reading as follows:

Mode: Transmitting		
Margin (dB)	Frequency (MHz)	Antenna Polarization (Horizontal/Vertical)
-24.42	1673.04	Vertical

30 MHz -10 GHz Radiated Emission at 3-meter (Middle Channel, 836.52 MHz)

Frequency (MHz)	S.A. Amp. (dBuV)	Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Antenna Gain (dBi)	Cable Loss (dB)			
1673.04	63.65	202	116	V	1673.04	-46.36	9.3	0.36	-37.42	-13	-24.42
1673.04	62.6	125	203	H	1673.04	-47.56	9.3	0.36	-38.62	-13	-25.62
3346.08	54.4	344	100	H	3346.08	-49.88	9.9	0.53	-40.51	-13	-27.51
3346.08	52.29	150	100	V	3346.08	-52.55	9.9	0.53	-43.18	-13	-30.18

## 9 §22.917 – BAND EDGE

### 9.1 Applicable Standard

According to § 22.917, the power of any emissions 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.

### 9.2 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.

### 9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-03-25
Agilent	Analyzer, Communications	E5155C	GB44051221	2009-04-28

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

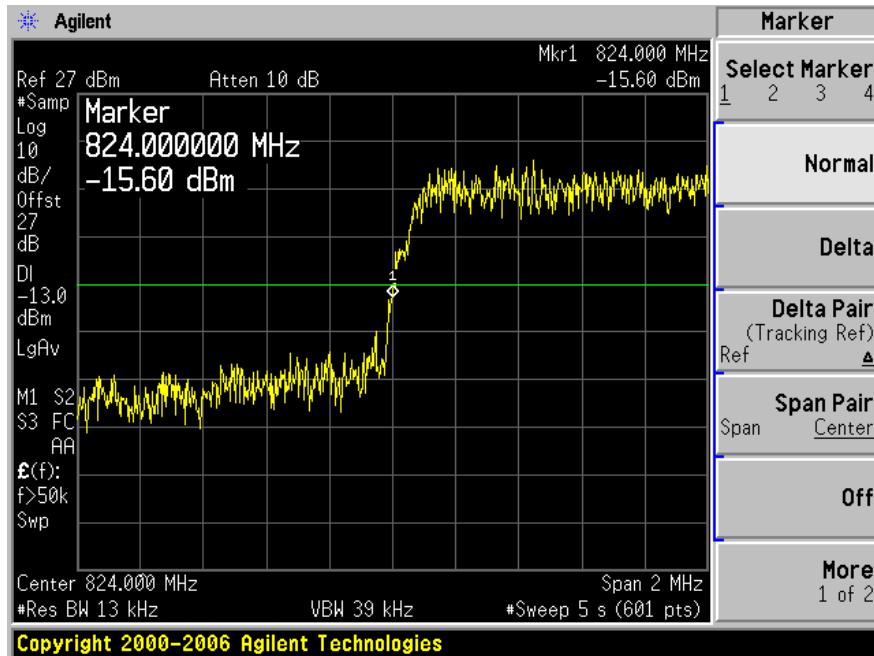
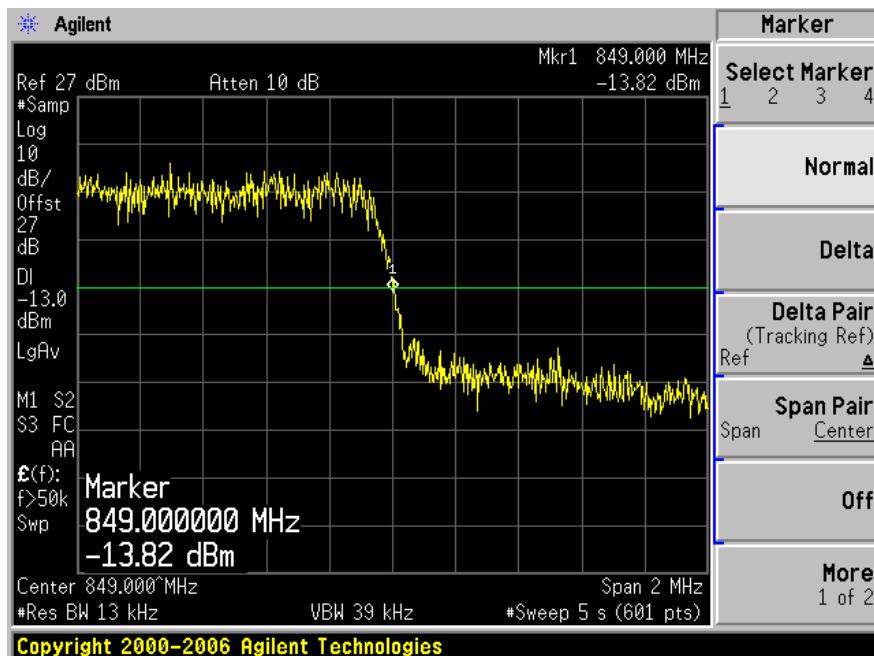
### 9.4 Environmental Conditions

Temperature:	24 ~25 °C
Relative Humidity:	35~40 %
ATM Pressure:	101.1~101.3kPa

\*Testing performed by Jack Liu on 2009-07-09 to 2009-07-10

### 9.5 Test Data & Plots

Please refer to the following plots.

**Lowest Channel****Highest Channel**

## 10 §2.1055 (a), §2.1055 (d) & §22.355 - FREQUENCY STABILITY

### 10.1 Applicable Standard

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

According to §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.

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	50.0
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

### 10.2 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 115% 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.

### 10.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Tenney	Temperature oven	Versa Tenn	12.431-8	N/A
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-03-25
Agilent	Analyzer, Communications	E5155C	GB44051221	2009-04-28

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

## 10.4 Environmental Conditions

<b>Temperature:</b>	22 °C
<b>Relative Humidity:</b>	43 %
<b>ATM Pressure:</b>	101.5kPa

\* Testing performed by Victor Zhang on 2009-07-02..

## 10.5 Test Data & Plots

### 1) Frequency Stability versus Temperature:

Reference Frequency: 836.52 MHz, Limit: 2.5 ppm				
Test Environment		Frequency Measure with Time Elapsed		
Temperature (°C)	Power Supplied (Vdc)	Measured Frequency (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	836.5200752	0.089896237	2.5
40	3.7	836.5198991	-0.120618754	2.5
30	3.7	836.520078	0.093243437	2.5
20	3.7	836.519895	-0.125520011	2.5
0	3.7	836.519916	-0.100416009	2.5
-20	3.7	836.5201388	0.165925501	2.5
-30	3.7	836.5200752	0.089896237	2.5

### 2) Frequency Stability versus Voltage:

Reference Frequency: 836.52 MHz, Limit: 2.5 ppm				
Test Environment		Frequency Measure with Time Elapsed		
Temperature (°C)	Power Supplied (Vdc)	Measured Frequency (Hz)	Frequency Error (ppm)	Limit (ppm)
20	3.5	836.5201015	0.121336011	2.5
20	3.7	836.520078	0.093243437	2.5

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## **11 §1.1307(b) (1) & §2.1093 - RF EXPOSURE**

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### **11.1 Applicable Standard**

According to §1.1310 and §2.1093 SAR Evaluation is required.

### **11.2 Test Result**

Compliant, Refer to SAR Report (Report Number: R0906172-SAR)