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

For

Spreadtrum Communication Inc.

810 E. Arques Ave.
Sunnyvale, California, United States 94085

FCC ID: SSJSM5100B

This Report Concerns:	**Equipment Type:**
☒ Original Report	850MHz / 1900 MHz GSM/GPRS Module

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Report No.:	R0412235
Report Date:	2005-01-31
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Note: The test report is specially limited to the above 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 US Government.

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Spreadtrum Communication Inc. 's* product, FCC ID: *SSJSM5100B* or the "EUT" as referred to in this report is a 850MHz / 1900 MHz GSM/GPRS Module, which measures approximately 35mm x 39mm x 2.9mm.

The EUT operates at the frequency of 824.2 – 848.8 MHz, output power 33.17 dBm (2.075W), frequency tolerance 2.5ppm, and emission designator 250KG1W & 1850.2 – 1909.8 MHz, output power 30.33 dBm (1.079W), frequency tolerance 2.5ppm, and emission designator 250KG1W.

** The test data gathered are from typical production sample, serial number: 21110145000E provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *Spreadtrum Communication 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 – Cellular Radio Telephone Service
Part 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, 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 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 radiated and AC line conducted test site criteria 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, BACLa 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: 1997, 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 TIA/EIA 603A.

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.

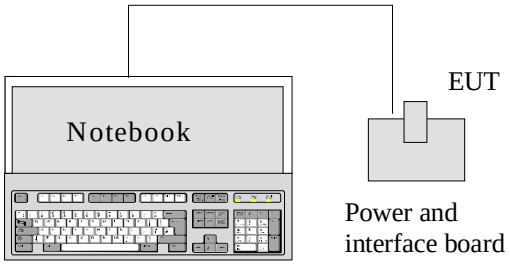
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Compaq	Notebook PC	2103US	CNF43403FB	DOC
Agilent	Wireless communication test set	E5515C	GB44051221	DOC
Spreadtrum	Power and interface board	N/A	N/A	DOC

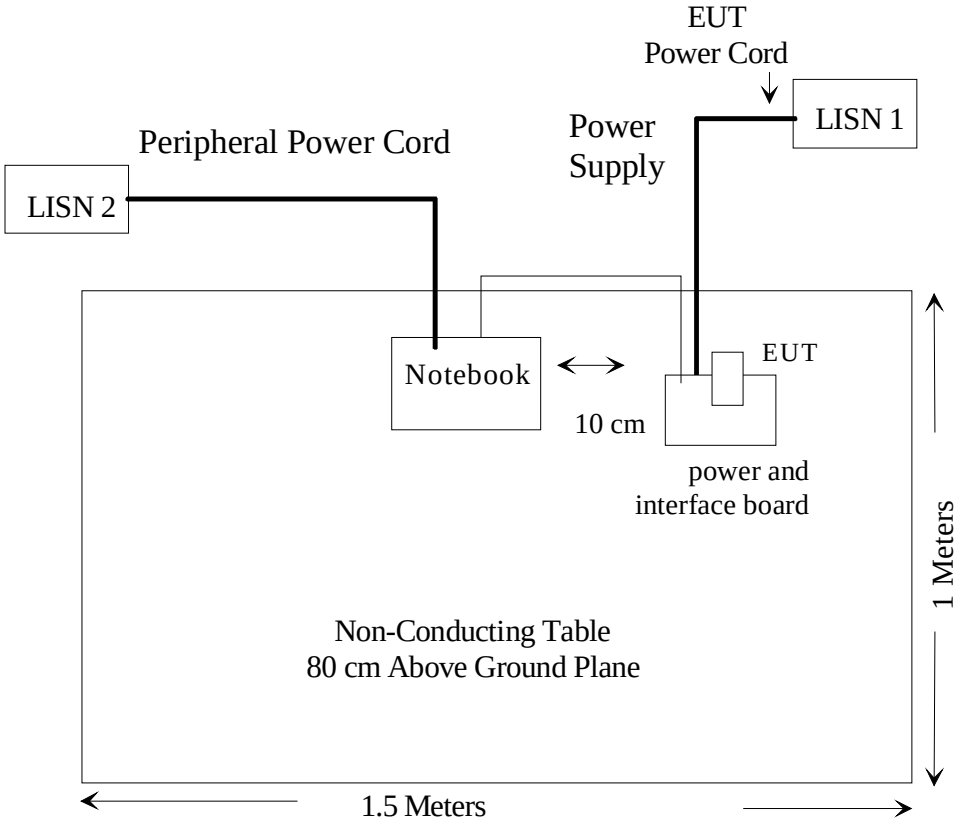
External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded Cable	0.5	RSS232 Port/Notebook PC	RSS232 Port / Power and interface board
N/A	N/A	EUT	Power and interface board

Configuration of Test System



Test Setup Block Diagram



SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: *21110145000E*.

