

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

For

MOBICOM CORPORATION

960 Holmdel Road, Building II
Holmdel, New Jersey 07733

FCC ID: P8D-2189A

This Report Concerns: ☒ Original Report	Equipment Type: 850/1900 MHz GSM Mobile Phone
	
Test Engineer:	Daniel Deng /
Report No.:	R0601032
Report Date:	2006-01-10
	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *MOBICOM CORPORATION*'s product, FCC ID: P8D-2189A or the "EUT" as referred to in this report is a GSM850 & PCS1900 Cell Phone, which measures approximately 99mmL x 45mmW x 17mmH.

** The test data gathered are from typical production sample, serial number: 2189A-2 provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *MOBICOM CORPORATION* in accordance with Part 2, Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules 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.

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

Part 24 Subpart E - PCS

Applicable Standards: TIA603-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.

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 with registration number: 90464.

Test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports 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 test methods and procedures set forth in ANSI C63.4-2003& TIA/EIA-603.

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, 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 is attached hereinafter and can also be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

SYSTEM TEST CONFIGURATION

Justification

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

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.

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Agilent	Wireless Communication Test Set	8960	GB43344477	DOC

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 (SAR)
§ 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	Compliant
§ 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. Connect EUT to Simulator and spectrum analyzer, check the waveform.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Communications	E5515C	GB44051221	2005-08-08
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06

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

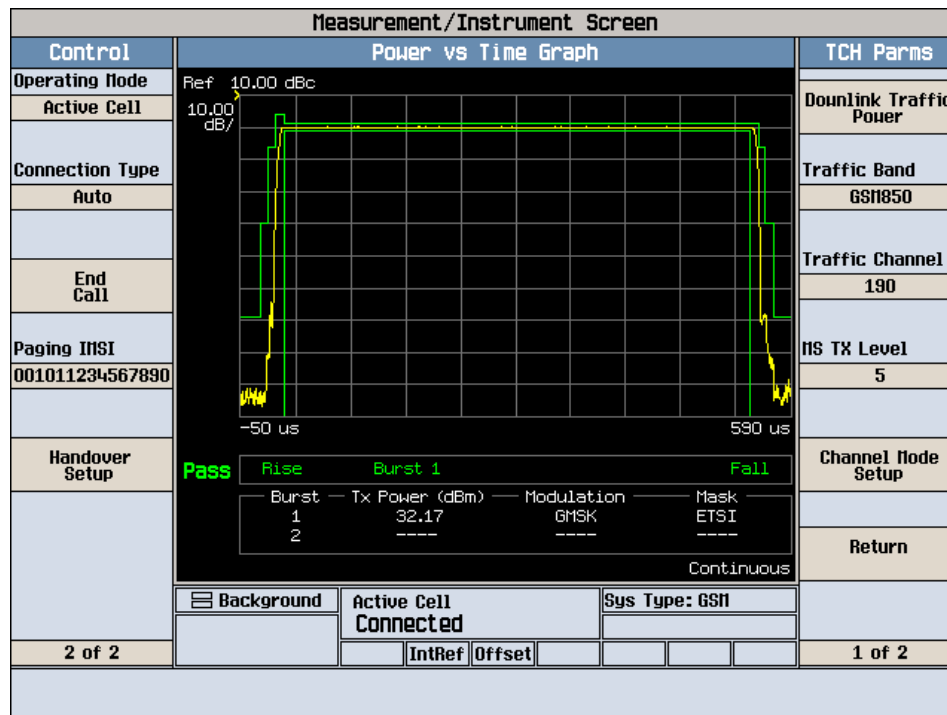
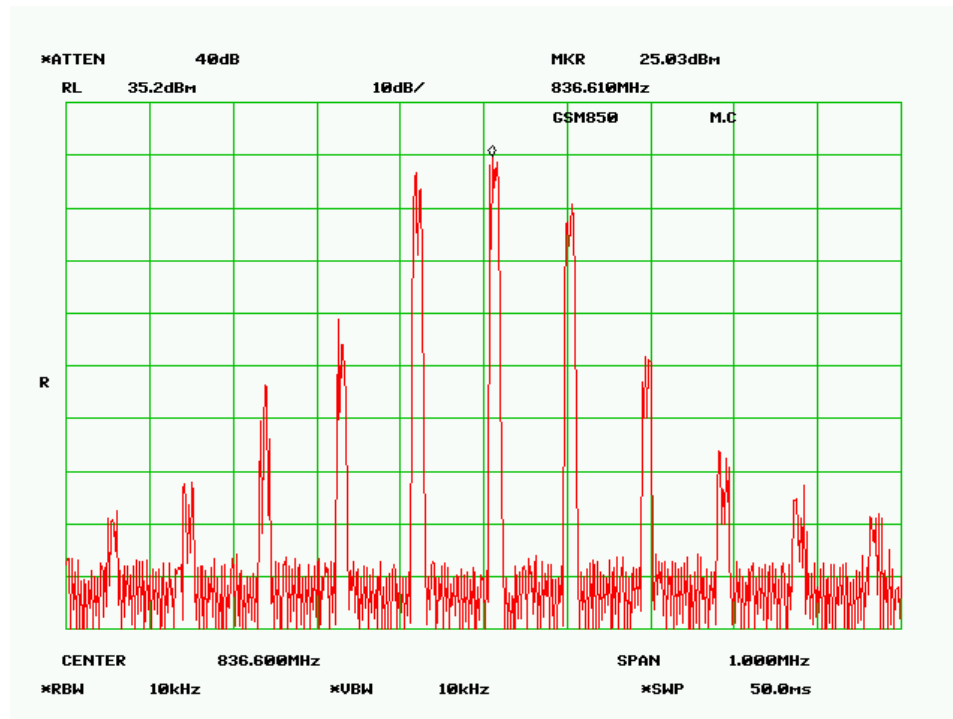
Environmental Conditions

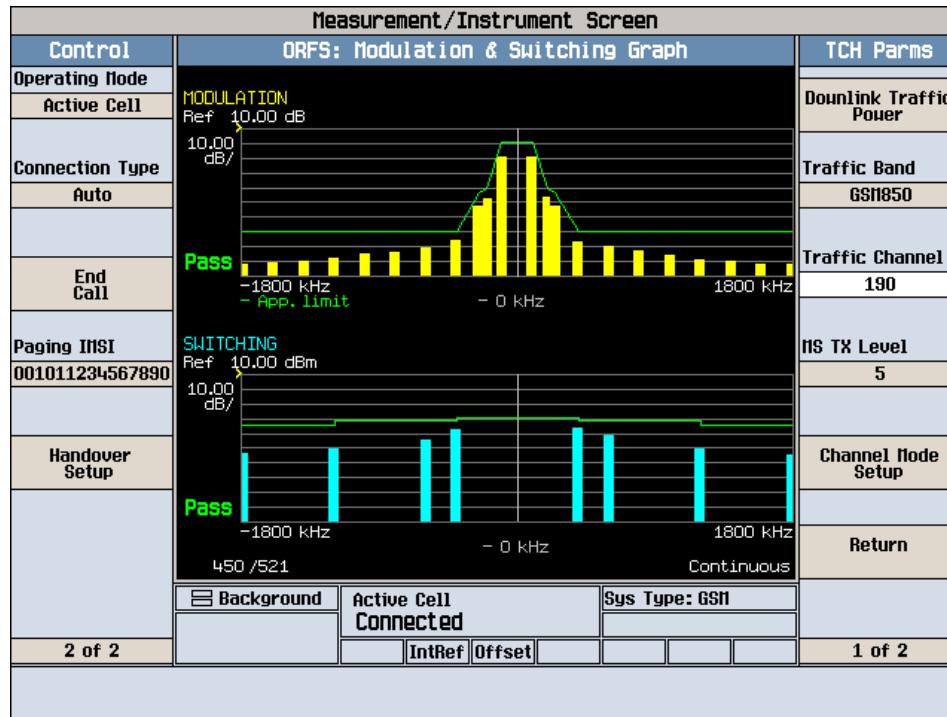
Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1020 mbar

The testing was performed by Daniel Deng on 2005-08-05.

