

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



For

VeriFone Inc.

3755 Atherton Road, Rocklin, CA 95765

FCC ID: B32OMNI56XXG

2004-08-11

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Wireless POS Terminal
Test Engineer: Ling Zhang / 	
Report No.: R0407301	
Test Date: 2004-08-09 / 2004-08-10	
Reviewed By: Ming Jing / 	
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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

Product Description for Equipment Under Test (EUT)

The *VeriFone Inc.* product, FCC ID:B32OMNI56XXG 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: 908, 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.

SYSTEM TEST CONFIGURATION

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.

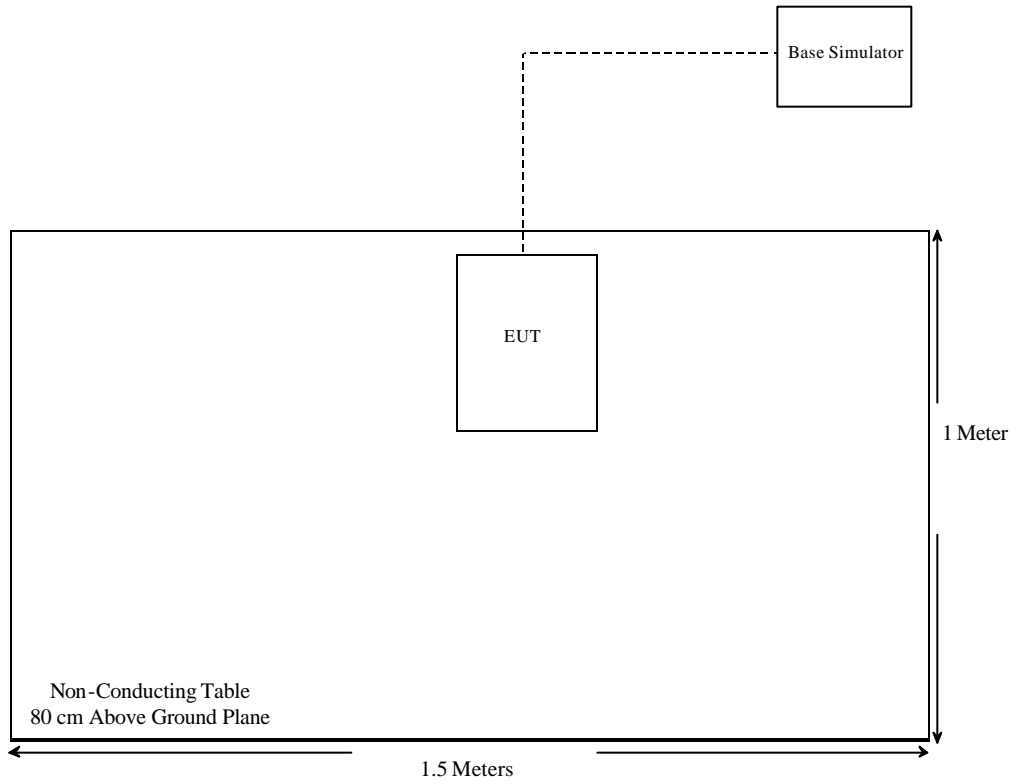
Support Equipment List and Details

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	N/A
§ 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

GSM digital mode is used by EUT.