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§1.1307(b)(1), §2.1093	RF Exposure	Compliant
§ 15.107	Conducted Emissions	Compliant
§ 2.1046, § 22.912 (d) § 24.232	RF Output Power	N/A
§ 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

CDMA digital mode is used by EUT.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-10-04
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

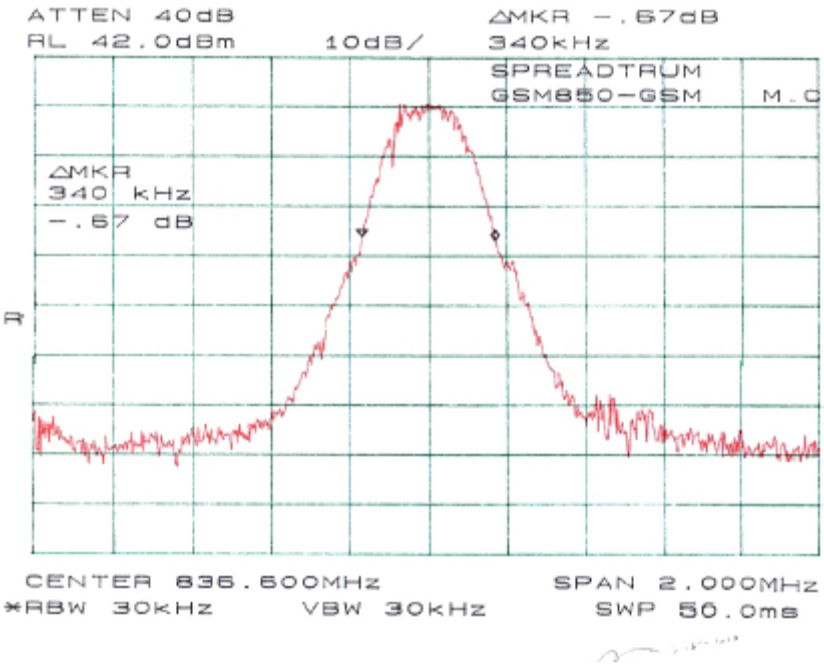
Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

The testing was performed by Ming Jin on 2005-01-12.

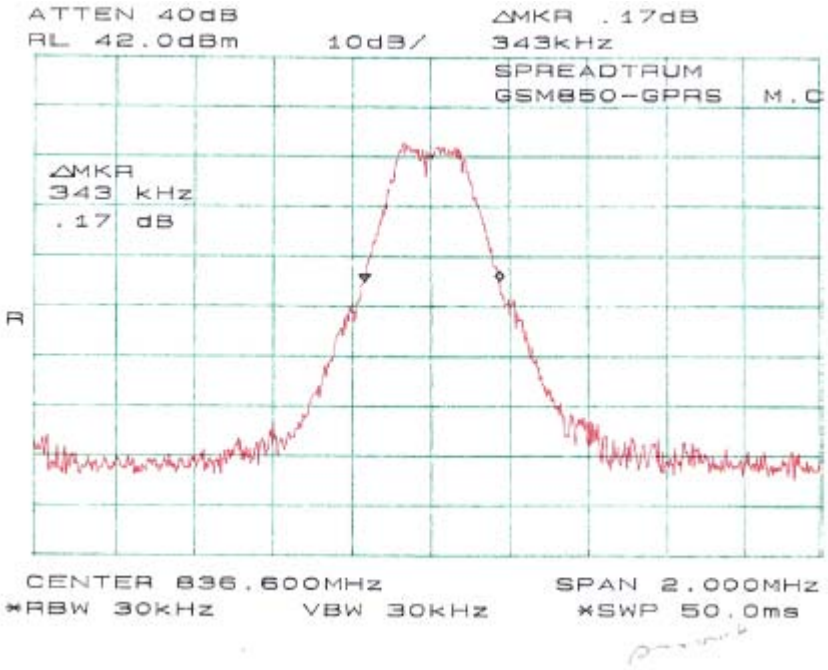
Test Results

Please refer to the hereinafter plots.

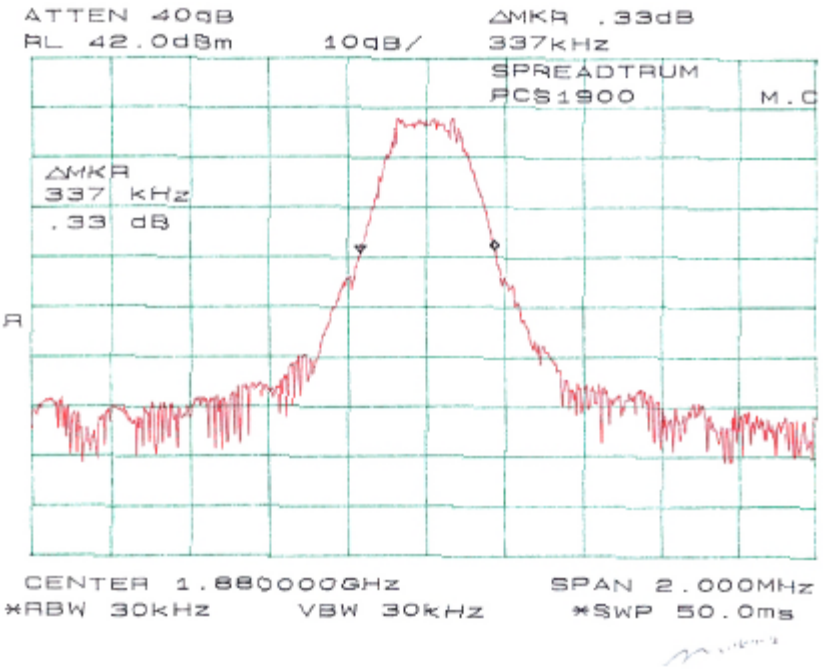
Plots of Modulation Characteristic for GSM 850, Part22