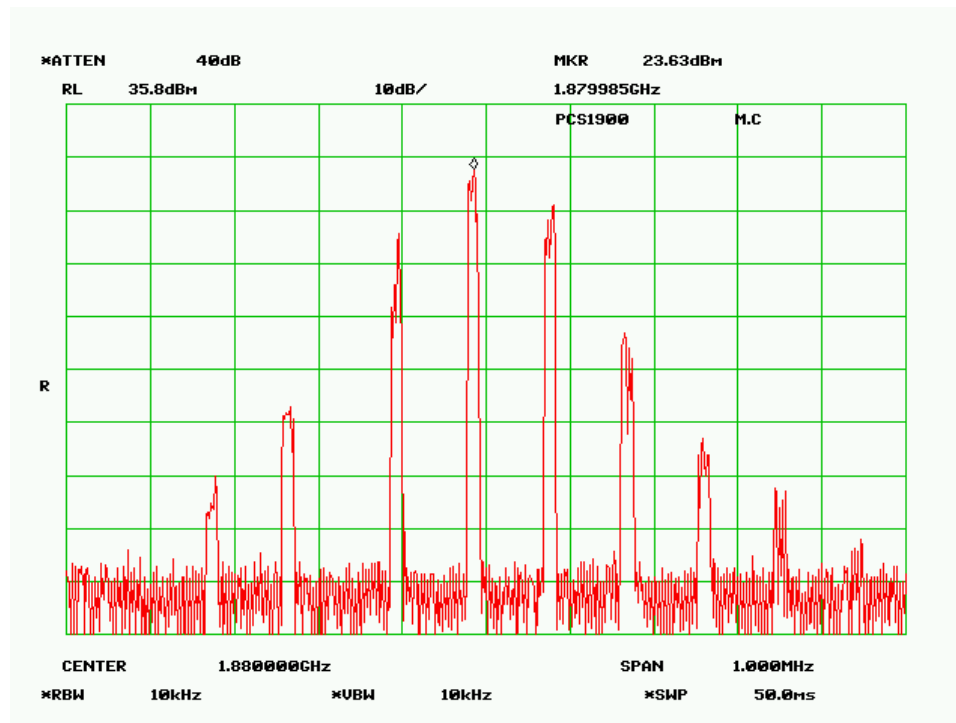
Test Results

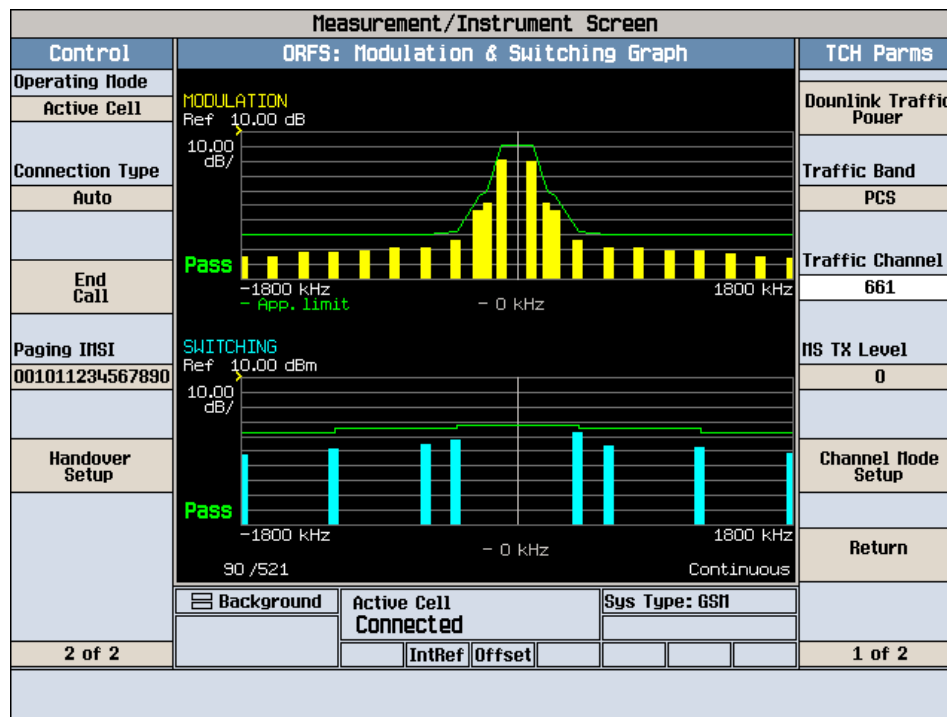
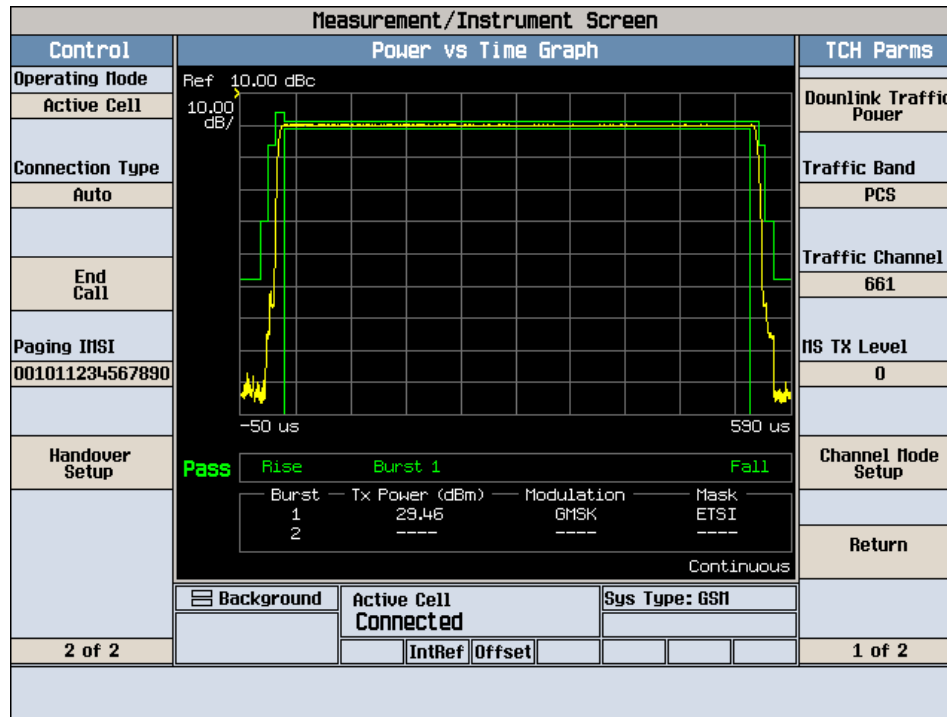
Please refer to the hereinafter plots.`

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06
Agilent	Analyzer, Communications	E5515C	GB44051221	2004-05-04
ETS	Antenna, Log-Periodic	3148	4-1155	2004-12-14
ETS	Antenna, Biconical	3110B	9603-2315	2004-12-14
HP	Amplifier, Pre	8447D	2944A10198	2004-08-20
HP	Amplifier, Pre, Microwave	8449B	3147A00400	2005-06-14
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2005-05-02
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2005-04-20
HP	Generator, Signal	83650B	3614A00276	2005-05-10
A.R.A.	Antenna, Horn	DRG-118/A	1132	2003-09-30
Wainwright	Filter, Band Reject	WRCG823/850-813/860-40/8SS	2	2004-08-11
Wainwright	Filter, Band Reject	WRCG1850/1910-1835/1925-40/8SS	5	2004-08-11

*** 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:	45%
ATM Pressure:	1016mbar

* The testing was performed by Daniel Deng on 2005-07-28.

