

# FCC PART 22, 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT



For

**VeriFone Inc.**

3755 Atherton Road, Rocklin, CA 95765

**FCC ID: B32OMNI56XXC**

2004-08-11

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> Wireless POS Terminal
<b>Test Engineer:</b> Ling Zhang / 	
<b>Report No.:</b> R0407211	
<b>Test Date:</b> 2004-07-26/2004-08-02	
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**Note:** This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

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## GENERAL INFORMATION

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

The *VeriFone Inc.* product, FCC ID:B32OMNI56XXC or the "EUT" as referred to in this report is a Wireless POS Terminal, which is measured approximately 209.2mmL x 101.8mmW x 72mmH.

*\* The test data gathered are from typical production sample, serial number: 60137F09-01, provided by the manufacturer.*

### Objective

This type approval report is prepared on behalf of *VeriFone Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and B, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

It is also prepared in accordance with Part 2, Subpart J, Part 15, Subparts A and B, 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 output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

### 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 15 Subpart B – Unintentional Radiators  
Part 22 Subpart H - Public Mobile Services  
Part 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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.

### Test Facility

The Open Area Test site used by BACL Corp. to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BAACL 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 has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules and Article 8 of the VCCI regulations. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. 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, BAACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 2002, Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods.

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## SYSTEM TEST CONFIGURATION

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### Justification

The EUT was configured for testing according to ANSI C63.4-2001.

The final qualification test was performed with the EUT operating at normal mode.

### Block Diagram

Please refer to Exhibit D.

### Equipment Modifications

No modifications were made to the EUT.

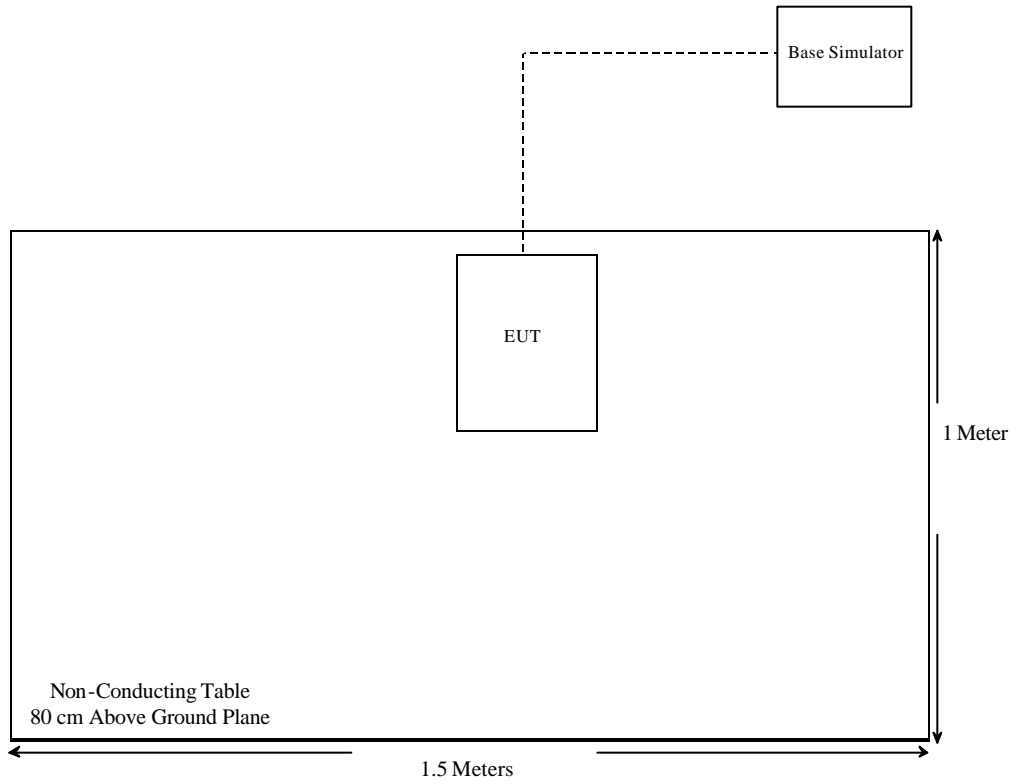
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Agilent	Wireless Communication Test Set	E5515C	GB44051221	None

### Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
VeriFone Inc.	I.T.E Power Supply	UP036C1090	CPS10936-3A	DOC

### Test Setup Block Diagram



## SUMMARY OF TEST RESULTS

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§2.1093	RF Exposure	Compliant
§ 15.107	Conducted Emissions	Compliant
§ 2.1046, § 22.912 (d) § 24.232	RF Output Power	Compliant
§ 2.1046, § 22.913 (a) § 24.232	Conducted Output Power	N/A
§ 2.1049 § 22.917 § 22.905 § 24.238	Out of Band Emission, Occupied Bandwidth	Compliant
§ 2.1051, § 22.917 § 24.238(a)	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1055 (a) § 2.1055 (d) § 22.355 § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 22.917 §24.238	Band Edge	Compliant



## §2.1047 - MODULATION CHARACTERISTIC

### Applicable Standard

Requirement: FCC § 2.1047.

### Test Procedure

CDMA digital mode is used by EUT.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

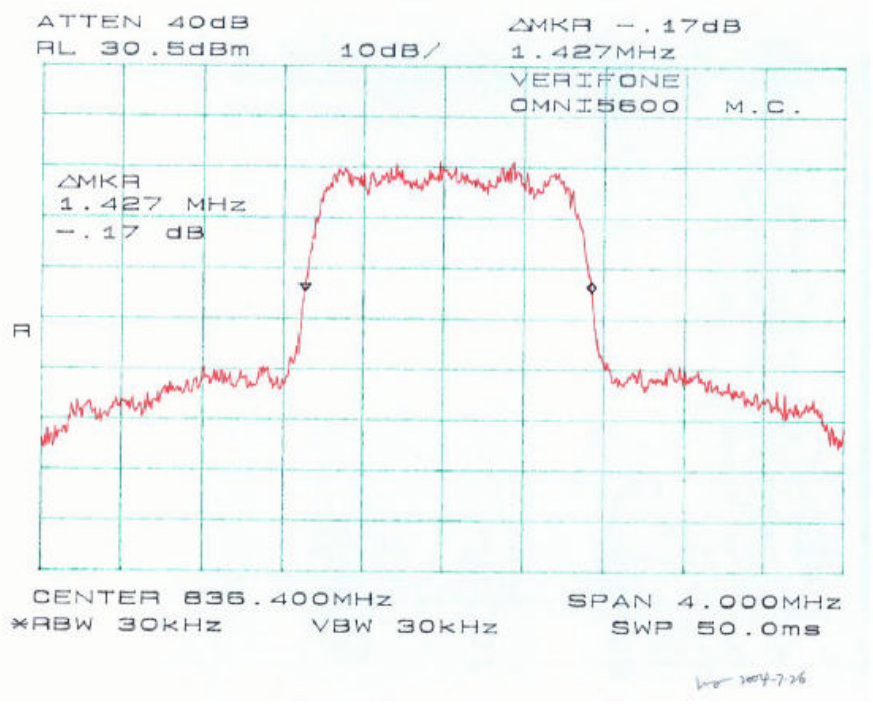
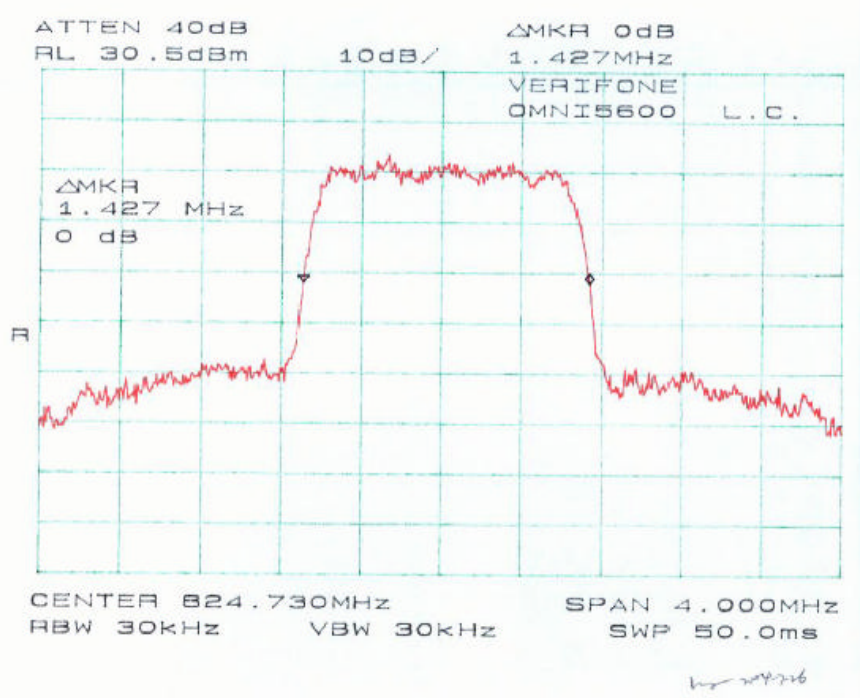
### Environmental Conditions

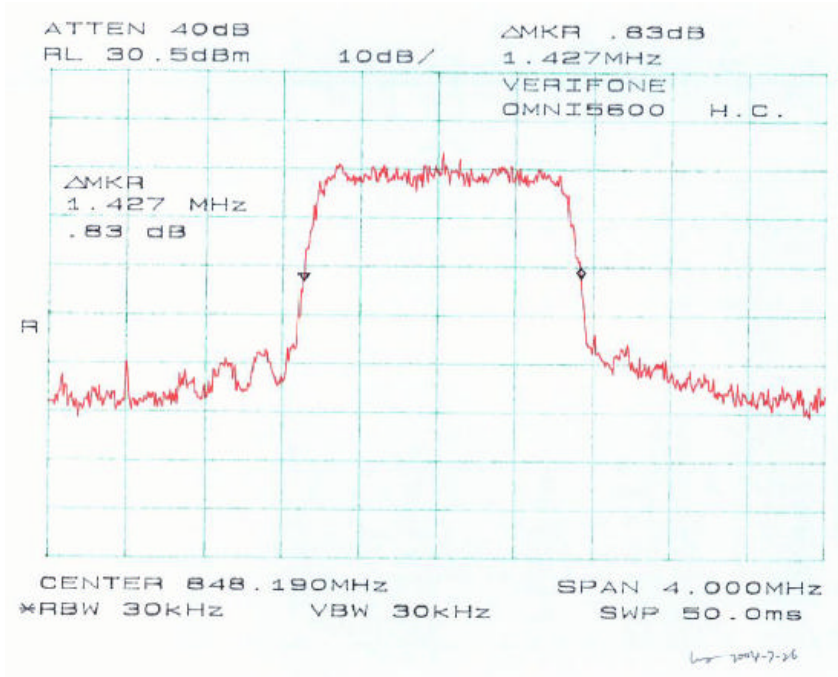
Temperature:	19°C
Relative Humidity:	60%
ATM Pressure:	1020 mbar

### Test Results

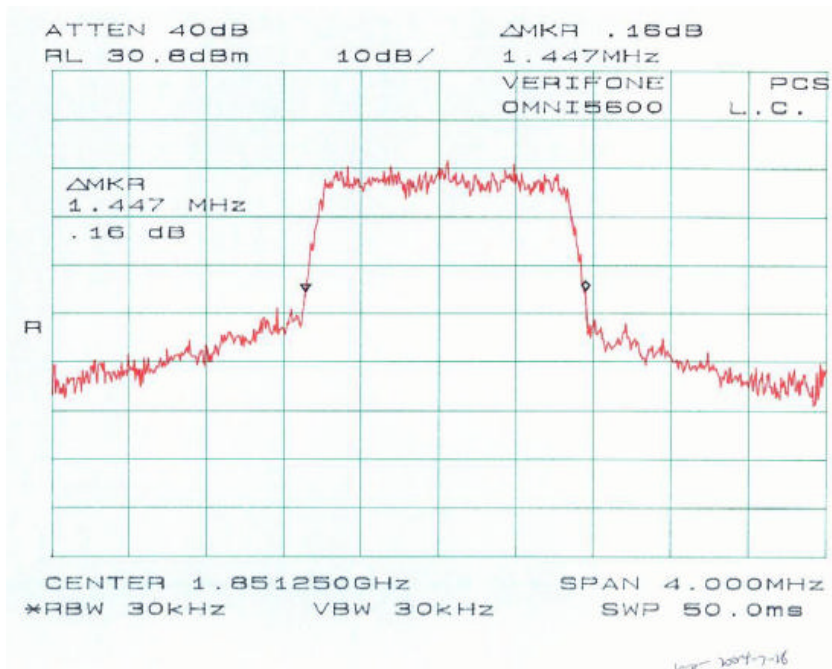
Please refer to the hereinafter plots.