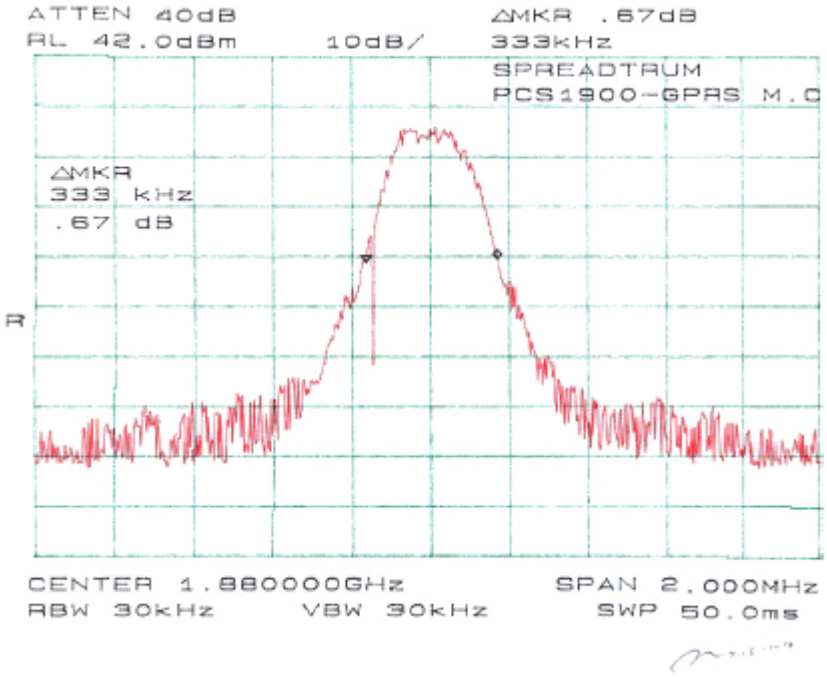
Plots of Modulation Characteristic for GPRS 850, Part22



Plots of Modulation Characteristic for GSM 1900



Plots of Modulation Characteristic for GPRS 1900



§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_{10} (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-07-03
HP	Spectrum Analyzer	HP8565EC	3956A00131	2004-08-06
HP	Amplifier	8449B	3147A00400	2004-03-14
HP	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11
AH System	Horn Antenna	SAS-200/511	261	2004-08-02

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

Environmental Conditions

Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

The testing was performed by Ming Jin on 2005-01-12.

Test Result

FCC Part 22: GSM850

-19.2 dB at 1673.2 MHz

FCC Part 24: PCS1900

-23.7 dB at 3760 MHz

Test Data for GSM 850

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
Primary Scan 30MHz – 10GHz											
836.6	62.1	0	1.5	v	836.6	0	0	0	0		
836.6	58.9	270	1.5	h	836.6	0	0	0	0		
1673.2	35.5	210	1.6	v	1673.2	-37.8	6.8	1.2	-32.2	-13	-19.2
1673.2	34.2	290	1.5	h	1673.2	-39.3	6.8	1.2	-33.7	-13	-20.7
2509.8	33.4	180	1.6	v	2509.8	-41.2	7.6	1.5	-35.1	-13	-22.1
2509.8	32.6	150	1.5	h	2509.8	-42.5	7.6	1.5	-36.4	-13	-23.4
3346.4	29.3	180	1.2	v	3346.4	-45.9	9.5	1.8	-38.2	-13	-25.2
3346.4	28.5	120	1.6	h	3346.4	-47.1	9.5	1.8	-39.4	-13	-26.4

Test Data for PCS 1900

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
Primary Scan 30MHz – 20GHz											
1880	69.3	180	2.2	v	1880	0	0	0	0		
1880	65.1	90	1.8	h	1880	0	0	0	0		
3760	28.7	0	1.5	v	3760	-44.5	9.8	2	-36.7	-13	-23.7
3760	27.6	310	1.6	h	3760	-45.7	9.8	2	-37.9	-13	-24.9
5550	25.9	270	1.5	v	5550	-47.3	10.3	2.3	-39.3	-13	-26.3
5550	25.4	60	1.5	h	5550	-47.9	10.3	2.3	-39.9	-13	-26.9

§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 2 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	HP8564E	3943A01781	2004-10-04
HP	Plotter	HP7470A	2541A49659	Not Required
A.H. Systems	Horn Antenna	SAS200	261	2004-05-31
ETS	Logperiodic Antenna	3148	0004-1155	2004-10-11
EMCO	Biconical Antenna	3110B	9603-2315	2004-10-11

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

Environmental Conditions

Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

The testing was performed by Ming Jin on 2005-01-12.

Test Results

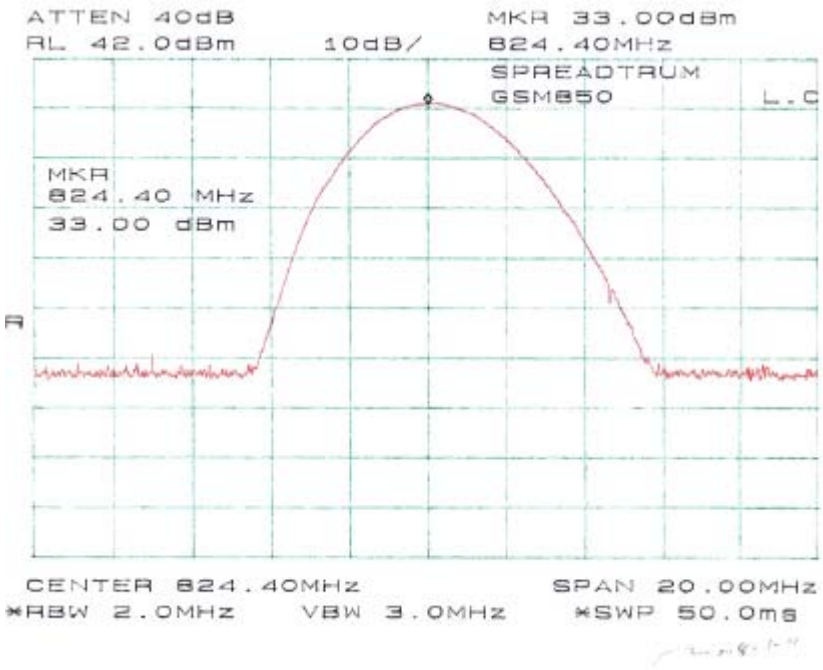
Part 22:

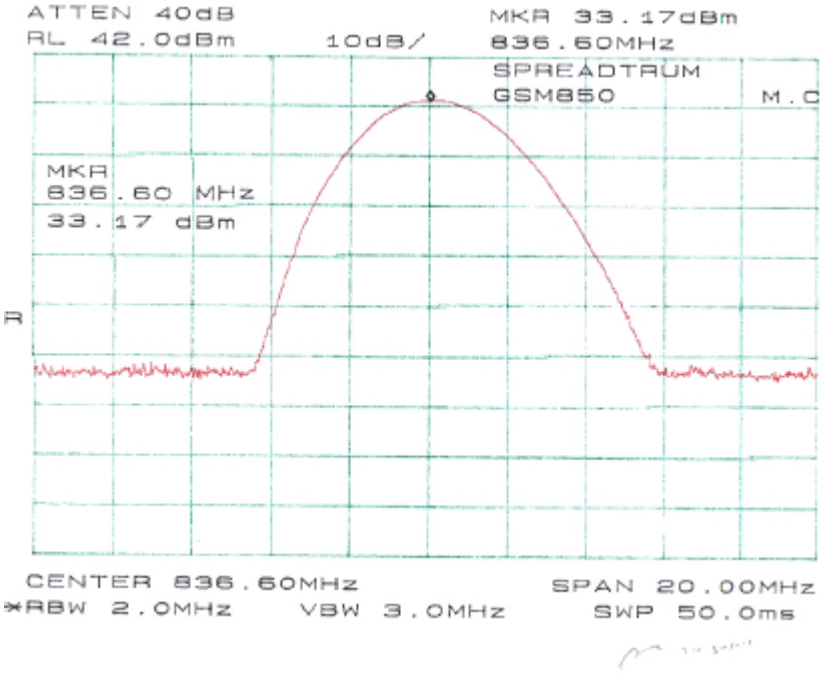
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	824.20	31.00	1.995	7
MIDDLE	836.60	33.17	2.075	7
HIGH	848.80	31.00	1.995	7

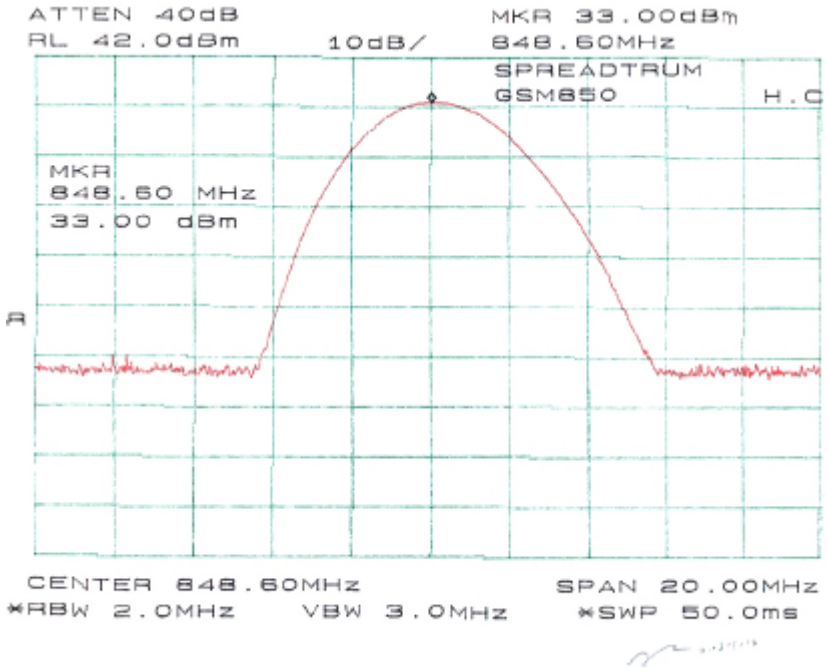
Part 24:

Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
LOW	1850.20	30.00	1.000	100
MIDDLE	1880.00	30.33	1.079	100
HIGH	1909.83	29.50	0.891	100

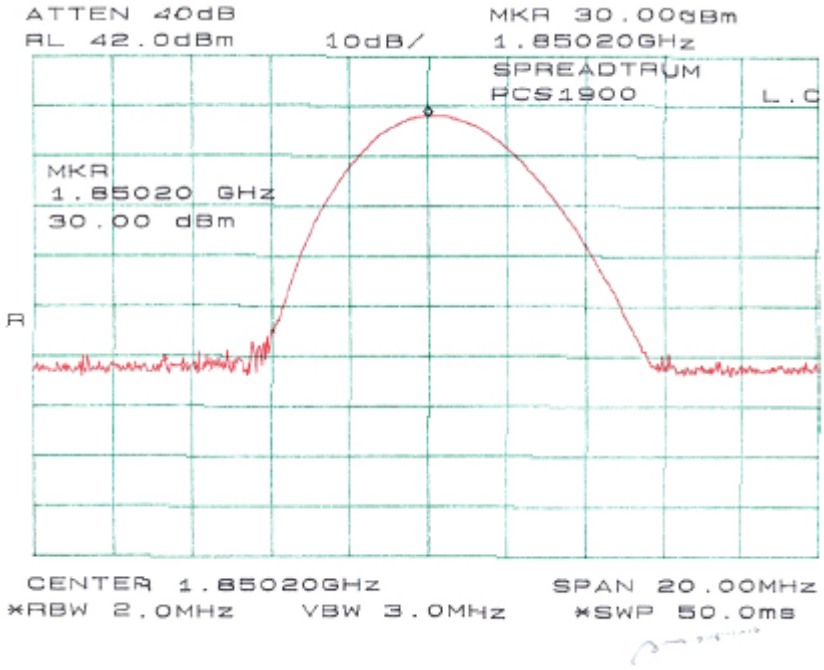
Plots of Conducted Output Power for GSM 850