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

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

Environmental Conditions

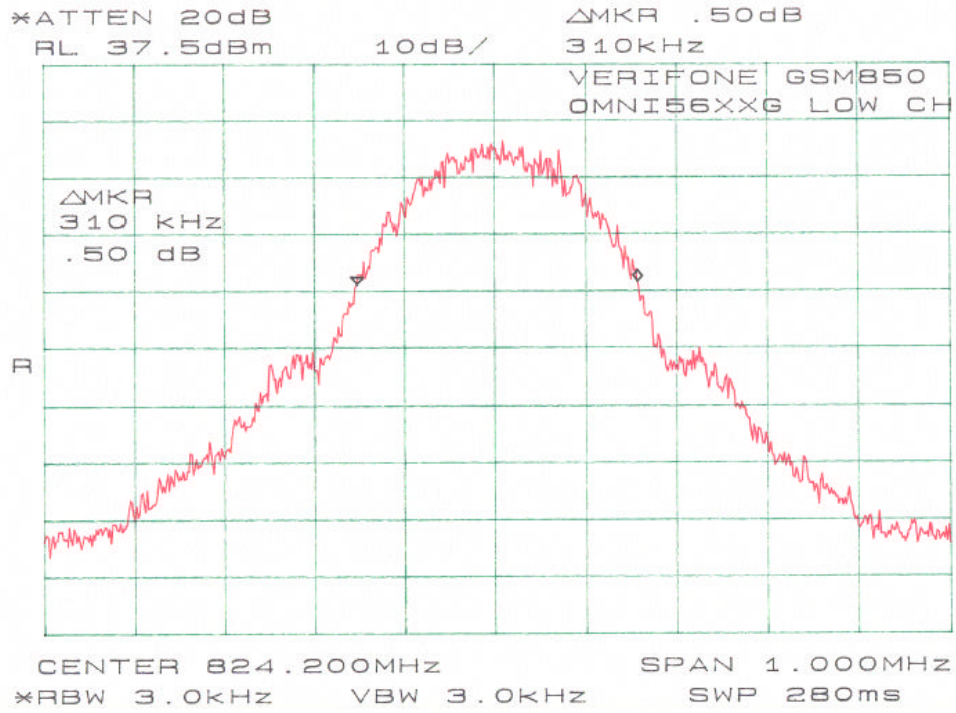
Temperature:	21° C
Relative Humidity:	63%
ATM Pressure:	1018 mbar

The testing was performed by Ling Zhang on 2004-08-09.

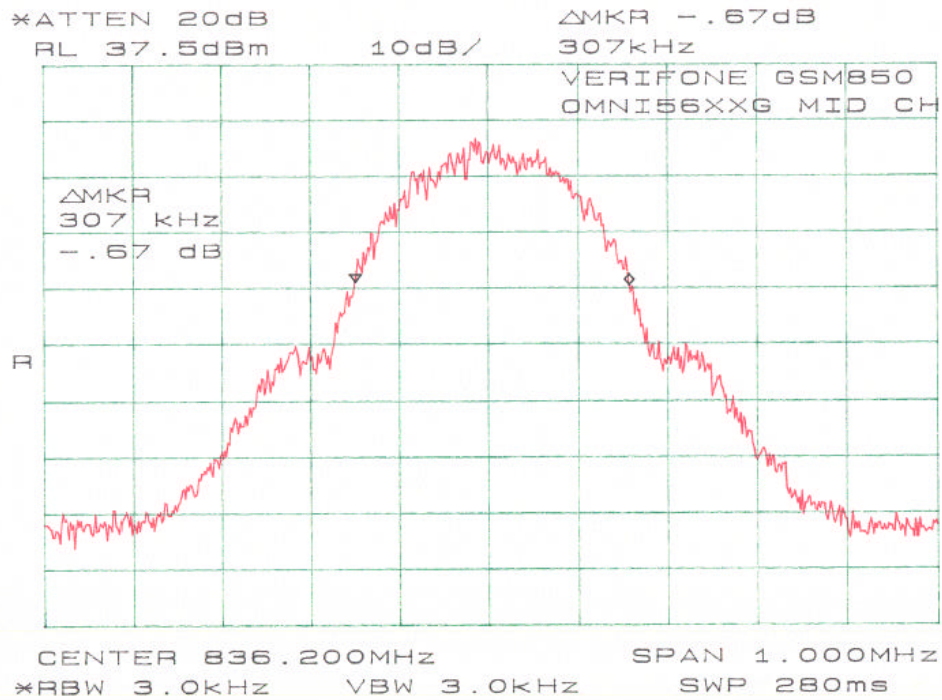
Test Results

Please refer to the hereinafter plots.