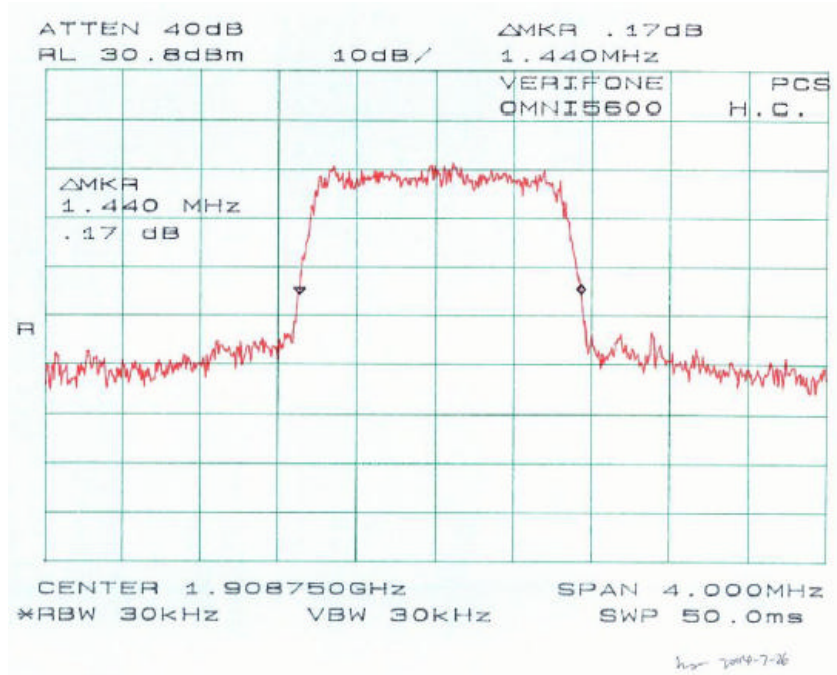
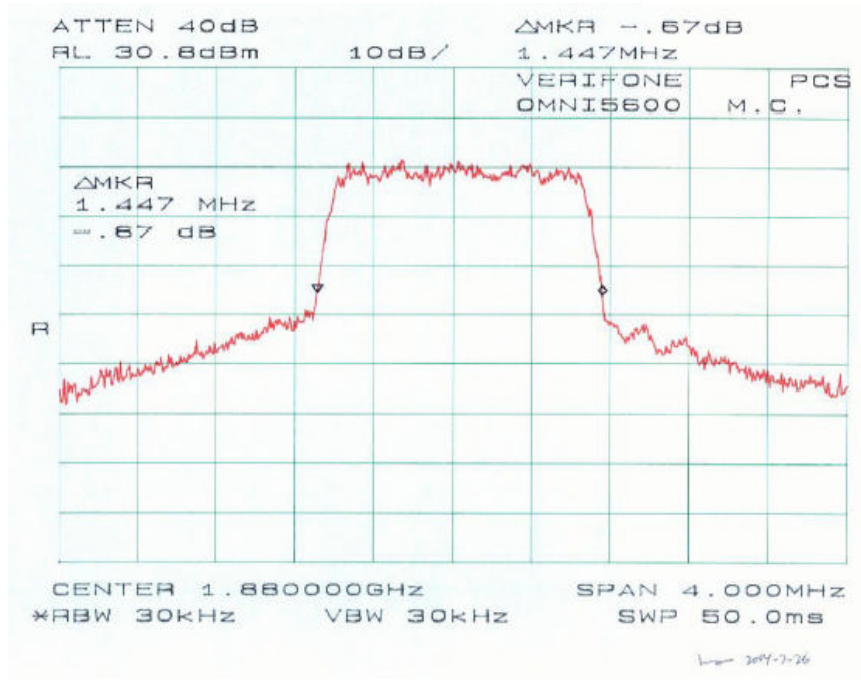
Plots of Modulation Characteristic for Part22





Plots of Modulation Characteristic for Part24





## §2.1053 - SPURIOUS RADIATED EMISSIONS

### Applicable Standard

Requirements: CFR 47, § 2.1053.

### 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<sub>10</sub> (power out in Watts)

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8565E	3946A00131	2004-06-30
HP	Amplifier, Microwave	8449E	3147A00400	2004-03-14
HP	Amplifier, Pre	8447E	1937A01057	2004-08-04
A.R.A	Antenna, Horn, DRG	DRG-118A	1132	2003-09-30
ETS	Biconical Antenna	3110B	9603-2315	2003-10-11
ETS	Log Periodic Antenna	3148	0004-1155	2003-10-11
AH System	Horn Antenna	SAS-200/511	2455-261	2004-08-01

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

### Environmental Conditions

Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

\* The testing was performed by Ling Zhang on 2004-07-26.

**Test Result for Antenna 1**

FCC Part 22: CDMA 800

Low Frequency: -33.9 dB at 1649.46 MHz  
 Middle Frequency: -33.3 dB at 1672.80 MHz  
 High Frequency: -32.6 dB at 1696.38 MHz

FCC Part 24: CDMA 1900

Low Frequency: -14.7 dB at 3702.5 MHz  
 Middle Frequency: -14.5 dB at 3760 MHz  
 High Frequency: -15.6 dB at 3817.5 MHz

**Test Data for CDMA800**

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna		Frequency	Level	Antenna	Cable	Absolute	FCC	FCC
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level	Limit	Margin
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Corrected	dB	dBm	dBm	dB
Low Channel											
824.73	117.67	150	1.8	V	824.73	21.3	0	0.8	20.5		
824.73	108.83	270	1.2	H	824.73	13.5	0	0.8	12.7		
1649.46	50.13	180	1.0	V	1649.46	-54.0	8.3	1.2	-46.9	-13	-33.9
1649.46	49.50	330	1.2	H	1649.46	-54.5	8.3	1.2	-47.4	-13	-34.4
2474.19	48.17	180	1.5	V	2474.19	-57.2	9.9	1.5	-48.8	-13	-35.8
2474.19	48	300	1.4	H	2474.19	-57.5	9.9	1.5	-49.1	-13	-36.1
MIDDLE CHANNEL											
836.4	118.17	330	1.6	V	836.4	21.7	0	0.8	20.9		
836.4	110.50	300	1.2	H	836.4	14.9	0	0.8	14.1		
1672.8	50.67	250	1.2	H	1672.8	-53.4	8.3	1.2	-46.3	-13	-33.3
1672.8	50.83	270	1.8	V	1672.8	-53.5	8.3	1.2	-46.4	-13	-33.4
2509.2	48.50	270	2.0	V	2509.2	-56.8	9.9	1.5	-48.4	-13	-35.4
2509.2	48.17	270	1.5	H	2509.2	-57.4	9.9	1.5	-49.0	-13	-36.0
HIGH CHANNEL											
848.19	119.50	180	1.8	V	848.19	22.9	0	0.8	22.1		
848.19	110.67	250	1.5	H	848.19	15.0	0	0.8	14.2		
1696.38	51.50	180	1.6	V	1696.38	-52.7	8.3	1.2	-45.6	-13	-32.6
1696.38	51	250	1.4	H	1696.38	-53.1	8.3	1.2	-46.0	-13	-33.0
2544.57	48.67	200	1.8	V	2544.57	-56.6	9.9	1.5	-48.2	-13	-35.2
2544.57	48.50	270	1.5	H	2544.57	-56.9	9.9	1.5	-48.5	-13	-35.5

**Test Data for CDMA1900**

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna		Frequency	Level	Antenna	Cable	Absolute	FCC	FCC
Frequency	Ampl.	Angle	Height	Polar	Frequency	Level	Gain	Loss	Level	Limit	Margin
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	Corrected	dB	dBm	dBm	dB
Low Channel											
1851.25	126	200	1.6	V	1851.25	16.9	8.3	1.3	23.90		
1851.25	124.33	300	1.8	H	1851.25	15.0	8.3	1.3	22.00		
3702.50	70.67	200	1.1	V	3702.50	-36.0	10.3	2.0	-27.70	-13	-14.70
3702.50	66.67	15	2.0	H	3702.50	-40.2	10.3	2.0	-31.90	-13	-18.90
5553.75	60.83	270	1.6	V	5553.75	-45.8	10.6	2.55	-37.75	-13	-24.75
5553.75	56.33	30	1.8	H	5553.75	-49.3	10.6	2.55	-41.25	-13	-28.25
7405	53.50	60	2.0	V	7405	-52.8	10.2	3.3	-45.90	-13	-32.90
7405	50.67	300	1.0	H	7405	-55.5	10.2	3.3	-48.60	-13	-35.60
MIDDLE CHANNEL											
1880	126.33	180	1.8	V	1880	17.1	8.3	1.3	24.10		
1880	125.67	330	1.1	H	1880	16.2	8.3	1.3	23.20		
3760	71	180	1.2	V	3760	-35.8	10.3	2.0	-27.50	-13	-14.50
3760	67	330	1.8	H	3760	-40.1	10.3	2.0	-31.80	-13	-18.80
5640	61	60	2.0	V	5640	-45.6	10.6	2.55	-37.55	-13	-24.55
5640	56.33	300	1.6	H	5640	-49.2	10.6	2.55	-41.15	-13	-28.15
7520	52.5	30	1.2	V	7520	-53.5	10.2	3.3	-46.60	-13	-33.60
7520	51.17	270	1.6	H	7520	-55.0	10.2	3.3	-48.10	-13	-35.10
HIGH CHANNEL											
1908.75	125.17	150	1.8	V	1908.75	16.3	8.3	1.3	23.30		
1908.75	124.50	0	1.1	H	1908.75	15.1	8.3	1.3	22.10		
3817.50	69.83	180	1.6	V	3817.50	-36.9	10.3	2.0	-28.60	-13	-15.60
3817.50	66.50	300	2.0	H	3817.50	-41.5	10.3	2.0	-33.20	-13	-20.20
5726.25	60.67	60	2.0	V	5726.25	-45.8	10.6	2.55	-37.75	-13	-24.75
5726.25	56	0	1.8	H	5726.25	-49.5	10.6	2.55	-41.45	-13	-28.45
7635	52.10	60	2.2	V	7635	-53.8	10.2	3.3	-46.90	-13	-33.90
7635	51.33	300	1.8	H	7635	-55.1	10.2	3.3	-48.20	-13	-35.20

**Test Result for Antenna 2**

FCC Part 22: CDMA 800

Low Frequency: -32.1 dB at 1649.46 MHz  
 Middle Frequency: -31.6 dB at 1672.80 MHz  
 High Frequency: -31.9 dB at 1696.38 MHz

FCC Part 24: CDMA 1900

Low Frequency: -17.7 dB at 3702.5 MHz  
 Middle Frequency: -17.0 dB at 3760 MHz  
 High Frequency: -17.7 dB at 3817.5 MHz