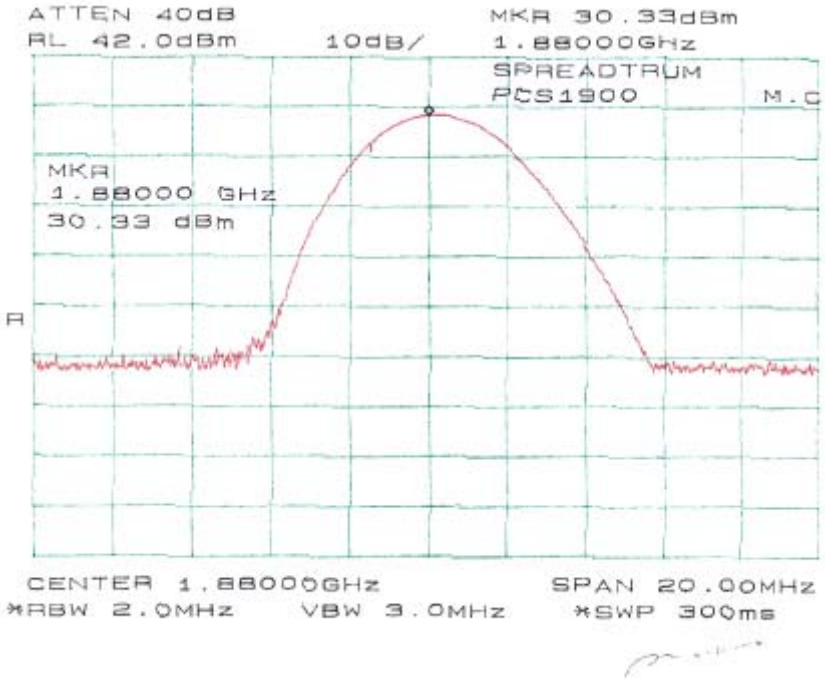


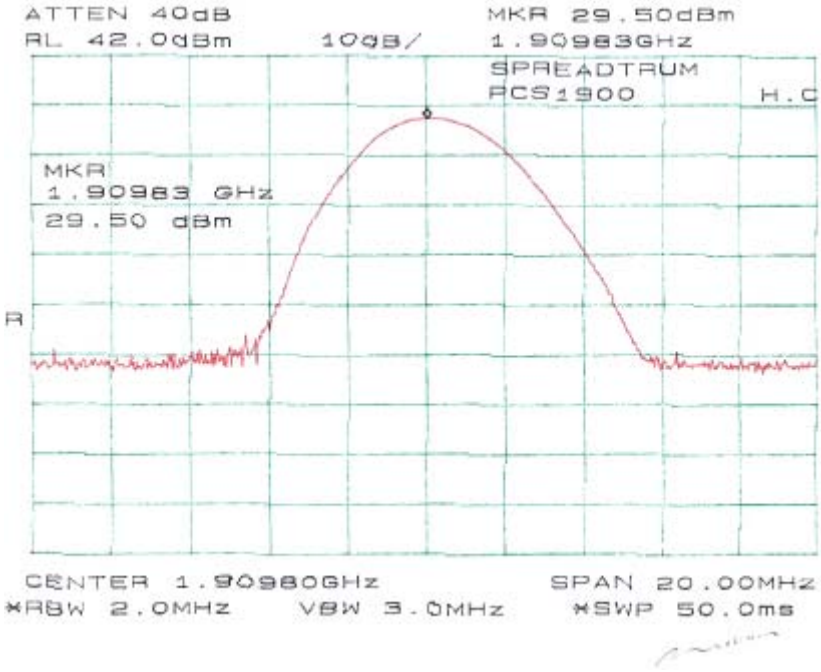




Plots of Conducted Output Power for PCS 1900




ATTEN 40dB
RL 42.0dBm
10dB/
MKR 30.33dBm
1.88000GHz
SPREADTRUM
PCS1900
M.C
MKR
1.88000 GHz
30.33 dBm
A
CENTER 1.88000GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 300ms


ATTEN 40dB
RL 42.0dBm
10dB/
MKR 29.50dBm
1.90983GHz
SPREADTRUM
PCS1900
H.C
MKR
1.90983 GHz
29.50 dBm
A
CENTER 1.90980GHz
SPAN 20.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms

§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

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-10-04
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