Test Result

Worst case reading as follows:

GSM 850

-7.1 dB at 1673.20 MHz

GSM 1900

-11.1 dB at 3760.20 MHz

Test Data for GSM850 (Without Pre-Amplifier)

EUT					Generator					Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
1673.20	53.02	150	1.3	V	1673.20	-27.9	9.3	1.5	-20.1	-13	-7.1
1673.20	51.67	180	2.0	H	1673.20	-29.6	9.3	1.5	-21.8	-13	-8.8
2510.00	38.00	300	2.5	H	2510.00	-32.1	9.3	1.9	-24.7	-13	-11.7
2510.00	39.53	90	1.3	V	2510.00	-32.7	9.3	1.9	-25.3	-13	-12.3
3346.67	27.52	180	1.5	V	3346.67	-45.3	10.0	2.2	-37.5	-13	-24.5
3346.67	26.83	0	1.3	H	3346.67	-46.1	10.0	2.2	-38.3	-13	-25.3
4182.69	22.00	220	1.4	V	4182.69	-51.6	11.1	2.5	-43.0	-13	-30.0
4182.69	21.45	270	1.5	H	4182.69	-55.8	11.1	2.5	-47.2	-13	-34.2

Test Data for GSM1900 (With Pre-Amplifier)

EUT					Generator					Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
3760.20	71.00	30	1.3	V	3760.20	-33.2	11.4	2.3	-24.1	-13	-11.1
3760.20	70.50	180	1.8	H	3760.20	-34.6	11.4	2.3	-25.5	-13	-12.5
5640.30	51.50	150	2.0	V	5640.30	-38.3	11.2	3.2	-30.3	-13	-17.3
5640.30	48.67	270	1.6	H	5640.30	-42.5	11.2	3.2	-34.5	-13	-21.5
7520.50	38.00	90	1.3	V	7520.50	-49.2	11.1	4.1	-42.2	-13	-29.2
7520.50	35.83	60	1.6	H	7520.50	-51.6	11.1	4.1	-44.6	-13	-31.6

§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	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06
Agilent	Analyzer, Communications	E5515C	GB44051221	2004-05-04
ETS	Antenna, Log-Periodic	3148	4-1155	2004-12-14
ETS	Antenna, Biconical	3110B	9603-2315	2004-12-14
HP	Amplifier, Pre	8447D	2944A10198	2004-08-20
HP	Amplifier, Pre, Microwave	8449B	3147A00400	2005-06-14
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2005-05-02
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2005-04-20
HP	Generator, Signal	83650B	3614A00276	2005-05-10
A.R.A.	Antenna, Horn	DRG-118/A	1132	2003-09-30
Wainwright	Filter, Band Reject	WRCG823/850-813/860-40/8SS	2	2004-08-11
Wainwright	Filter, Band Reject	WRCG1850/1910-1835/1925-40/8SS	5	2004-08-11

* **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:	45%
ATM Pressure:	1016mbar

* The testing was performed by Daniel Deng on 2005-07-28.

Test Results

Frequency		Antenna	Cable	Absolute
MHz	Measured Power (dBm)	Gain	Loss	Level
		Correction	dB	dBm
824.20	27.2	5.2	1.3	31.10
836.60	26.5	5.2	1.3	30.40
848.80	26.7	5.2	1.3	30.60

Frequency		Antenna	Cable	Absolute
Mhz	Measured Power (dBm)	Gain	Loss	Level
		Correction	dB	dBm
1850.20	21.9	8.3	1.3	28.90
1880.00	21.3	8.3	1.3	28.30
1909.80	21.1	8.3	1.3	28.10

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$27.2 + 5.2 - 1.3 = 31.1$$

§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 2 watt.

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde&Schwarz	Communication, Radio Universal	CMU200	103492	2005-05-24
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06

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

Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1020mbar

* *The testing was performed by Daniel Deng on 2005-08-05.*

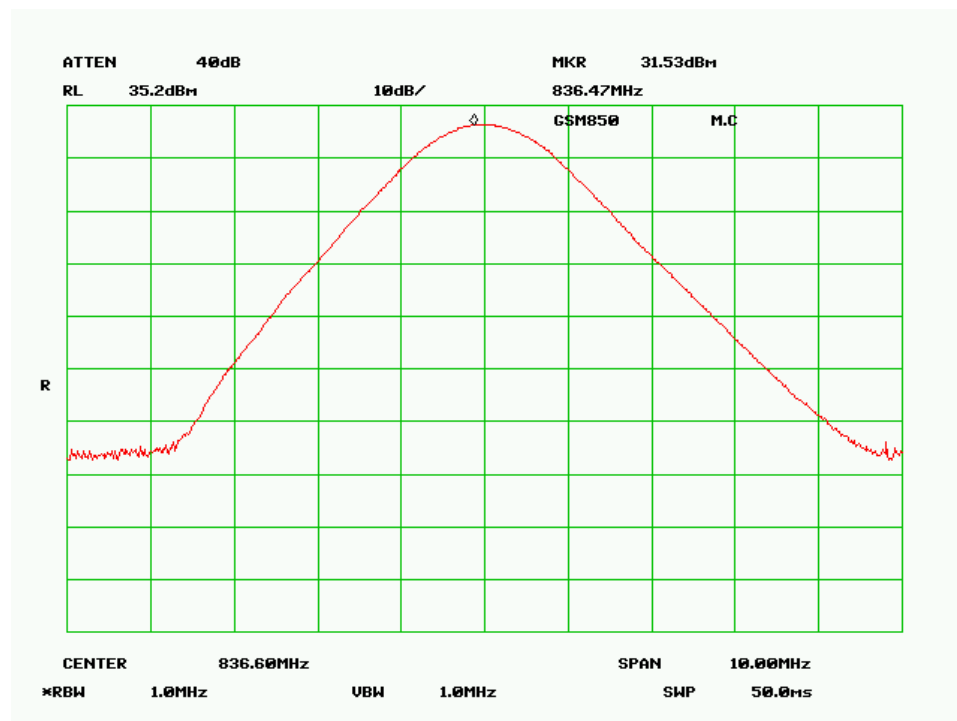
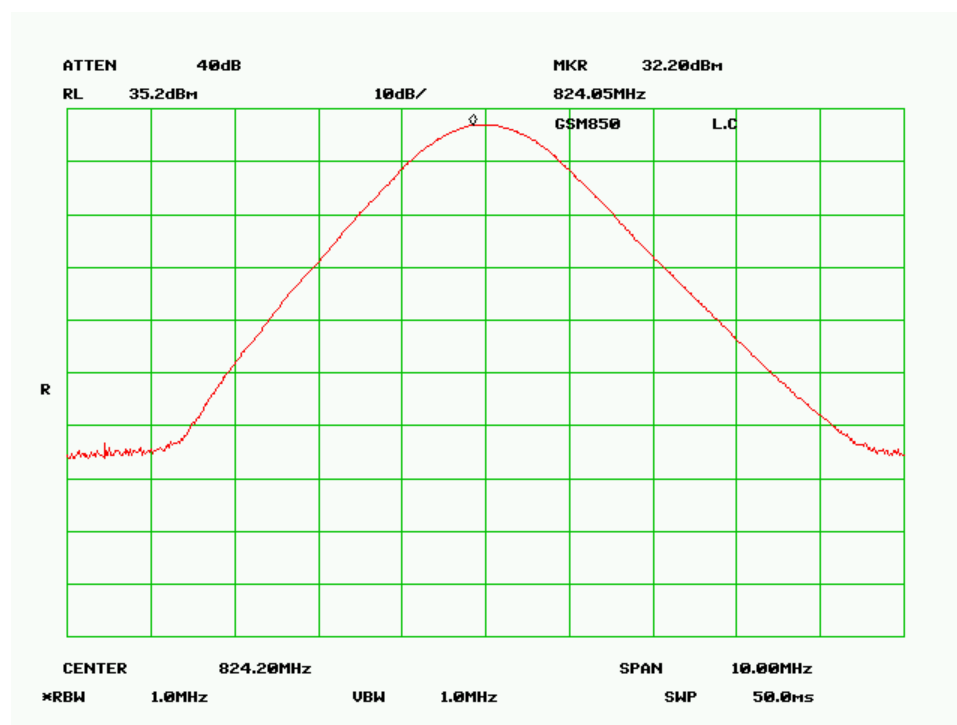
Test Results