**Test Data for CDMA800**

EUT					Generator					Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
Low Channel											
824.73	115.17	180	1.6	V	824.73	19.2	0	0.8	18.4		
824.73	116.33	270	1.4	H	824.73	20.5	0	0.8	19.7		
1649.46	52	330	1.2	H	1649.46	-52.2	8.3	1.2	-45.1	-13	-32.1
1649.46	51.83	220	1.5	V	1649.46	-52.7	8.3	1.2	-45.6	-13	-32.6
2474.19	51.67	300	1.6	H	2474.19	-54.2	9.9	1.5	-45.8	-13	-32.8
2474.19	51.50	270	1.8	V	2474.19	-54.5	9.9	1.5	-46.1	-13	-33.1
MIDDLE CHANNEL											
836.4	116.33	0	2.0	V	836.4	20.2	0	0.8	19.4		
836.4	117.67	270	1.4	H	836.4	21.6	0	0.8	20.8		
1672.8	52.83	330	1.6	H	1672.8	-51.7	8.3	1.2	-44.6	-13	-31.6
1672.8	52.33	30	1.6	V	1672.8	-52.2	8.3	1.2	-45.1	-13	-32.1
2509.2	52.67	270	1.4	V	2509.2	-53.5	9.9	1.5	-45.1	-13	-32.1
2509.2	51.67	300	1.6	H	2509.2	-54.1	9.9	1.5	-45.7	-13	-32.7
HIGH CHANNEL											
848.19	116.67	220	1.4	V	848.19	20.5	0	0.8	19.7		
848.19	117.67	300	1.2	H	848.19	21.6	0	0.8	20.8		
1696.38	52.50	270	1.4	H	1696.38	-52.0	8.3	1.2	-44.9	-13	-31.9
1696.38	52	180	1.5	V	1696.38	-52.5	8.3	1.2	-45.4	-13	-32.4
2544.57	51.50	15	1.0	H	2544.57	-54.3	9.9	1.5	-45.9	-13	-32.9
2544.57	51.83	200	1.6	V	2544.57	-54.5	9.9	1.5	-46.1	-13	-33.1



**Test Data for CDMA1900**

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna		Frequency	Level	Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	MHz	dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
<b>Low Channel</b>											
1851.25	125	0	1.8	V	1851.25	15.9	8.3	1.3	22.90		
1851.25	125.67	330	1.4	H	1851.25	16.2	8.3	1.3	23.20		
3702.50	67.67	300	1.6	V	3702.50	-39.0	10.3	2.0	-30.70	-13	-17.70
3702.50	65	270	1.5	H	3702.50	-41.8	10.3	2.0	-33.50	-13	-20.50
5553.75	60.17	220	1.8	V	5553.75	-46.2	10.6	2.55	-38.15	-13	-25.15
5553.75	56.50	0	1.8	H	5553.75	-49.1	10.6	2.55	-41.05	-13	-28.05
7405	51.50	330	1.8	V	7405	-54.5	10.2	3.3	-47.60	-13	-34.60
7405	51.33	330	1.6	H	7405	-55.0	10.2	3.3	-48.10	-13	-35.10
<b>MIDDLE CHANNEL</b>											
1880	125	0	1.8	V	1880	15.8	8.3	1.3	22.80		
1880	125.17	0	1.3	H	1880	15.7	8.3	1.3	22.70		
3760	68.33	200	1.3	V	3760	-38.3	10.3	2.0	-30.00	-13	-17.00
3760	65.33	330	1.8	H	3760	-41.5	10.3	2.0	-33.20	-13	-20.20
5640	60.50	330	1.6	V	5640	-46.0	10.6	2.55	-37.95	-13	-24.95
5640	57.83	0	1.8	H	5640	-48.7	10.6	2.55	-40.65	-13	-27.65
7520	52.17	0	1.8	V	7520	-53.2	10.2	3.3	-46.30	-13	-33.30
7520	51.83	300	1.4	H	7520	-54.6	10.2	3.3	-47.70	-13	-34.70
<b>HIGH CHANNEL</b>											
1908.75	124.17	0	1.8	V	1908.75	15.4	8.3	1.3	22.40		
1908.75	125	330	1.6	H	1908.75	15.5	8.3	1.3	22.50		
3817.50	67.50	330	2.0	V	3817.50	-39.0	10.3	2.0	-30.70	-13	-17.70
3817.50	65.17	300	1.8	H	3817.50	-42.8	10.3	2.0	-34.50	-13	-21.50
5726.25	59.83	180	1.8	V	5726.25	-46.2	10.6	2.55	-38.15	-13	-25.15
5726.25	55.67	270	1.6	H	5726.25	-50.0	10.6	2.55	-41.95	-13	-28.95
7635	50.33	300	2.0	V	7635	-54.5	10.2	3.3	-47.60	-13	-34.60
7635	51.17	0	1.8	H	7635	-55.0	10.2	3.3	-48.10	-13	-35.10

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## **§2.1046, §22.912(d), & §24.232 - RF POWER OUTPUT**

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### **Applicable Standard**

According to FCC §2.1046 and §24.232 (1), mobile/portable stations are limited to 2 watts EIRP. According to FCC §22.912(d), the ERP of mobile transmitters must not exceed 7 watts.

### **Test Procedure**

1. On a test site, the EUT shall be placed at 1.5m height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the quasi-peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a Dipole (for frequency below 1GHz, or Horn (for frequency above 1GHz).
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

17. The measure of the effective radiated power is the large of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8565E	3946A00131	2004-06-30
HP	Amplifier, Microwave	8449E	3147A00400	2004-03-14
HP	Amplifier, Pre	8447E	1937A01057	2004-08-04
A.R.A	Antenna, Horn, DRG	DRG-118A	1132	2003-09-30
ETS	Biconical Antenna	3110B	9603-2315	2003-10-11
ETS	Log Periodic Antenna	3148	0004-1155	2003-10-11
AH System	Horn Antenna	SAS-200/511	2455-261	2004-08-01

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

### Environmental Conditions

Temperature:	19° C
Relative Humidity:	60%
ATM Pressure:	1020 mbar

### Test Results for Antenna 1

*For CDMA800:*

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	ERP (dBm)
824.73	21.3	0	0.8	20.5
836.40	21.7	0	0.8	20.9
848.19	22.9	0	0.8	22.1

*For CDMA1900 :*

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	EIRP (dBm)
1851.25	16.9	8.3	1.3	23.9
1880.00	17.1	8.3	1.3	24.1
1908.75	16.3	8.3	1.3	23.3

**Test Results for Antenna 2***For CDMA800:*

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	ERP (dBm)
824.73	20.5	0	0.8	19.7
836.40	21.6	0	0.8	20.8
848.19	21.6	0	0.8	20.8

*For CDMA1900 :*

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	EIRP (dBm)
1851.25	17.7	8.3	1.3	24.7
1880.00	16.8	8.3	1.3	23.8
1908.75	16.5	8.3	1.3	23.5

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$17.7 + 8.3 - 1.3 = 24.7$$

## §2.1046, §22.913(a), & §24.232 – CONDUCTED 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.

According to FCC §2.1046 and §24.232 (a), in no case may the peak output power of a base station transmitter exceed 100 watt.

### Test Procedure

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

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8564E	3943A01781	2003-08-25
HP	Plotter	HP7475A	2541A49659	Not Required

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

### Environmental Conditions

Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

\* The testing was performed by Ling Zhang on 2004-07-26.

### Test Results

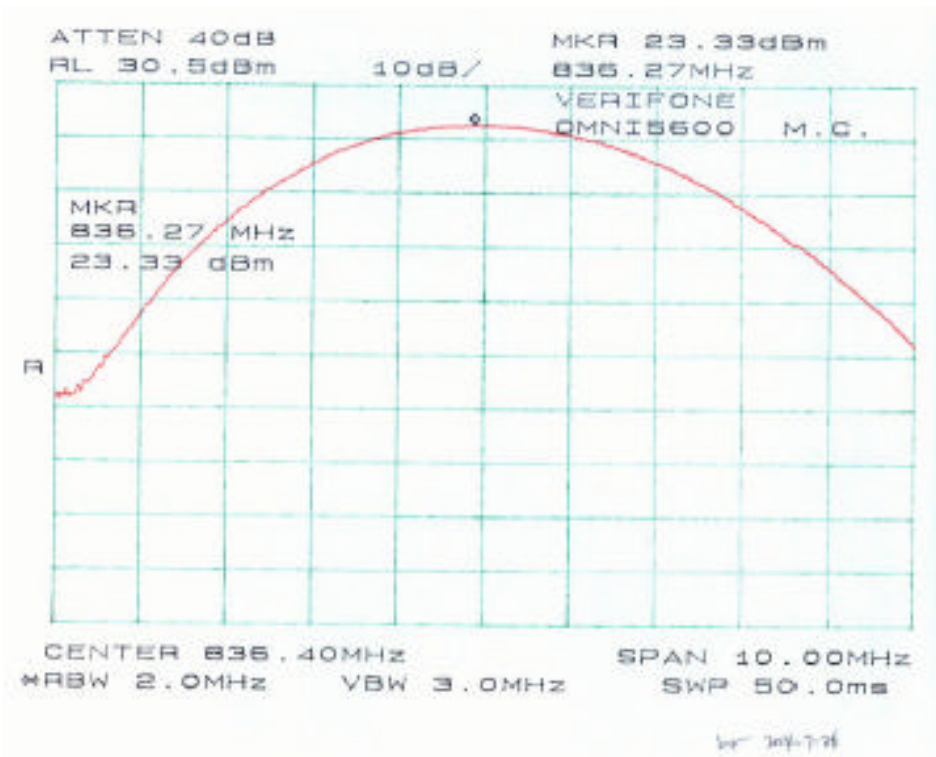
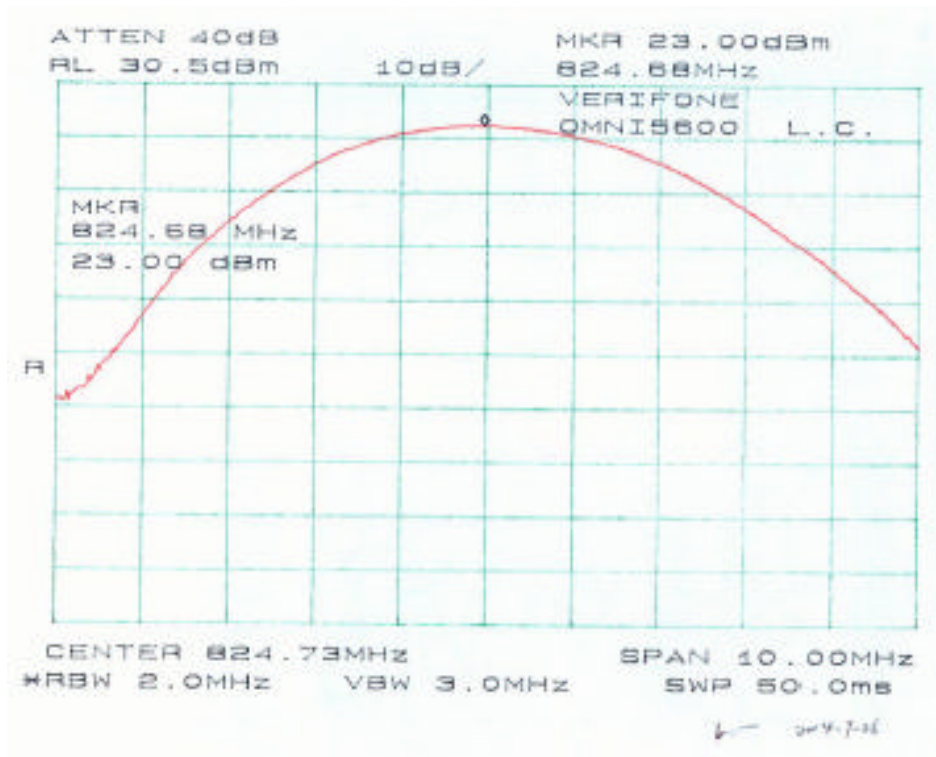
Part 22:

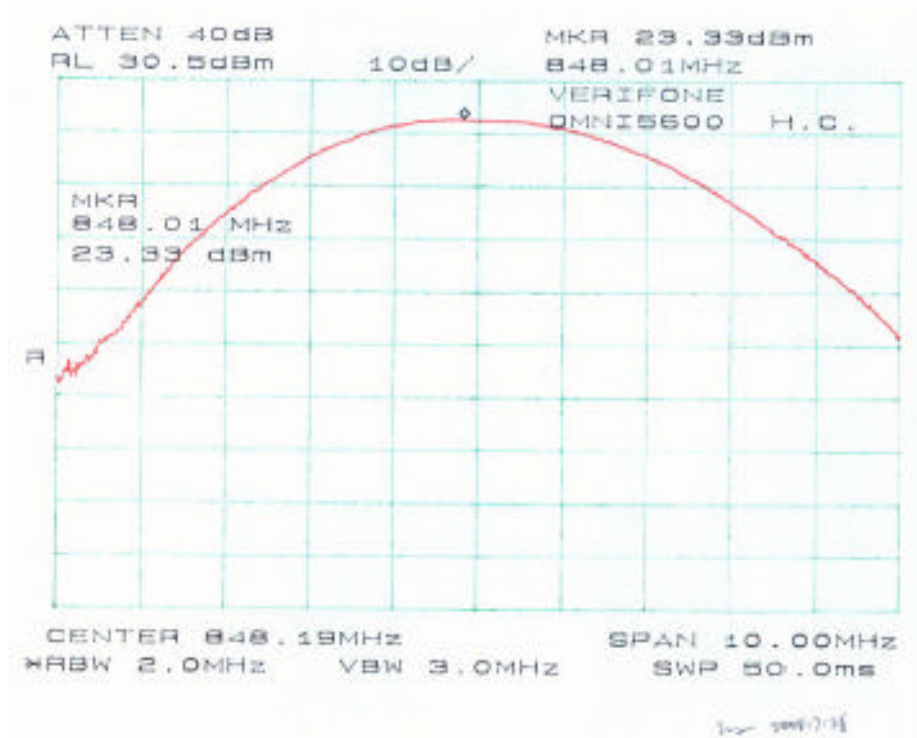
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	824.68	23.00	0.199	7
MIDDLE	836.27	23.33	0.215	7
HIGH	848.01	23.33	0.215	7

Part 24:

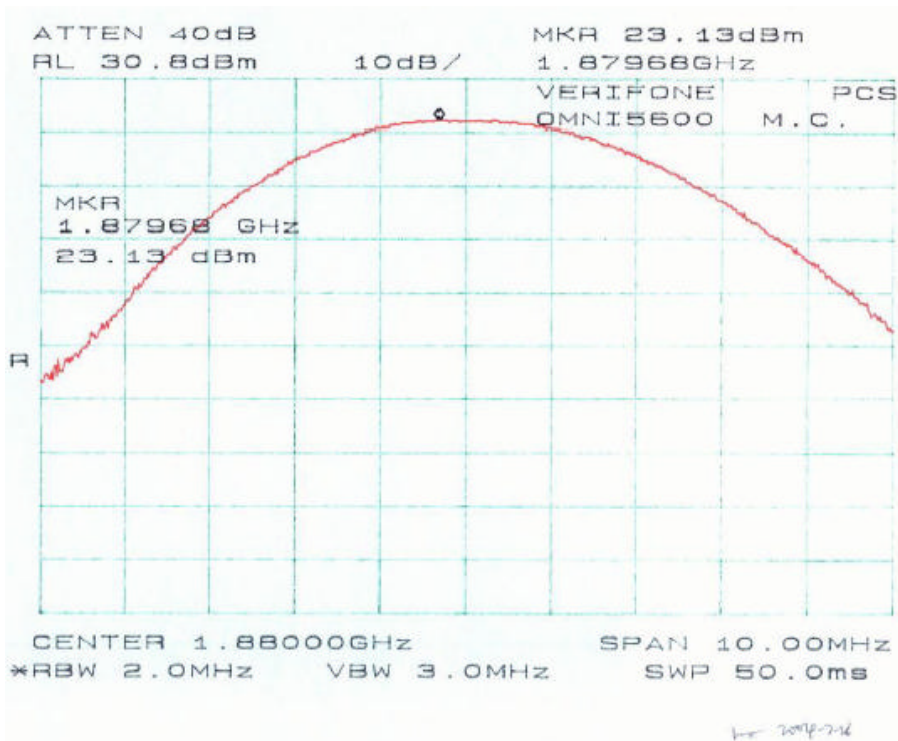
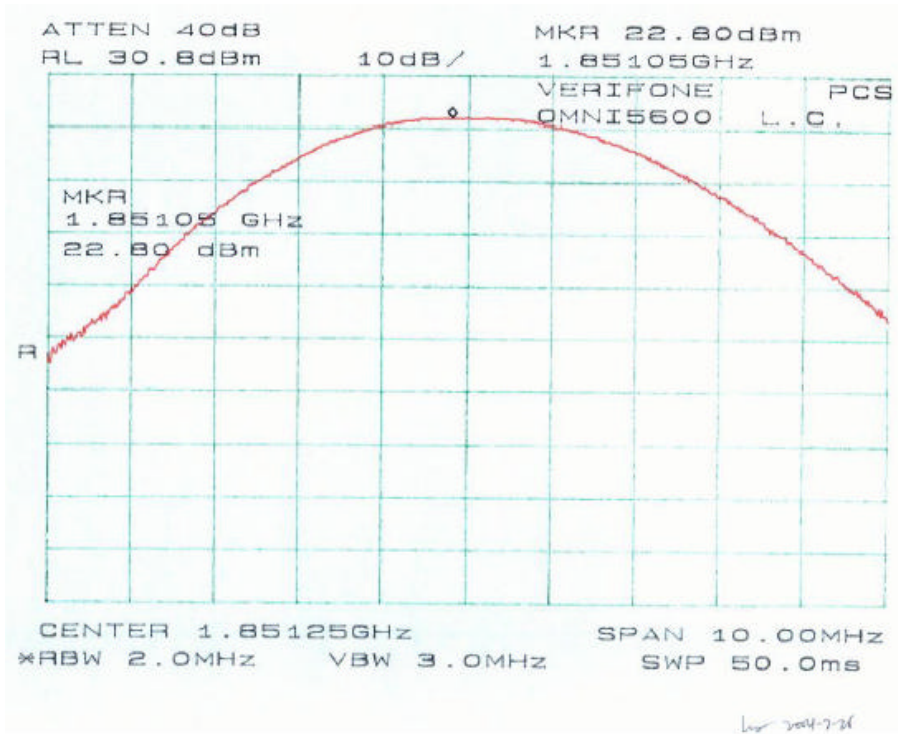
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	1851.05	22.80	0.191	100
MIDDLE	1879.68	23.13	0.206	100
HIGH	1908.45	22.80	0.191	100

Plots of Conducted Output Power for Part 22

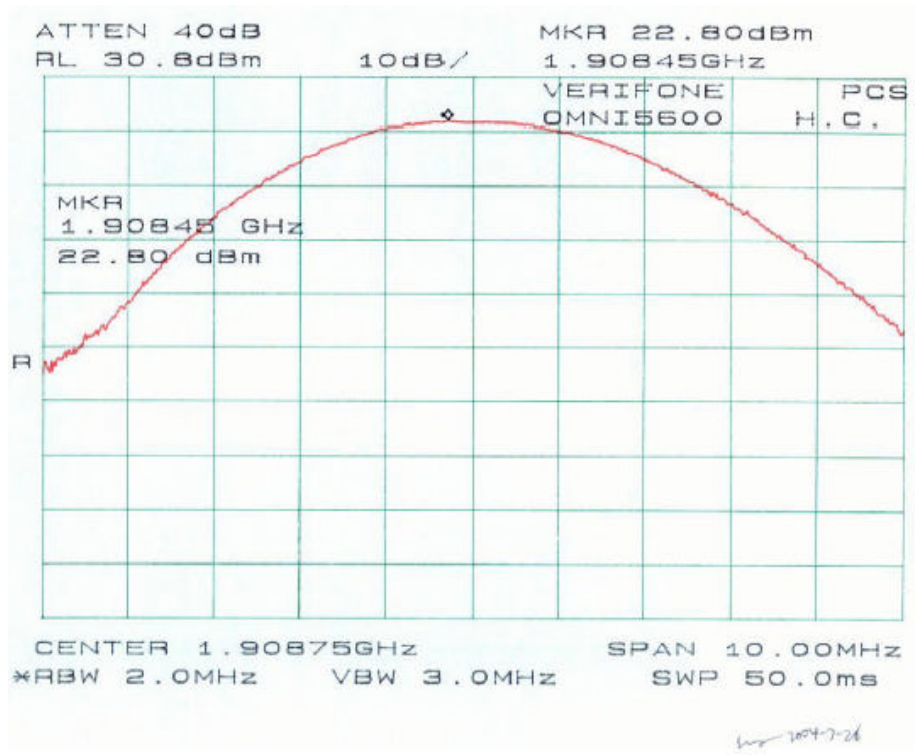




Plots of Conducted Output Power for Part24







## **§2.1049, §22.917, §22.905, & §24.238 - OCCUPIED BANDWIDTH**

### **Applicable Standard**

Requirements: CFR 47, Section 2.1049, Section 22.901, Section 22.917 and Section 24.238.

### **Test Procedure**

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

The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the 26 dB bandwidth was recorded.

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

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal. Date</b>
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

### **Environmental Conditions**

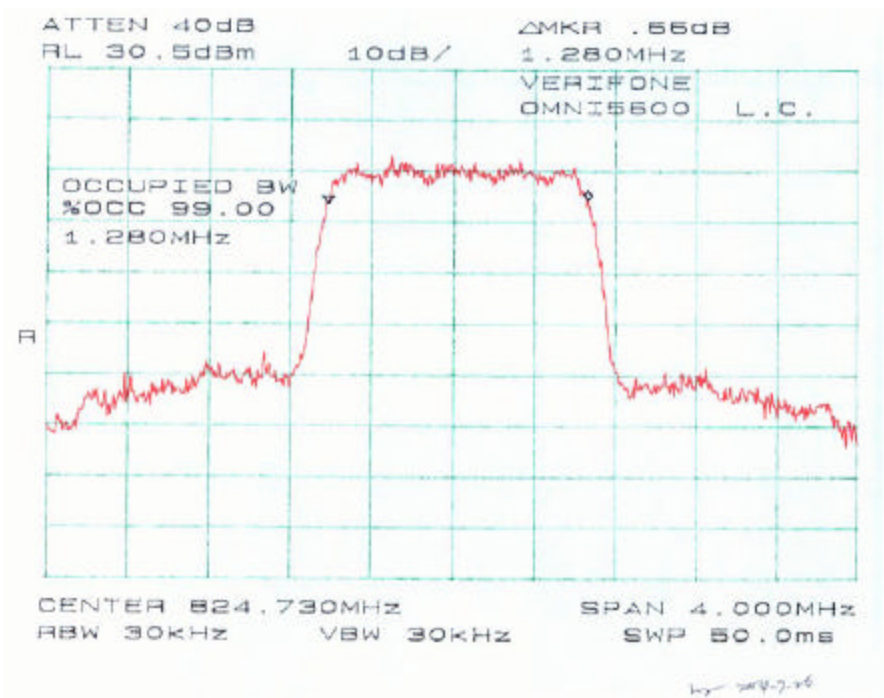
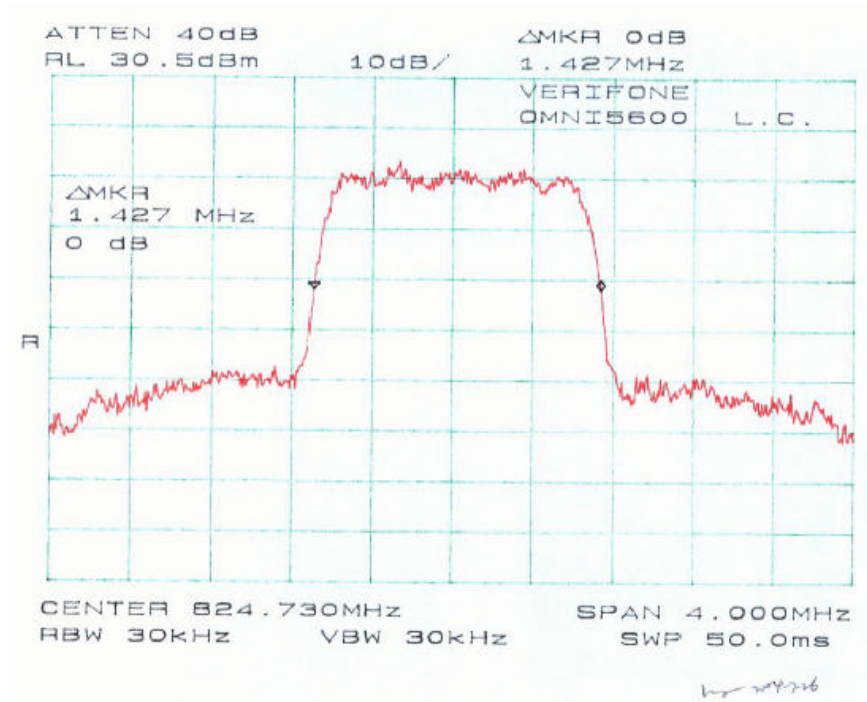
Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