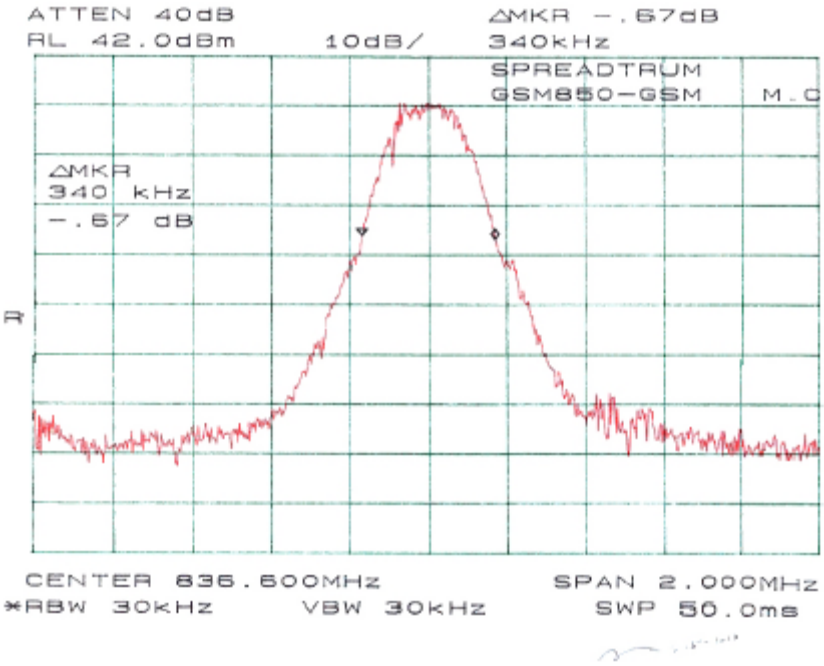
Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

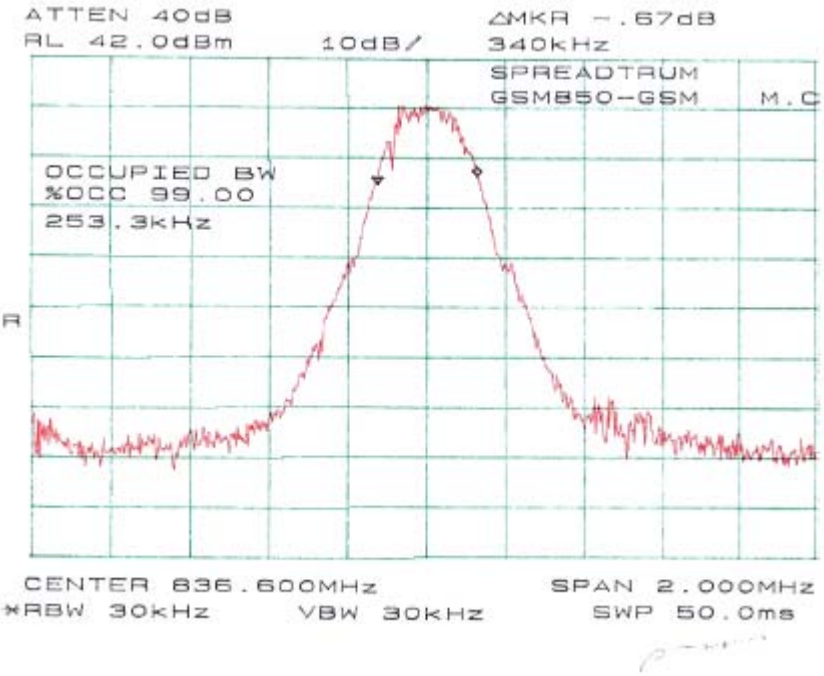
The testing was performed by Ming Jin on 2005-01-12.

Test Results

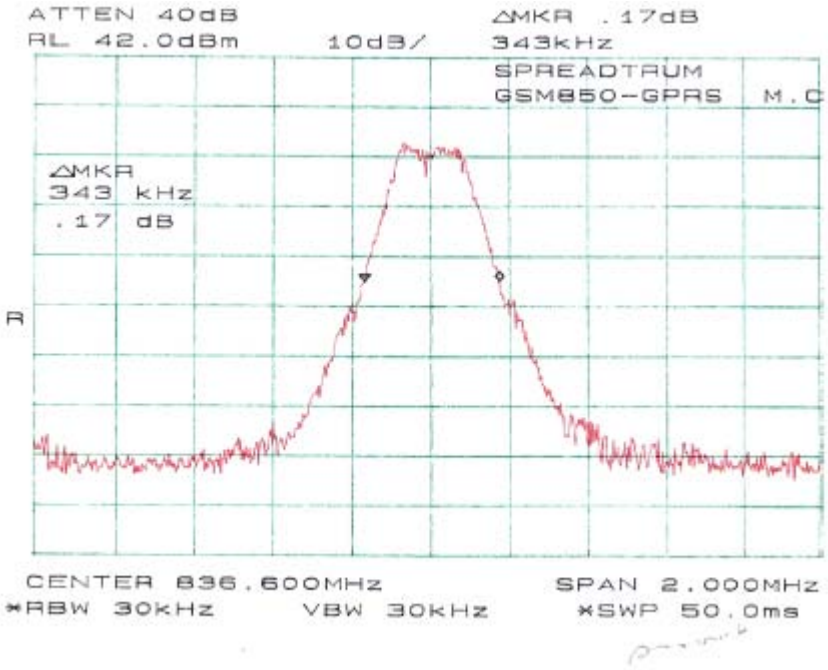
Please refer to the following plots.