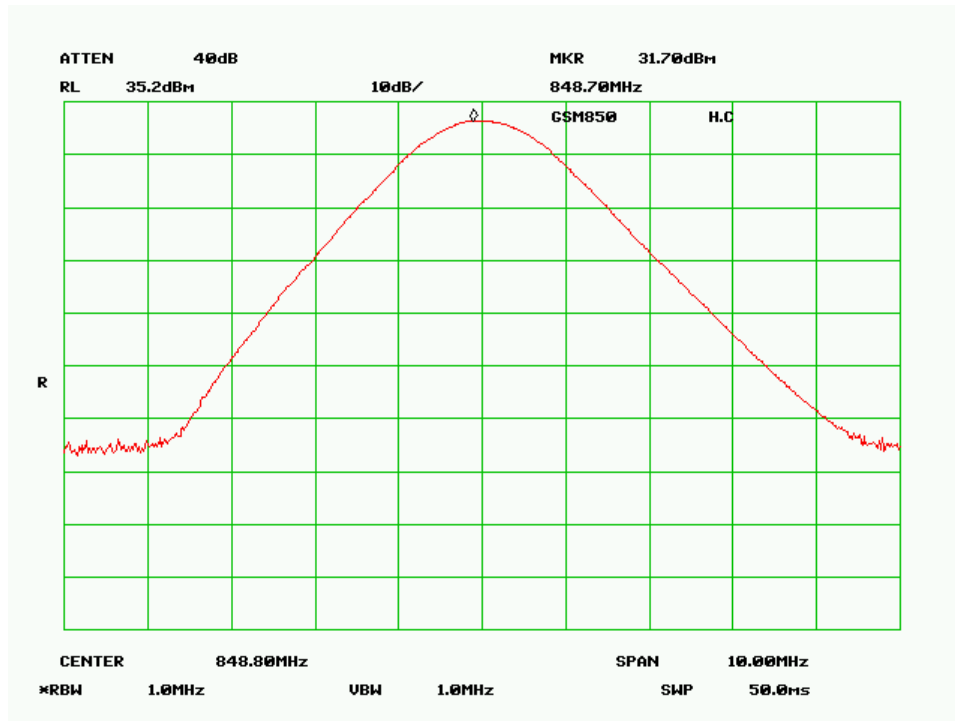
GSM850:

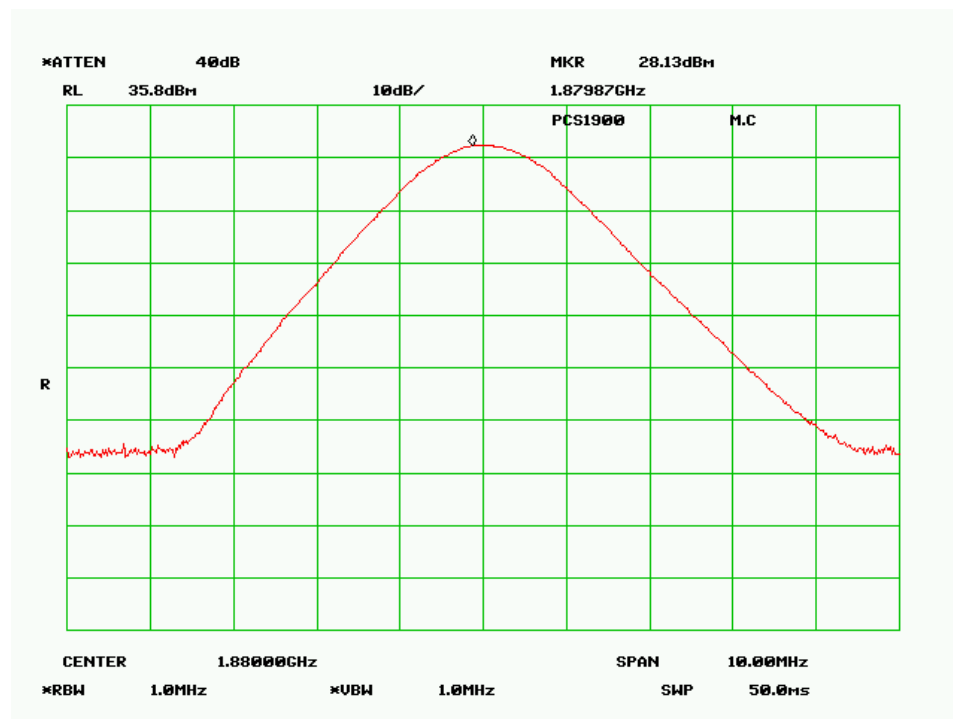
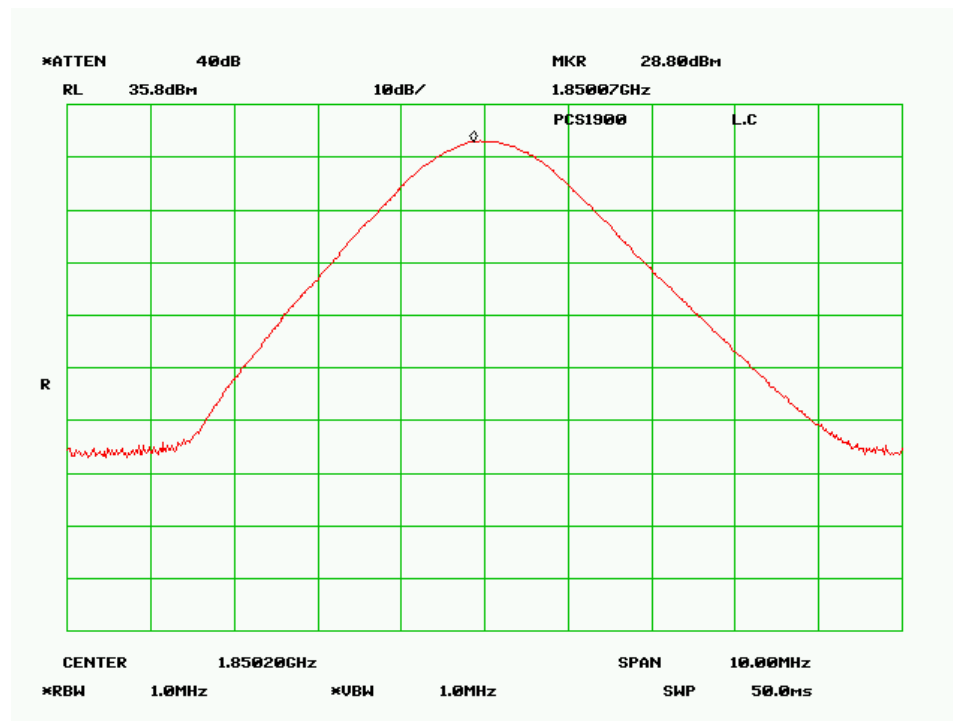
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	824.2	32.20	1.660	7
MIDDLE	836.6	31.53	1.422	7
HIGH	848.8	31.70	1.480	7