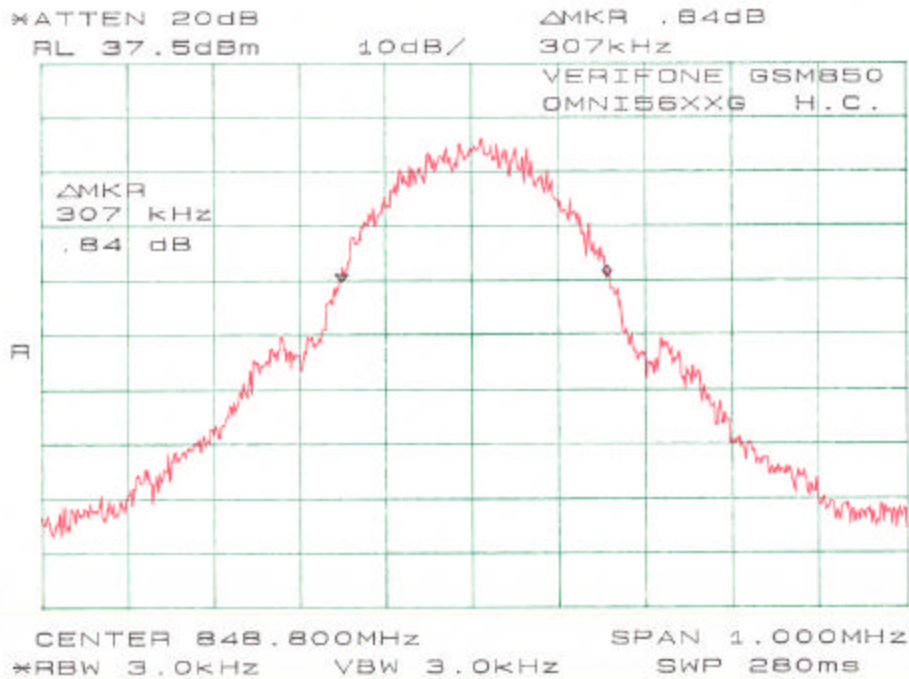
Plots of Modulation Characteristic for Part22



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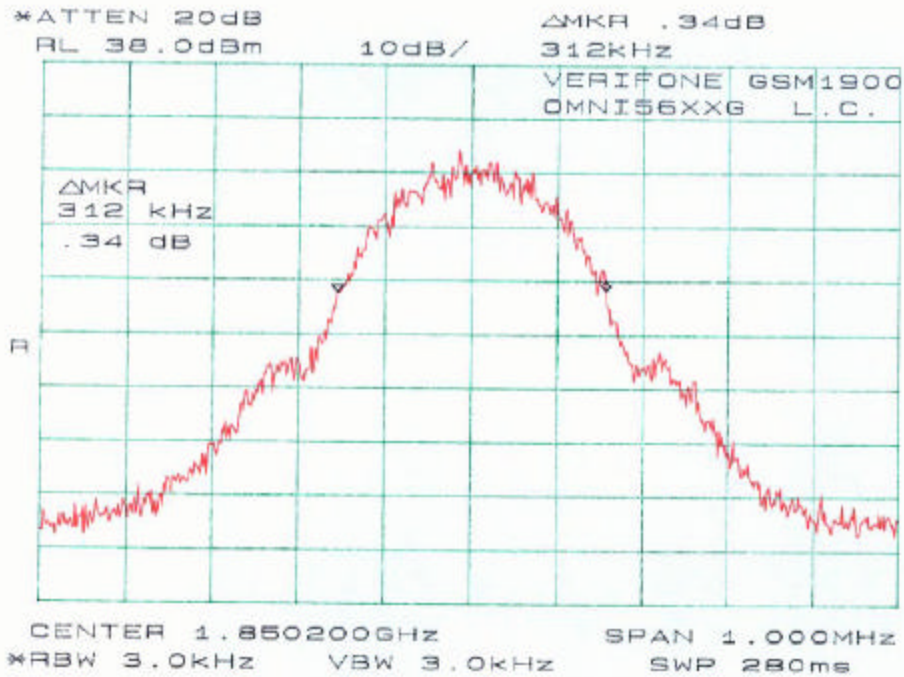