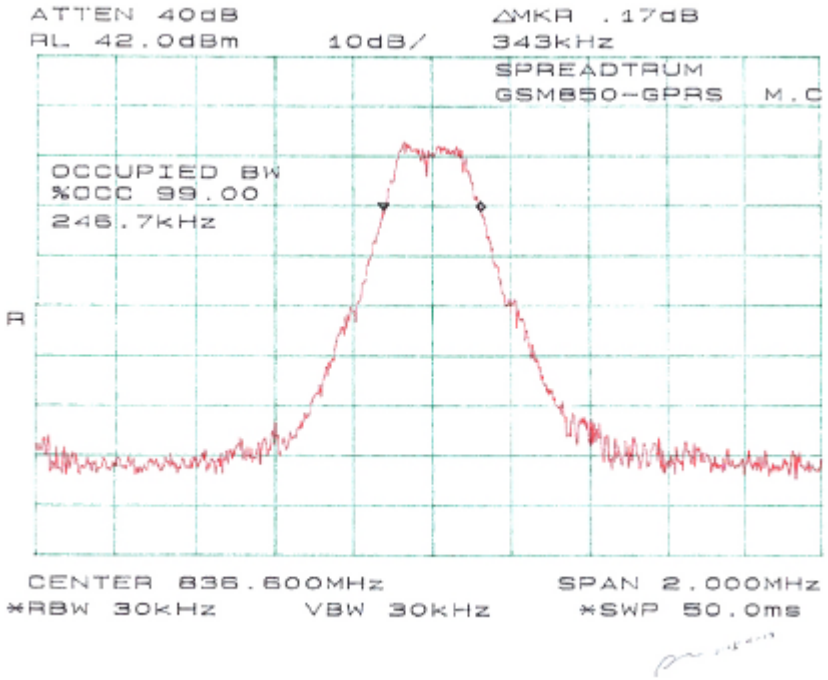
Plots of Occupied Bandwidth for GSM 850, Part22



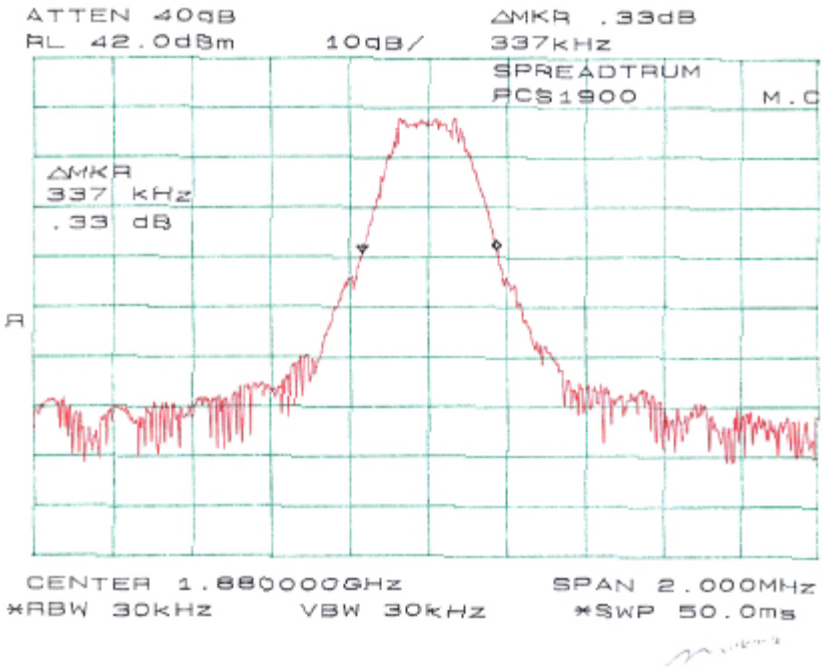


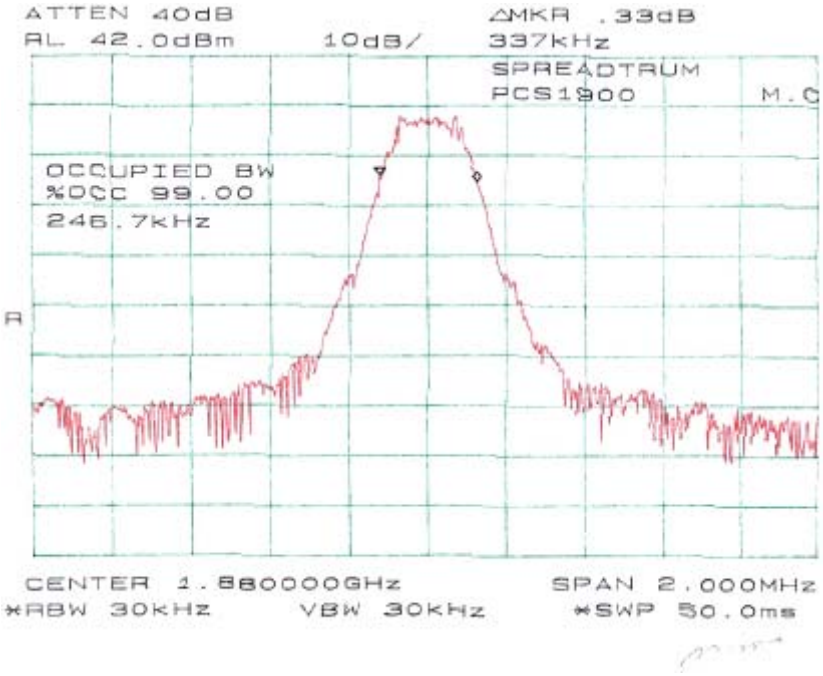
Plots of Occupied Bandwidth for GPRS 850, Part22