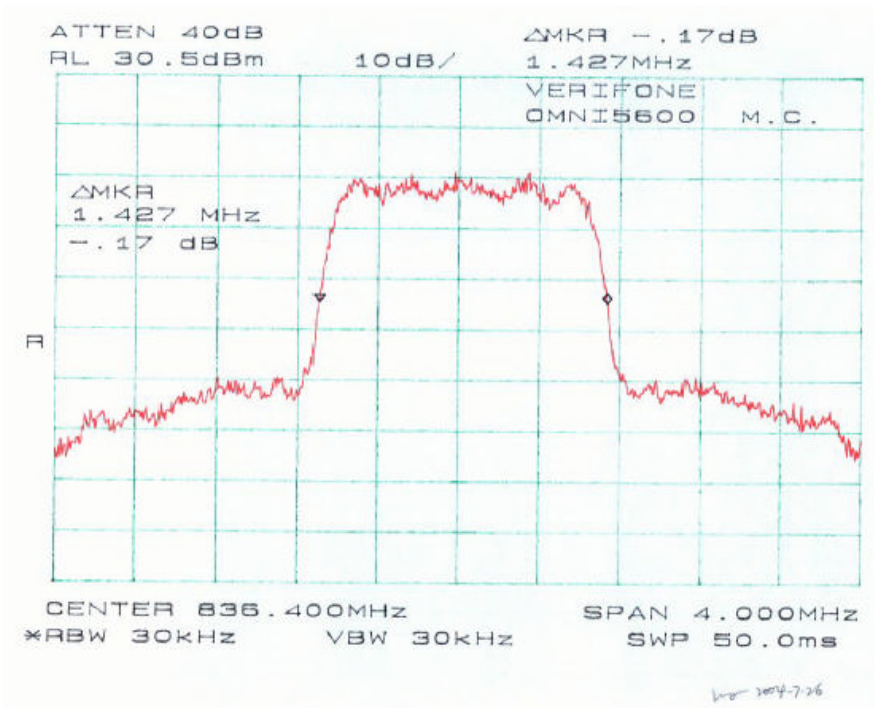
\* The testing was performed by Ling Zhang on 2004-07-26.

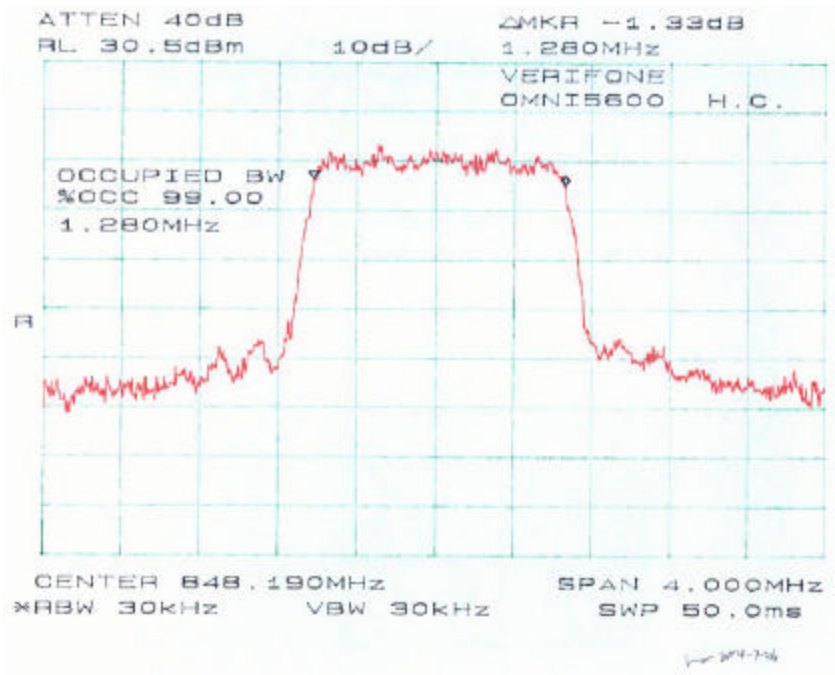
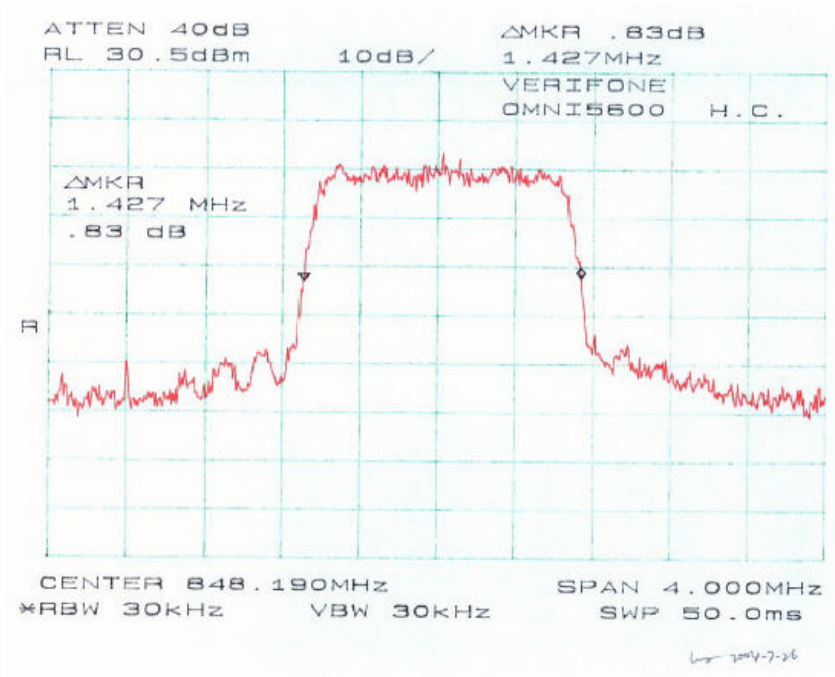
### **Test Results**

Please refer to the following plots.

Plots of Modulation Characteristic for Part22

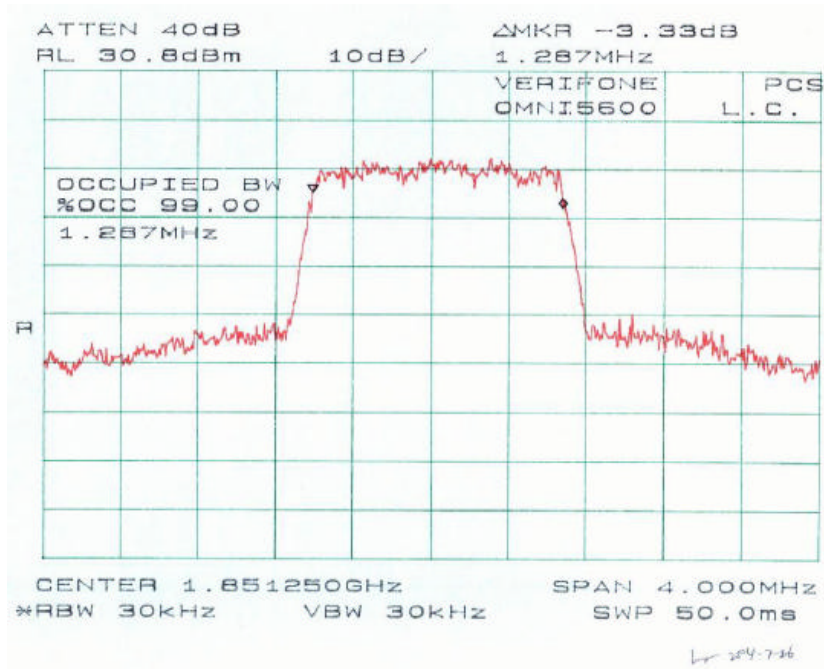
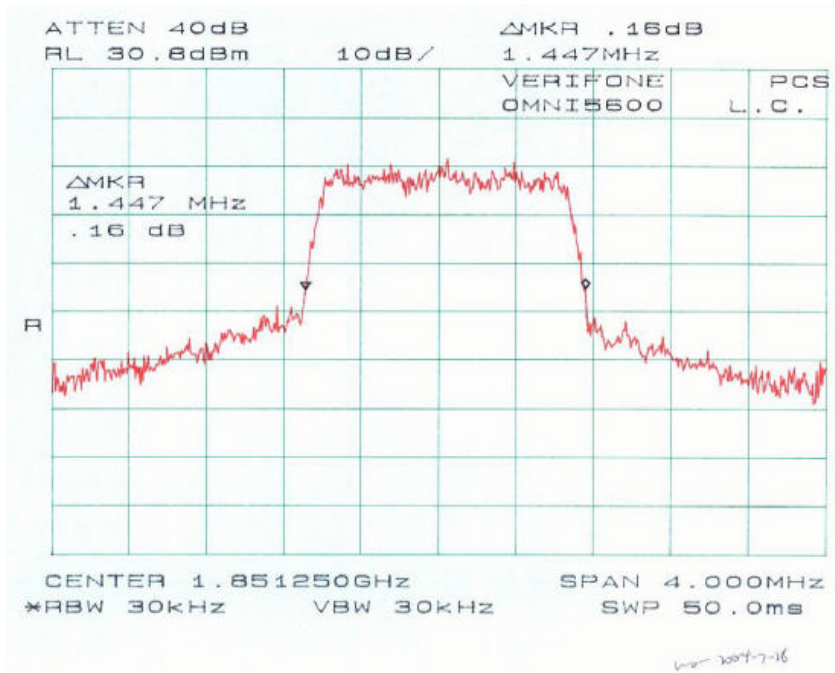


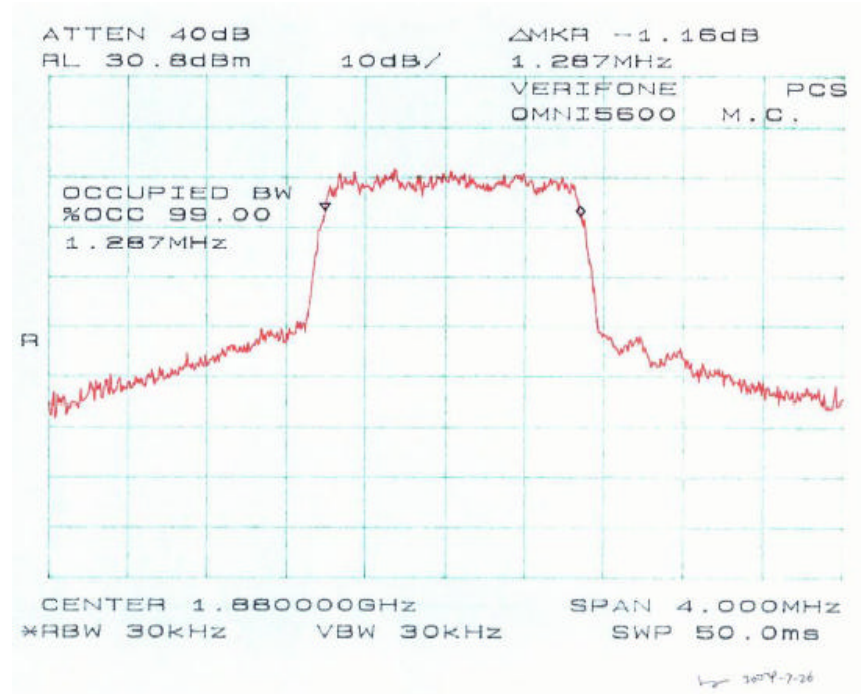
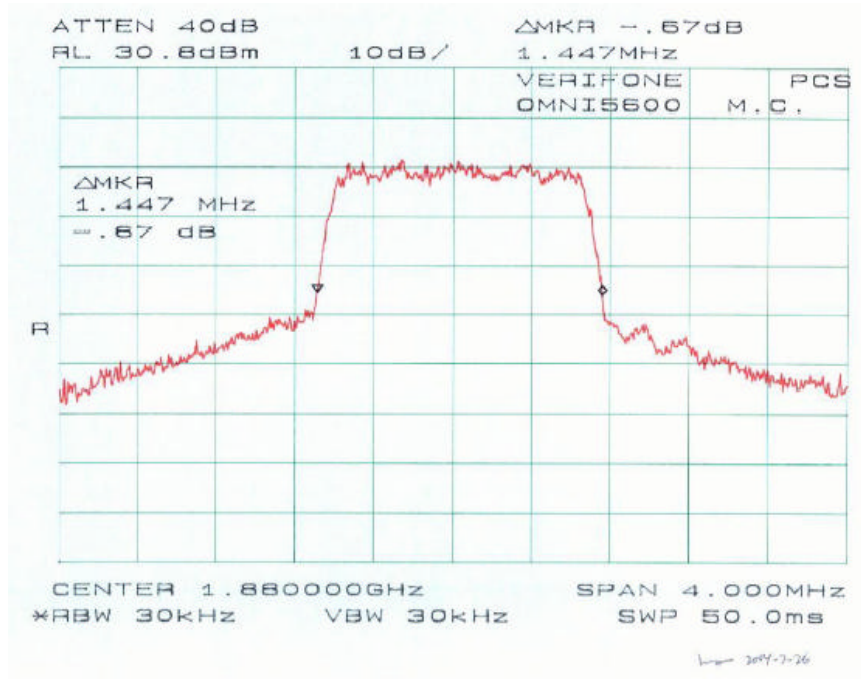