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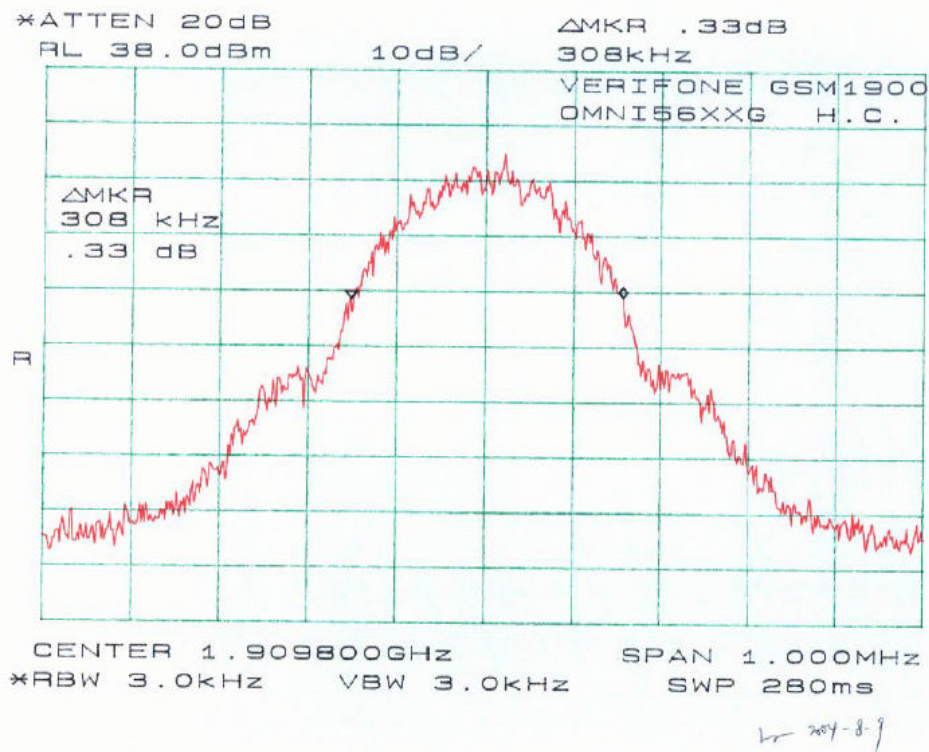
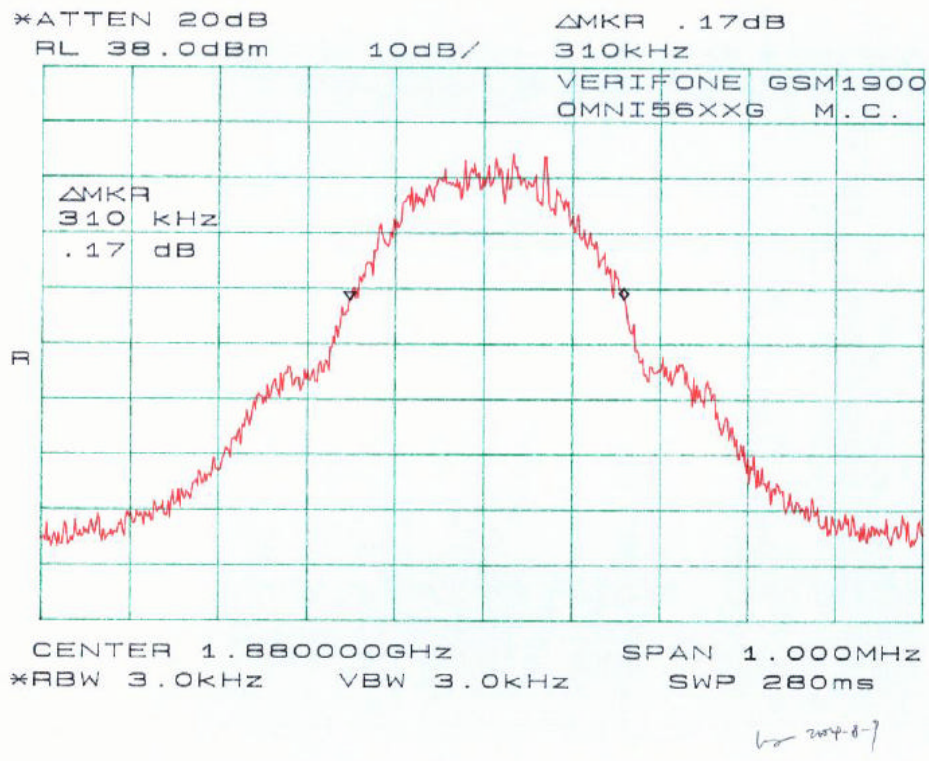


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Plots of Modulation Characteristic for Part24



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§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 Log₁₀ (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:	59%
ATM Pressure:	1017 mbar

* The testing was performed by Ling Zhang on 2004-08-10.