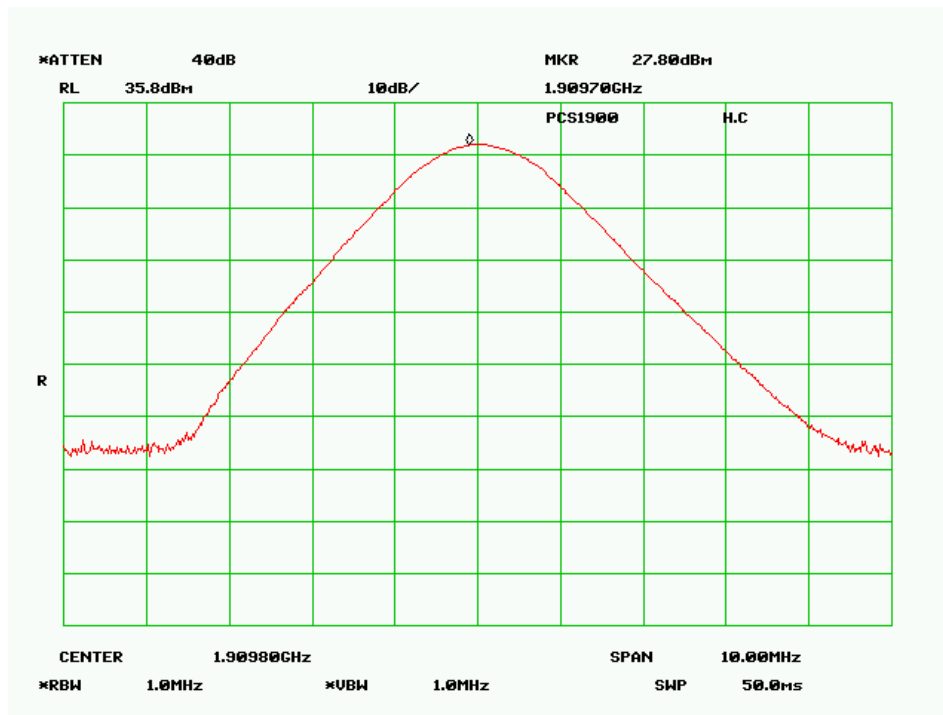
GSM1900:

Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	1850.2	28.80	0.759	2
MIDDLE	1880.0	28.13	0.650	2
HIGH	1909.8	27.80	0.603	2

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 simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 10 KHz and the 26 dB bandwidth was recorded.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde&Schwarz	Communication, Radio Universal	CMU200	103492	2005-05-24
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06

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

Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1020 mbar

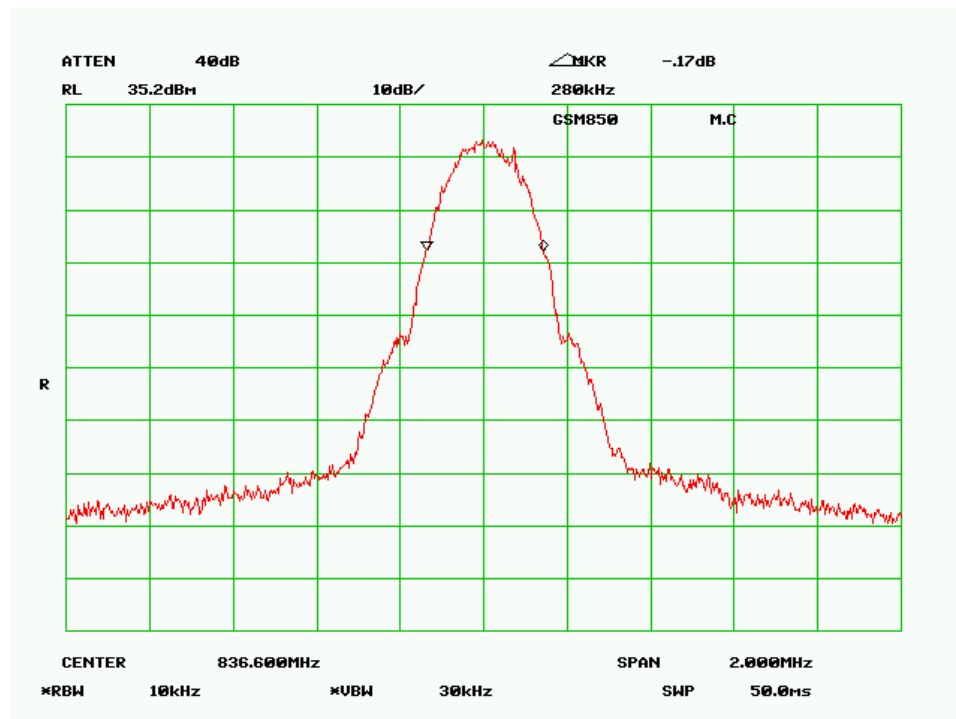
* *The testing was performed by Daniel Deng on 2005-08-05.*