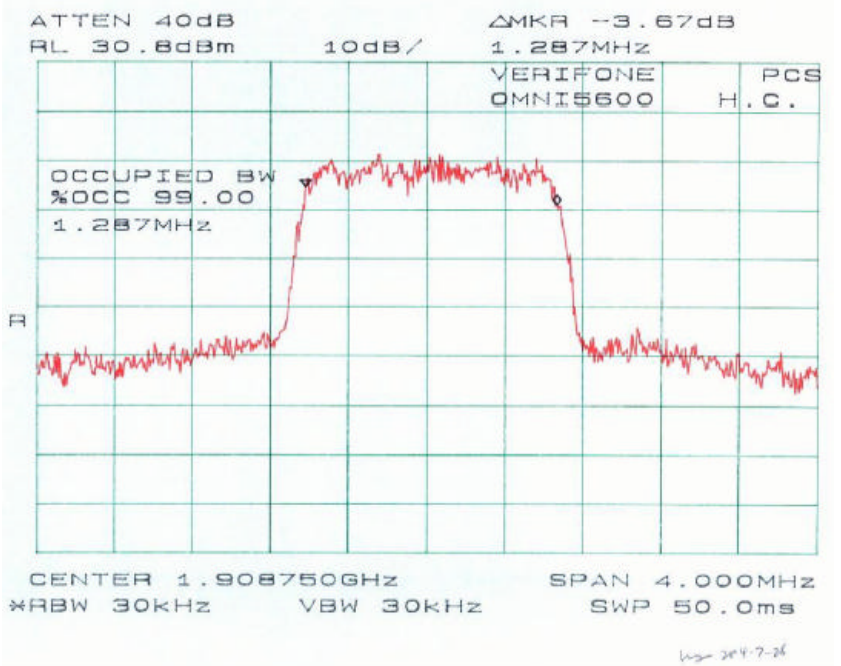
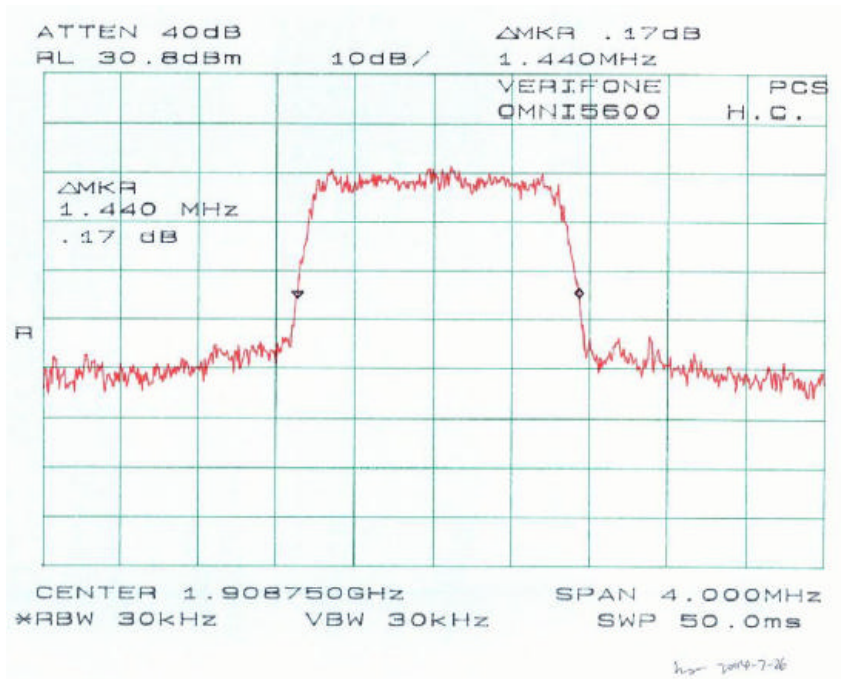




Plots of Modulation Characteristic for Part24









## §2.1051, §22.917, & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Applicable Standard

Requirements: CFR 47, § 2.1051, § 22.917 & §24.238(a).

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

### Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer 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
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

### Environmental Conditions

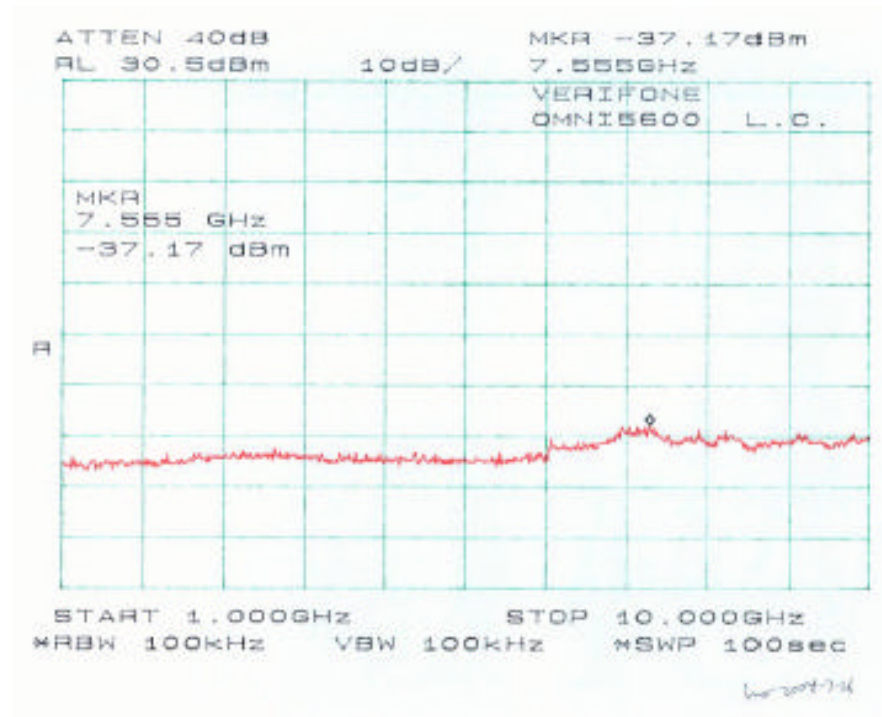
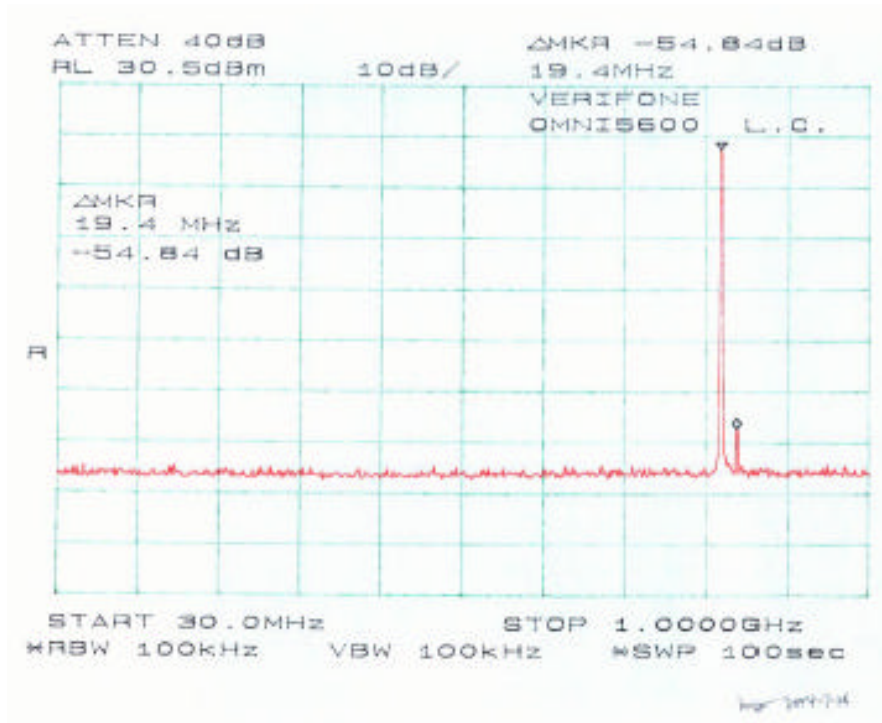
Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

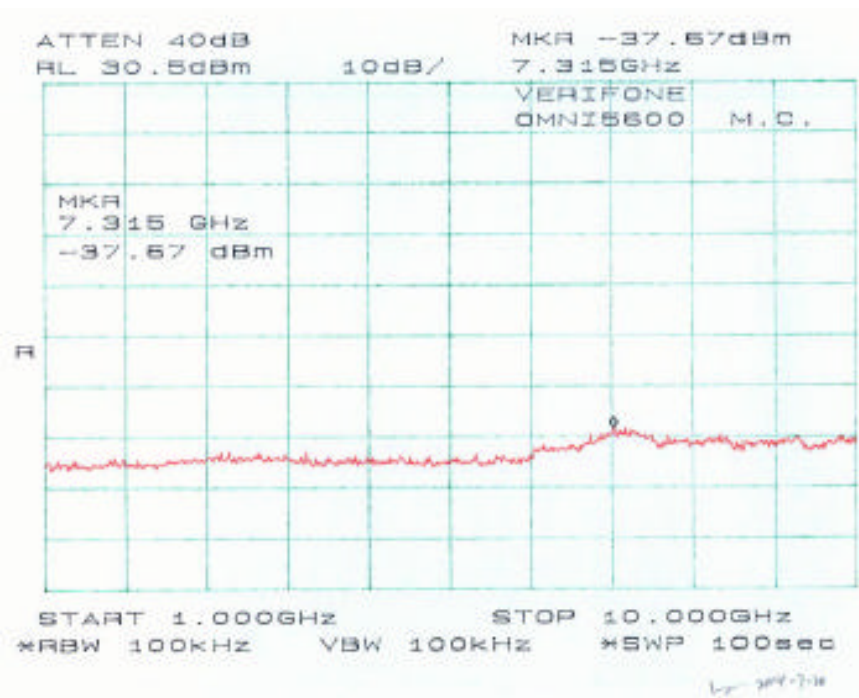
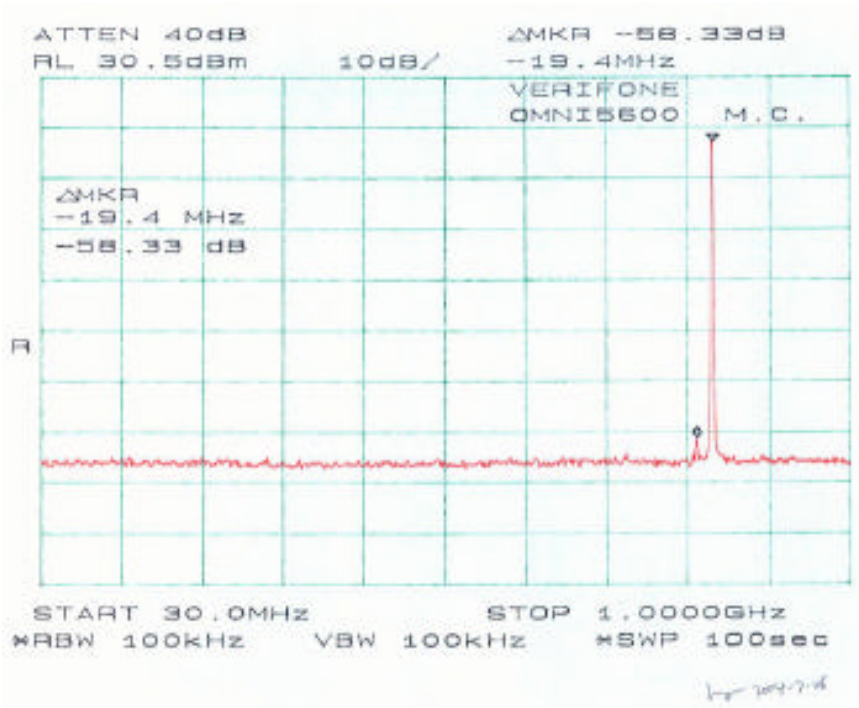
\* The testing was performed by Ling Zhang on 2004-07-26.