Test Result**GSM 850**

Low Frequency: -17.4 dB at 1648.4 MHz
 Middle Frequency: -17.2 dB at 1672.4 MHz
 High Frequency: -18.3 dB at 1697.6 MHz

GSM 1900

Low Frequency: -33.8 dB at 3700.4 MHz
 Middle Frequency: -33.4 dB at 3760.0 MHz
 High Frequency: -32.5 dB at 3819.6 MHz

Test Data for GSM850

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											
824.2	129	200	1.6	V	824.2	31.0	0	0.8	30.2		
824.2	129	200	1.4	H	824.2	31.1	0	0.8	30.3		
1648.4	74.83	180	1.0	H	1648.4	-36.0	6.8	1.2	-30.4	-13	-17.4
1648.4	75.50	200	1.5	V	1648.4	-37.0	6.8	1.2	-31.4	-13	-18.4
2472.6	60.17	200	1.5	V	2472.6	-47.2	7.6	1.5	-41.1	-13	-28.1
2472.6	58.17	180	1.5	H	2472.6	-50.0	7.6	1.5	-43.9	-13	-30.9
MIDDLE CHANNEL											
836.2	129.17	180	1.4	V	836.2	31.2	0	0.8	30.4		
836.2	129	270	1.5	H	836.2	31.1	0	0.8	30.3		
1672.4	76.83	60	1.2	V	1672.4	-35.8	6.8	1.2	-30.2	-13	-17.2
1672.4	73.17	180	1.2	H	1672.4	-37.3	6.8	1.2	-31.7	-13	-18.7
2508.6	58.50	45	1.6	V	2508.6	-48.8	7.6	1.5	-42.7	-13	-29.7
2508.6	56.67	150	1.5	H	2508.6	-51.3	7.6	1.5	-45.2	-13	-32.2
HIGH CHANNEL											
848.8	129	270	1.5	V	848.8	31.0	0	0.8	30.2		
848.8	129	270	1.6	H	848.8	31.1	0	0.8	30.3		
1697.6	75.67	15	1.4	V	1697.6	-36.9	6.8	1.2	-31.3	-13	-18.3
1697.6	73.33	180	1.4	H	1697.6	-37.2	6.8	1.2	-31.6	-13	-18.6
2546.4	58.83	0	1.3	V	2546.4	-48.6	7.6	1.5	-42.5	-13	-29.5
2546.4	57.10	270	1.5	H	2546.4	-50.8	7.6	1.5	-44.7	-13	-31.7

Test Data for GSM1900

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
LOW CHANNEL											
1850.2	128.5	0	1.2	V	1850.2	22.8	8.3	1.3	29.80		
1850.2	128.5	0	1.8	H	1850.2	22.9	8.3	1.3	29.90		
3700.4	51.67	270	1.6	H	3700.4	-55.1	10.3	2.0	-46.80	-13	-33.80
3700.4	50.33	200	1.6	V	3700.4	-56.2	10.3	2.0	-47.90	-13	-34.90
5550.6	50.5	200	1.6	V	5550.6	-56.0	10.6	2.55	-47.95	-13	-34.95
5550.6	48.83	270	2.0	H	5550.6	-57.1	10.6	2.55	-49.05	-13	-36.05
MIDDLE CHANNEL											
1880	128	270	1.6	V	1880	22.4	8.3	1.3	29.40		
1880	128.67	330	1.4	H	1880	23.0	8.3	1.3	30.00		
3760	51	90	2.2	H	3760	-54.7	10.3	2.0	-46.40	-13	-33.40
3760	51.67	90	1.4	V	3760	-55.5	10.3	2.0	-47.20	-13	-34.20
5640	48.33	60	1.5	H	5640	-57.3	10.6	2.55	-49.25	-13	-36.25
5640	48.67	60	2.0	V	5640	-57.5	10.6	2.55	-49.45	-13	-36.45
HIGH CHANNEL											
1909.8	127.67	300	2.2	V	1909.8	22.1	8.3	1.3	29.10		
1909.8	127.83	330	1.8	H	1909.8	22.3	8.3	1.3	29.30		
3819.6	53.9	60	1.6	V	3819.6	-53.8	10.3	2.0	-45.50	-13	-32.50
3819.6	51.5	90	2.0	H	3819.6	-54.2	10.3	2.0	-45.90	-13	-32.90
5729.4	51.4	60	2.2	V	5729.4	-55.3	10.6	2.55	-47.25	-13	-34.25
5729.4	50.0	0	1.8	H	5729.4	-56.1	10.6	2.55	-48.05	-13	-35.05