Test Results

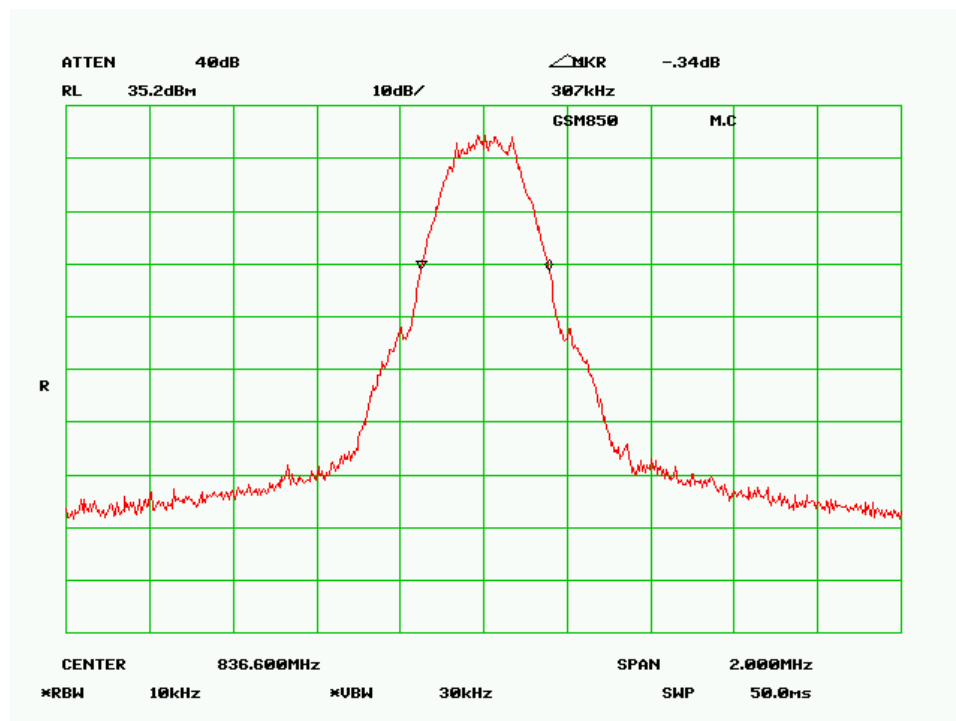
Please refer to the following plots.

Plots of Occupied Bandwidth for Part22

20dB Bandwidth

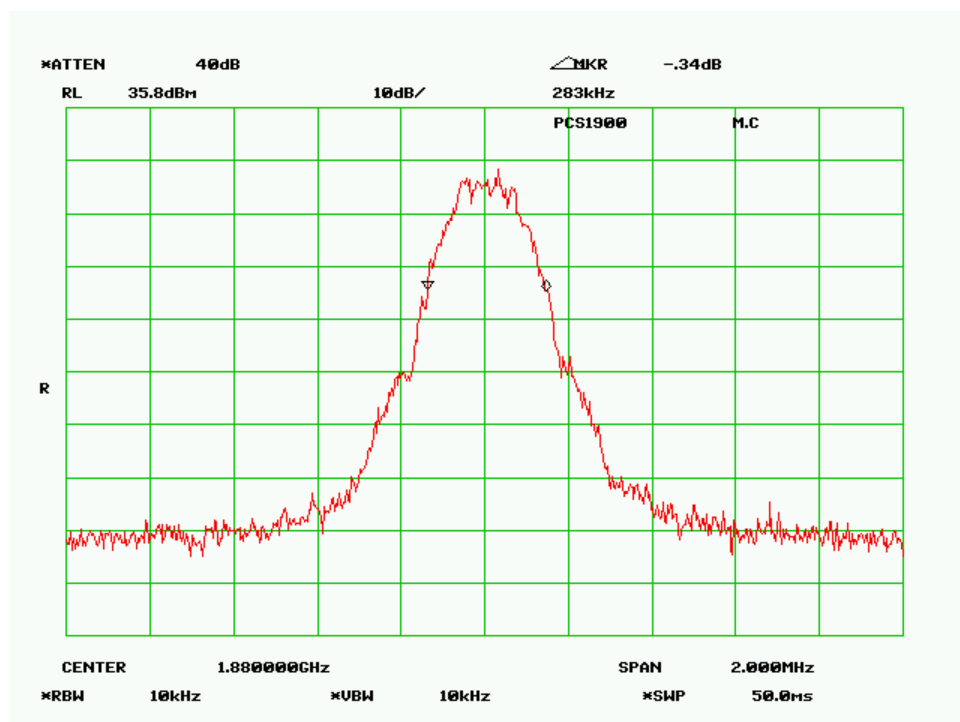


26dB Bandwidth

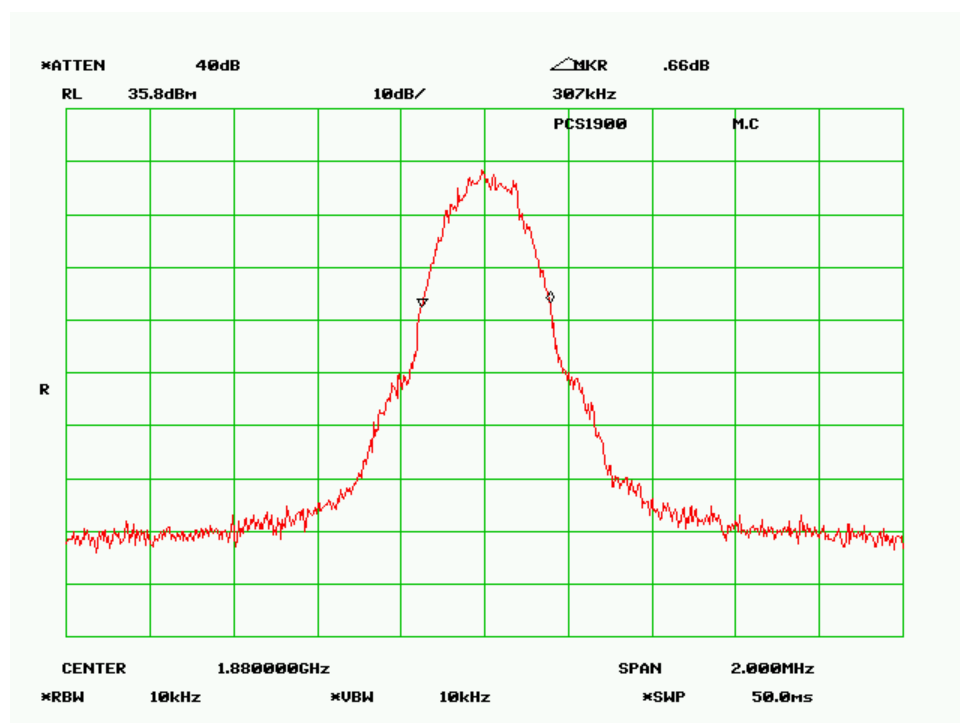


Plots of Occupied Bandwidth for Part24

20dB Bandwidth



26dB Bandwidth



§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 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 10th harmonic.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde&Schwarz	Communication, Radio Universal	CMU200	103492	2005-05-24
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-08-06