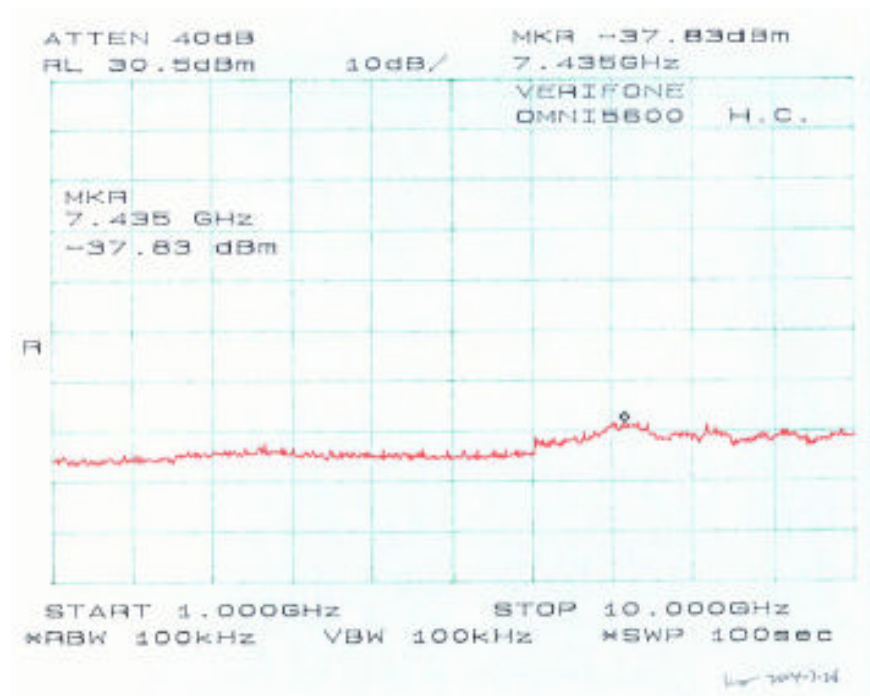
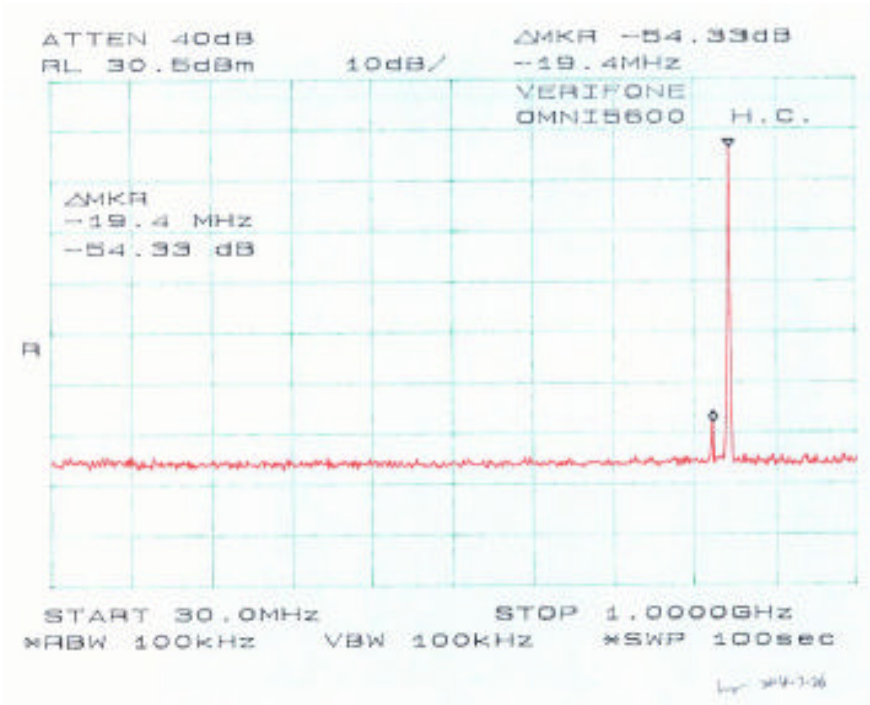
### Test Results

Please refer to the hereinafter plots.

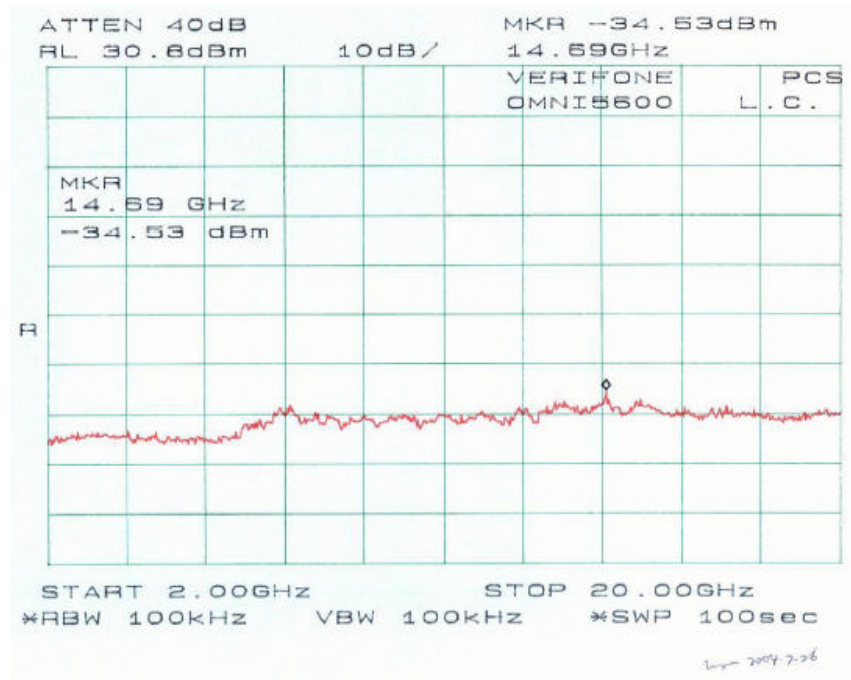
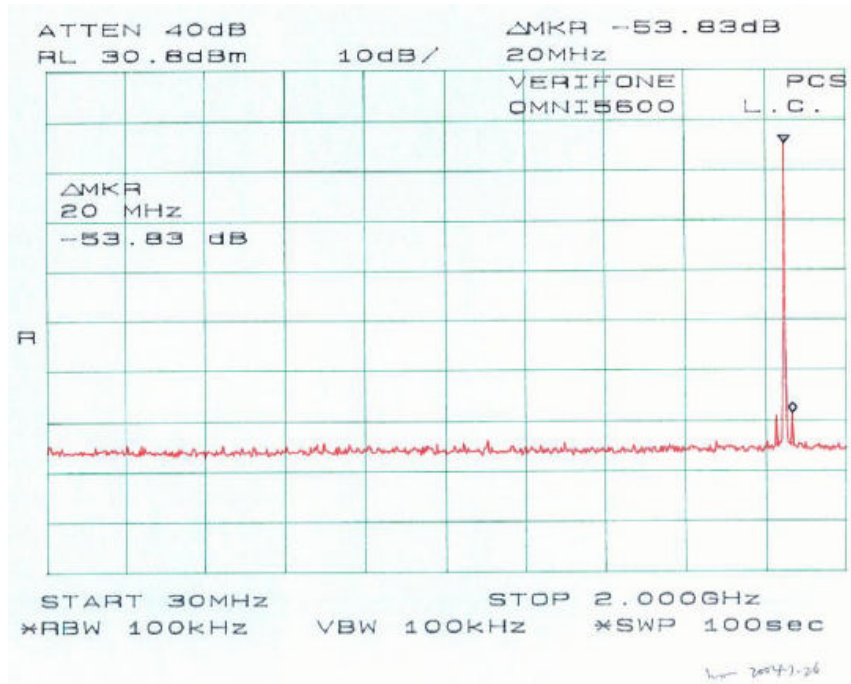
Plots of Spurious Emission for Part22



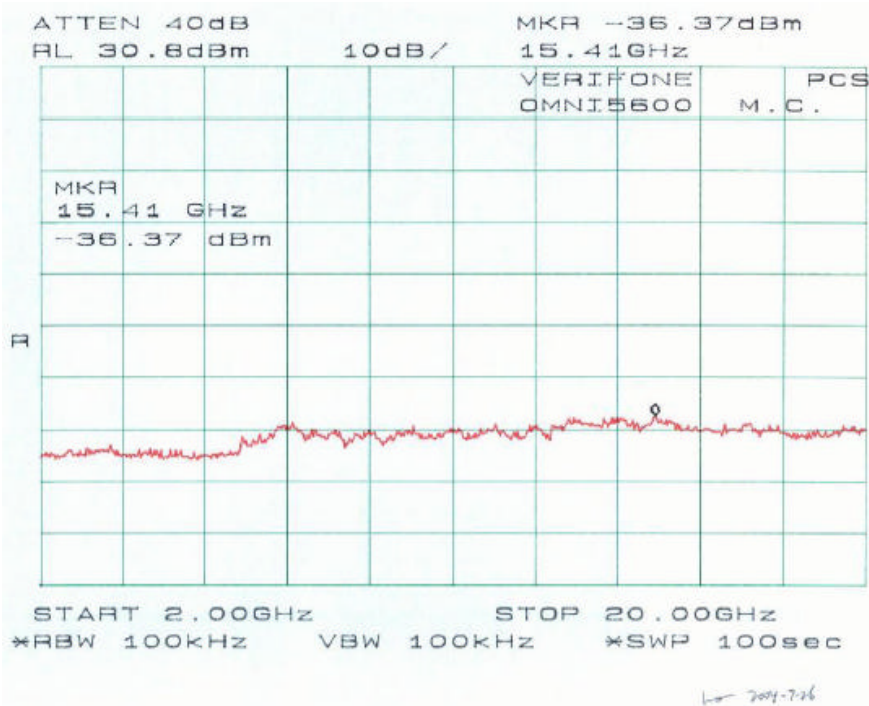
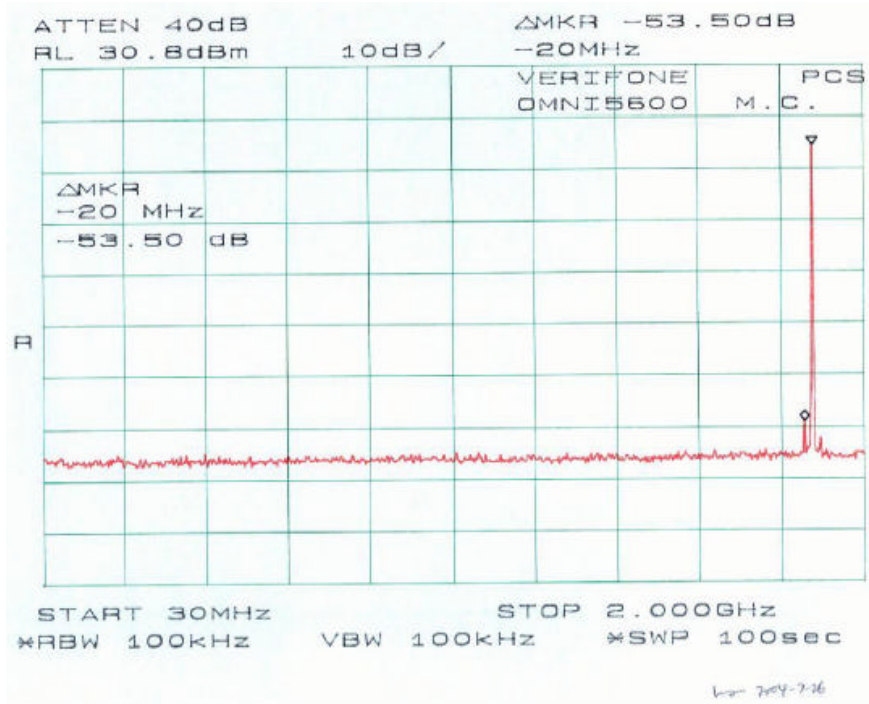