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

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: 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

For GSM850:

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	ERP (dBm)
824.2	31.1	0	0.8	30.3
836.2	31.2	0	0.8	30.4
848.8	31.1	0	0.8	30.3

For GSM1900 :

FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	EIRP (dBm)
1850.2	22.9	8.3	1.3	29.9
1880	23.0	8.3	1.3	30.0
1909.8	22.3	8.3	1.3	29.3

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$22.9 + 8.3 - 1.3 = 29.9$$

§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:	21° C
Relative Humidity:	63%
ATM Pressure:	1018 mbar

* *The testing was performed by Ling Zhang on 2004-08-09.*

Test Results

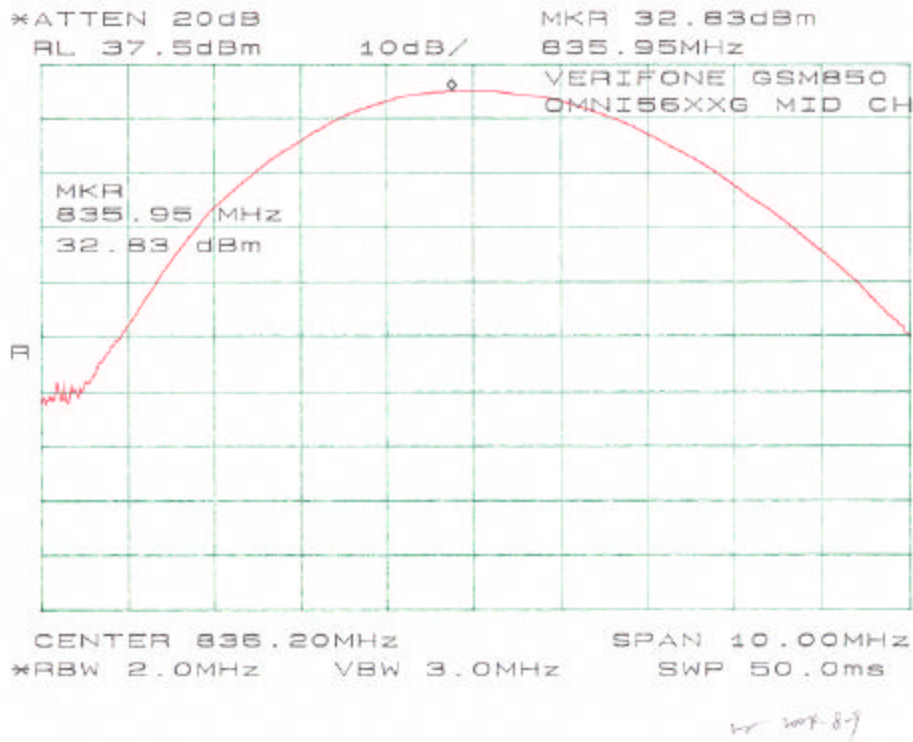
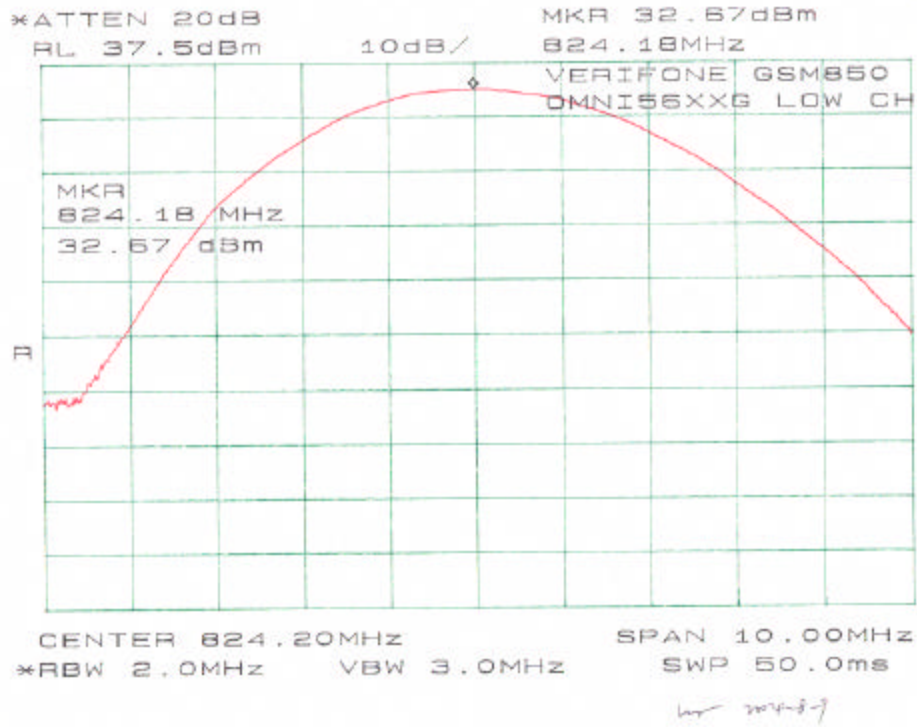
GSM850:

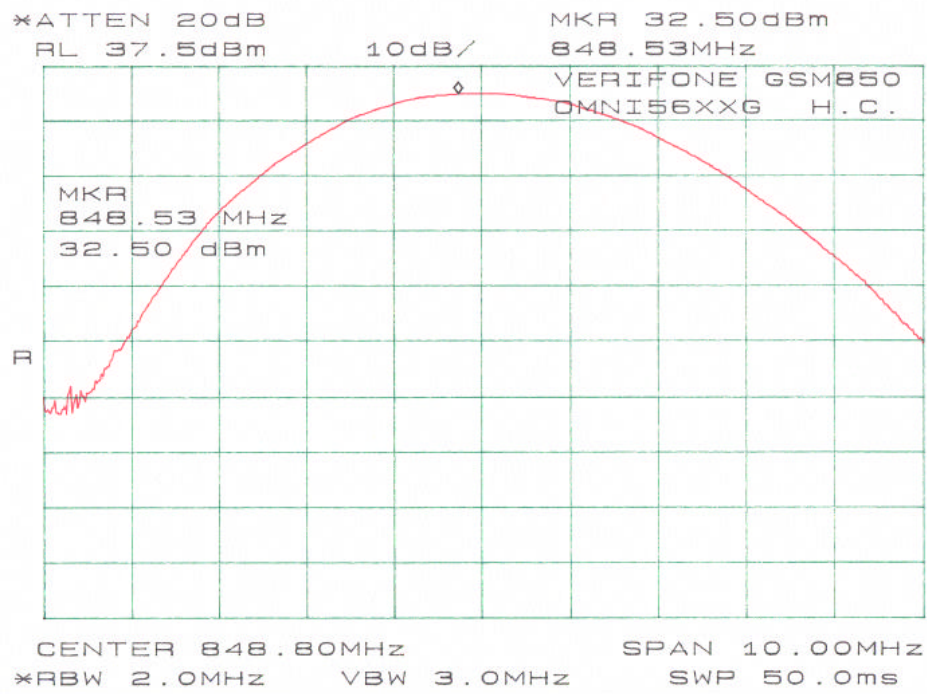
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	824.20	32.67	1.849	7
MIDDLE	836.20	32.83	1.919	7
HIGH	848.80	32.50	1.778	7

GSM1900:

Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	1850.20	29.50	0.891	100
MIDDLE	1880	29.67	0.927	100
HIGH	1909.80	29.83	0.962	100

Plots of Conducted Output Power for Part 22





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