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

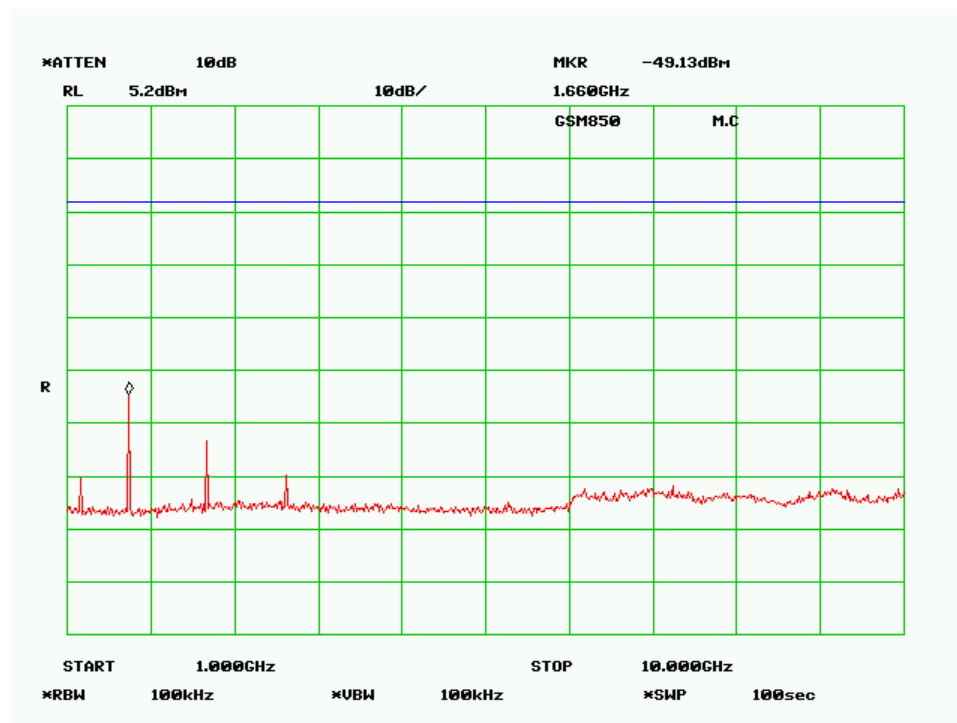
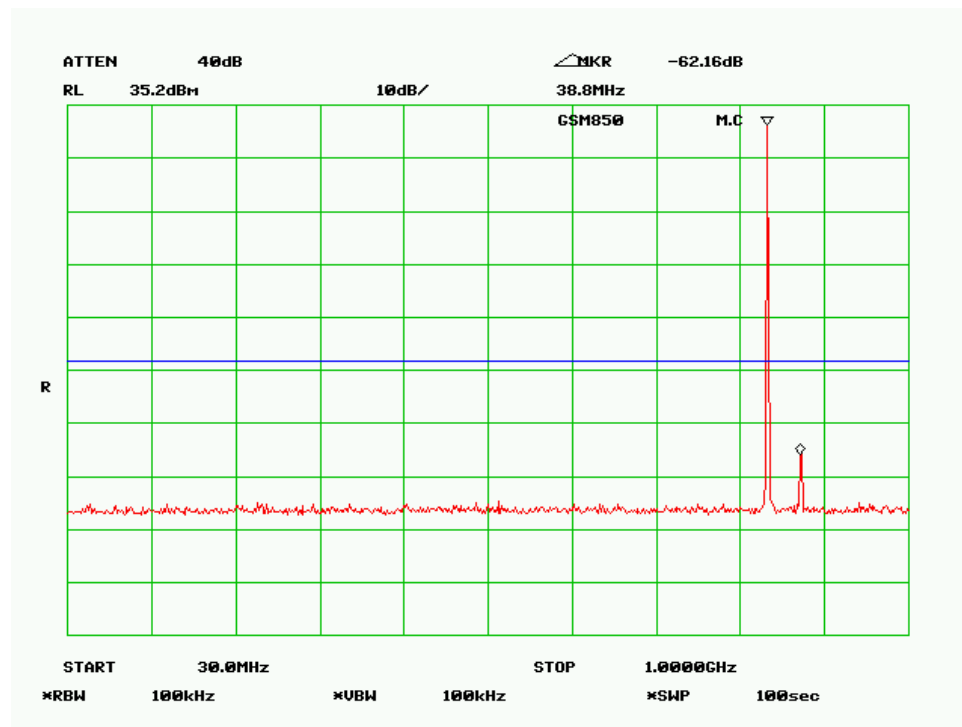
Environmental Conditions

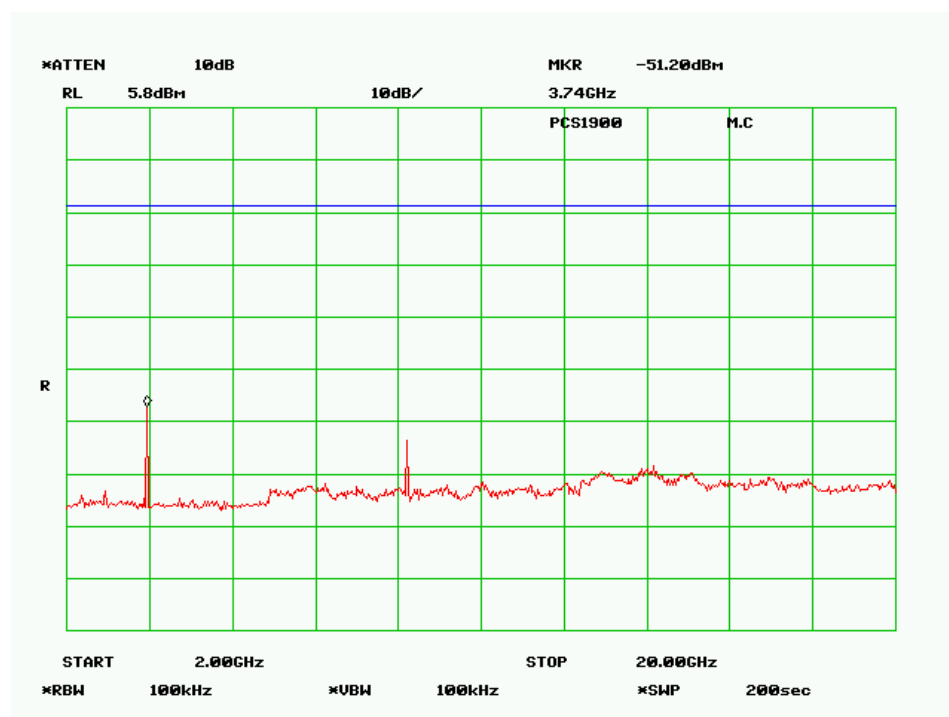
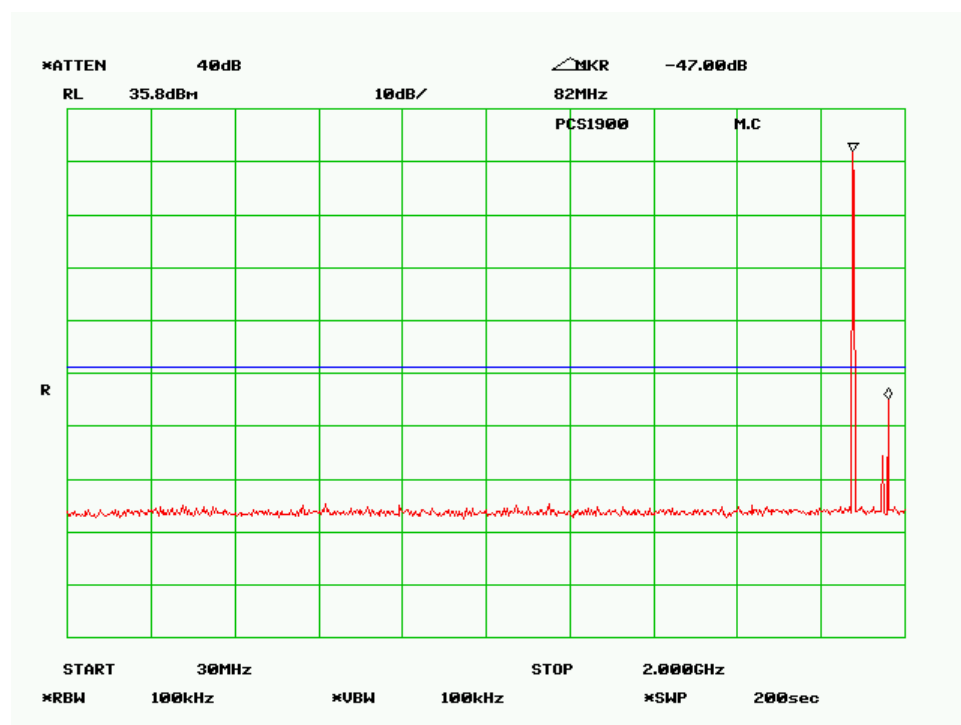
Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1020 mbar

* *The testing was performed by Daniel Deng on 2005-08-05.*

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 Base, fixed [SU][le]/ (ppm)		Mobile SU]3 watts [le]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	

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 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde&Schwarz	Communication, Radio Universal	CMU200	103492	2005-05-24
Tenney	Oven, Temperature	VersaTenn	12.222-193	2004-06-04

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

Environmental Conditions

Temperature:	23° C
Relative Humidity:	42%
ATM Pressure:	1016 mbar

* The testing was performed by Daniel Deng on 2005-08-08.