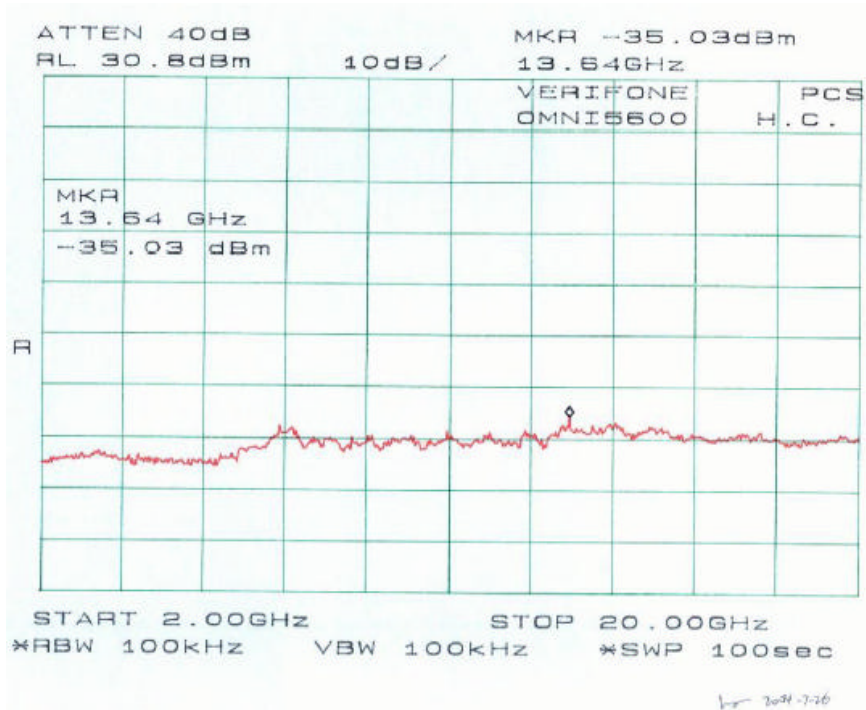
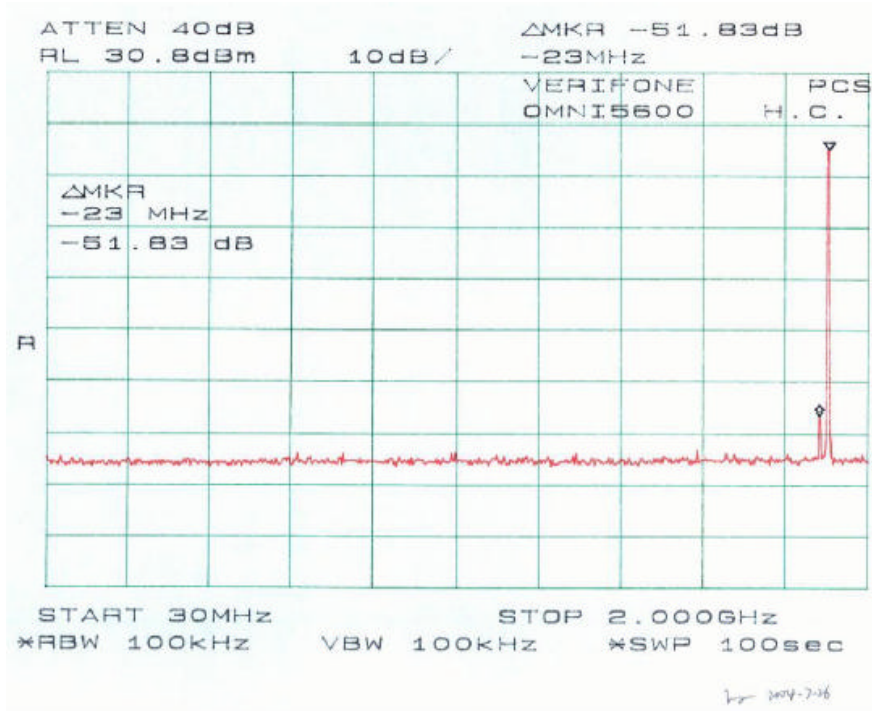


Plots of Spurious Emission for Part24









## §2.1055 (a), §2.1055 (d), §22.355, & §24.235 - FREQUENCY STABILITY

### 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.

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

Frequency range (MHz)	Mobile		Mobile SU3 watts [le]3 watts (ppm)
	Base, fixed (ppm)	[SU][le]/ (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

According to §24.235, The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 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 a frequency counter 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 counter.

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.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2003-08-25
HP	Plotter	HP7470A	2541A49659	Not Required
Tenney	Oven, Temperature	Versa Tenn	12222-193	2004-06-23



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

### Environmental Conditions

Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

\* The testing was performed by Ling Zhang on 2004-07-26.

### Test Results

Test Result for CDMA800

#### *Frequency Stability Versus Temperature*

Reference Frequency: 836.4 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MHz	PPM Error
50	7.2	836.400009	0.011
40	7.2	836.400007	0.008
30	7.2	836.400005	0.006
20	7.2	836.400005	0.006
10	7.2	836.399996	-0.005
0	7.2	836.399995	-0.006
-10	7.2	836.399994	-0.007
-20	7.2	836.399992	-0.010
-30	7.2	836.399992	-0.010

Battery operating voltage: 7.4V

#### *Frequency Stability Versus Battery Voltage*

Reference Frequency: 836.4MHz, Limit: 2.5ppm			
Power Supplied (Vdc)	Environment Temperature (°C)	MHz	ppm

## Test Result for CDMA1900

*Frequency Stability Versus Temperature*

Reference Frequency: 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MHz	PPM Error
50	7.2	1880.000016	0.009
40	7.2	1880.000015	0.008
30	7.2	1880.000013	0.007
20	7.2	1880.000013	0.007
10	7.2	1880.000012	0.006
0	7.2	1879.999988	-0.006
-10	7.2	1879.999985	-0.008
-20	7.2	1879.999982	-0.010
-30	7.2	1879.999982	-0.010

*Frequency Stability Versus Battery Voltage*

Reference Frequency: 1880MHz, Limit: 2.5ppm			
Power Supplied (Vdc)	Environment Temperature (°C)	MHz	ppm
6.5	20	1880.000014	0.007

Normal battery operation voltage: 7.2V

Battery end point: 6.5V

## §22.917 & §24.238 – 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.

According to §24.238, 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 30KHz.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

### Environmental Conditions

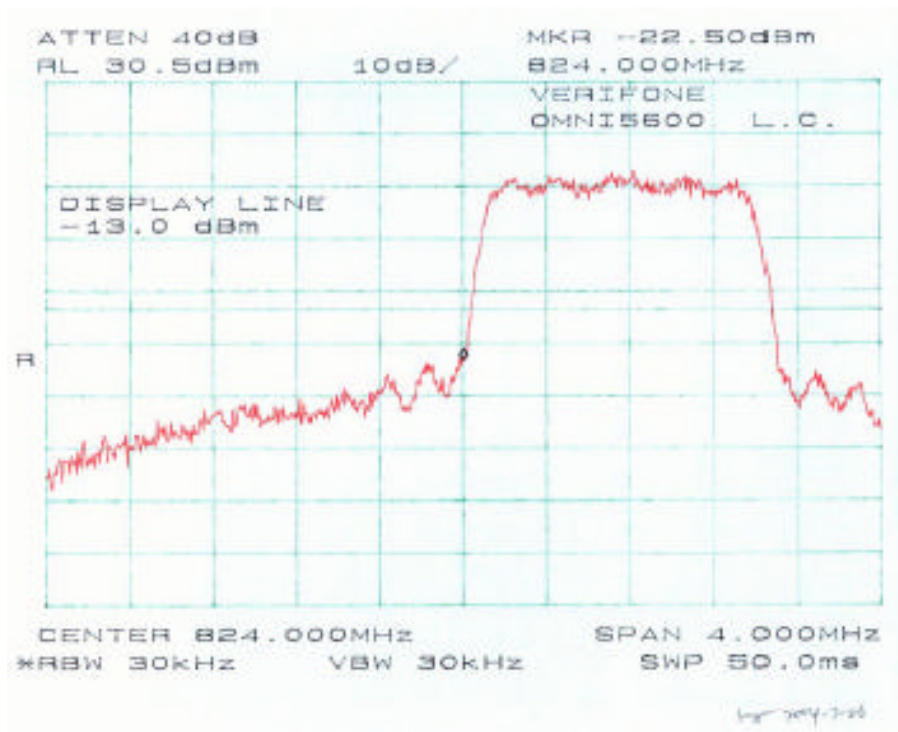
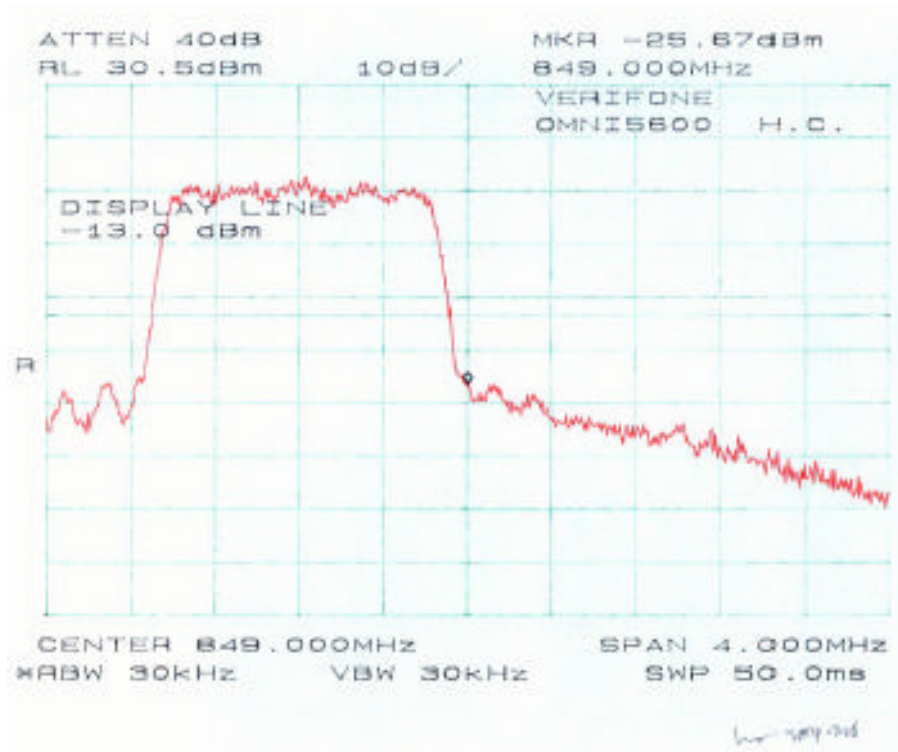
Temperature:	22° C
Relative Humidity:	37%
ATM Pressure:	1011 mbar

\* The testing was performed by Ling Zhang on 2004-07-26.

### Test Results

Please refer to the following plots.

Plots of Band Edge for Part 22



Plots of Band Edge for Part 24