Test Results

GSM 850

Frequency Stability Versus Temperature

Reference Frequency: Mid Channel 836.6 MHz , Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Error (HZ)	Error (PPM)
50	3.7	-13	-0.016
40	3.7	-11	-0.013
30	3.7	-12	-0.014
20	3.7	-8	-0.001
10	3.7	-5	-0.006
0	3.7	-3	-0.004
-10	3.7	-6	-0.007
-20	3.7	5	0.006
-30	3.7	9	0.011

Frequency Stability Versus Voltage

Reference Frequency: Mid Channel 836.6MHz , Limit: 2.5ppm			
Power Supplied (VDC)	Environment Temperature (°C)	Error (H)z	Error (PPM)
3.7	20	-8	-0.001
3.3	20	10	0.012

PCS 1900*Frequency Stability Versus Temperature*

Reference Frequency: Mid Channel 1880 MHz , Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Error (HZ)	Error (PPM)
50	3.7	34	0.018
40	3.7	39	0.021
30	3.7	37	0.020
20	3.7	41	0.022
10	3.7	35	0.019
0	3.7	20	0.011
-10	3.7	26	0.014
-20	3.7	35	0.019
-30	3.7	33	0.018

Frequency Stability Versus Voltage

Reference Frequency: Mid Channel 1880MHz , Limit: 2.5ppm			
Power Supplied (VDC)	Environment Temperature (°C)	Error (H)z	
		Error (H)z	Error (PPM)
3.7	20	41	0.022
3.3	20	35	0.019

§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 3KHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde&Schwarz	Communication, Radio Universal	CMU200	103492	2005-05-24
HP	Analyzer, Spectrum	8565EC	3946A00131	2005-08-06

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

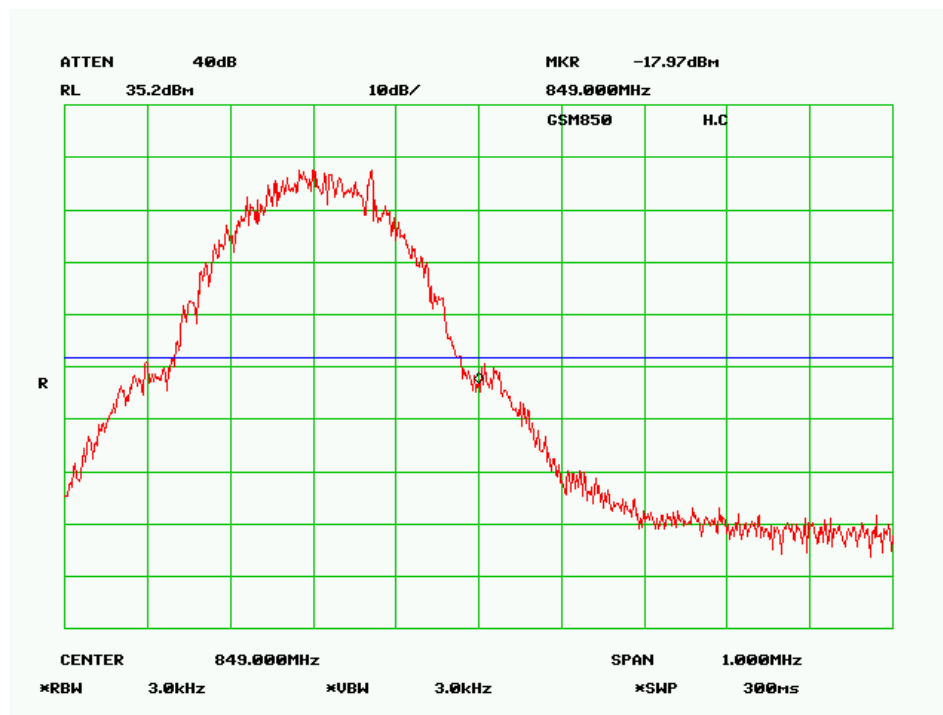
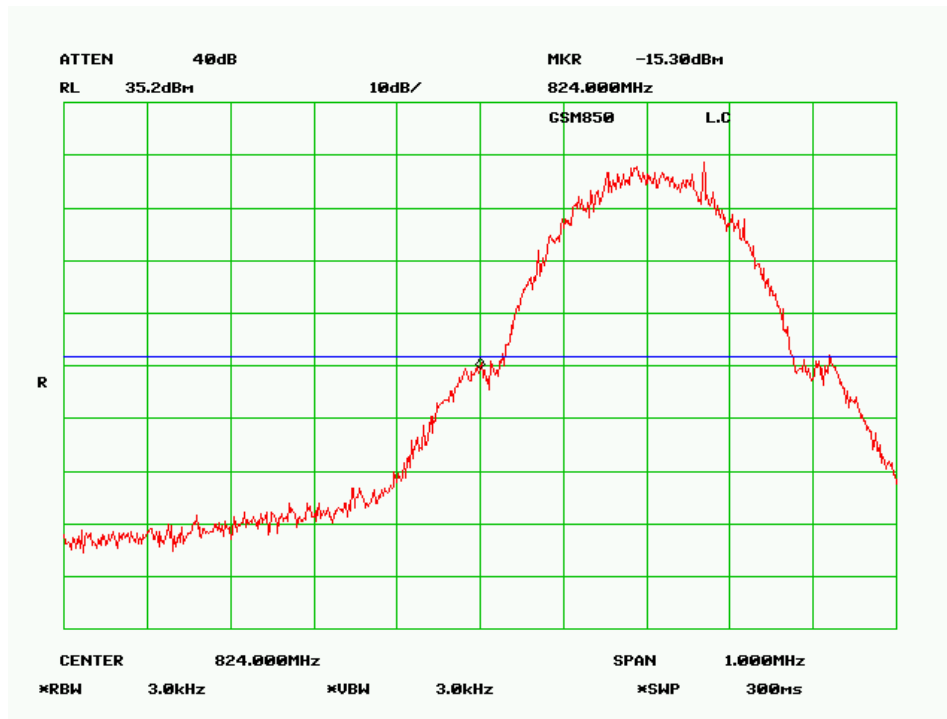
Environmental Conditions

Temperature:	25° C
Relative Humidity:	46%
ATM Pressure:	1020 mbar

* The testing was performed by Daniel Deng on 2005-08-05.

Test Results

Please refer to the following plots.

Plots of Band Edge for Part 22

Plots of Band Edge for Part 24