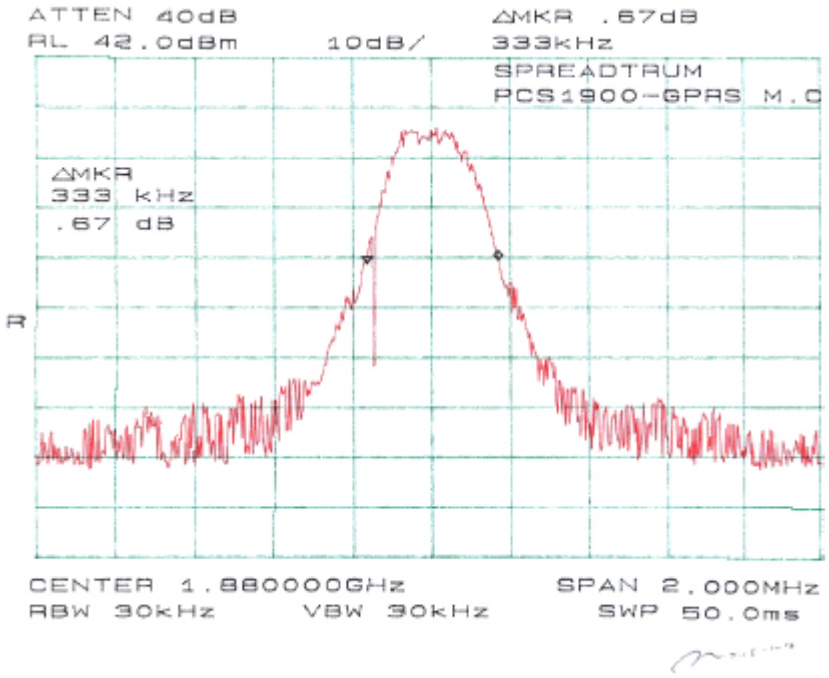


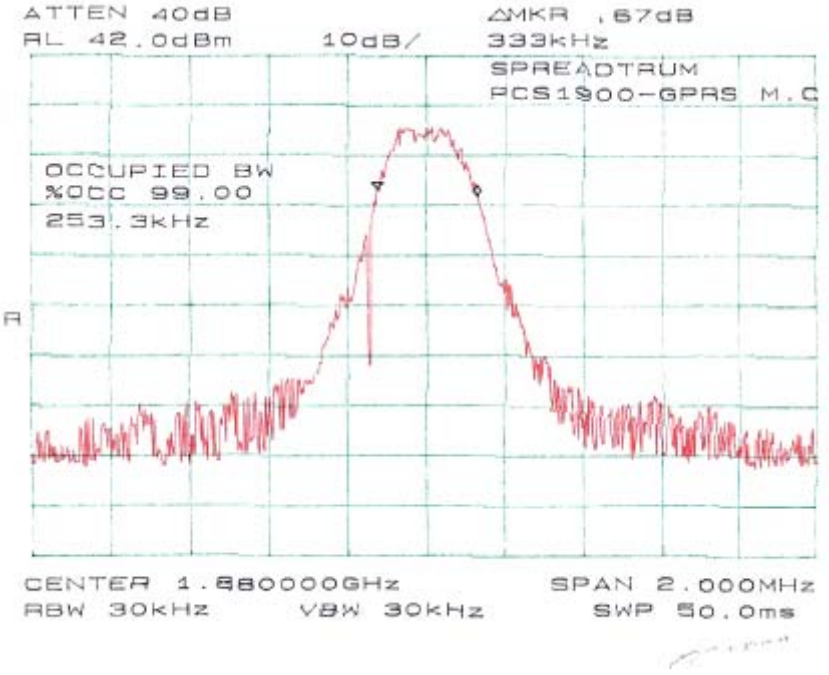
Plots of Occupied Bandwidth for GSM 1900





Plots of Modulation Characteristic for GPRS 1900





§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 10th harmonic.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-10-04
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

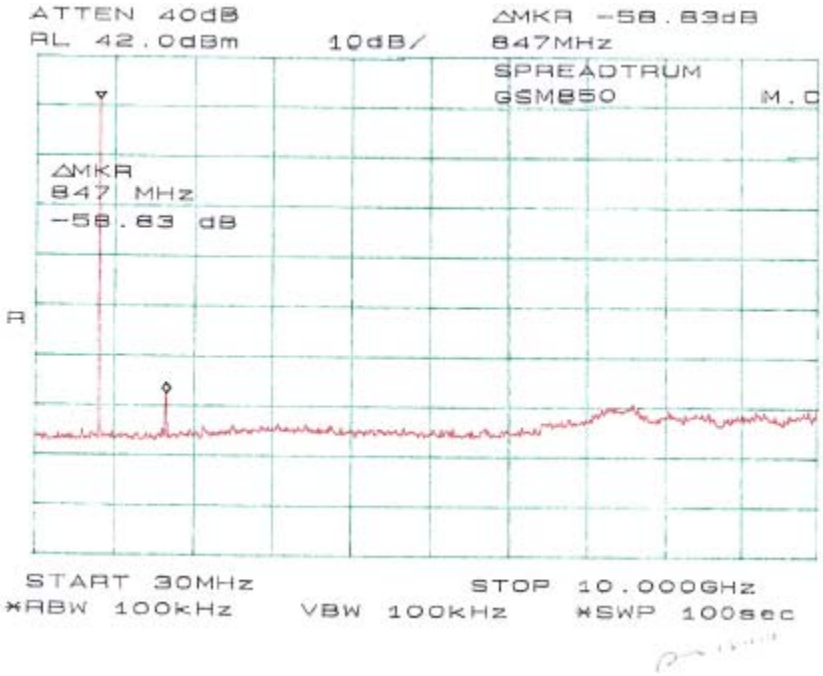
Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

The testing was performed by Ming Jin on 2005-01-12.

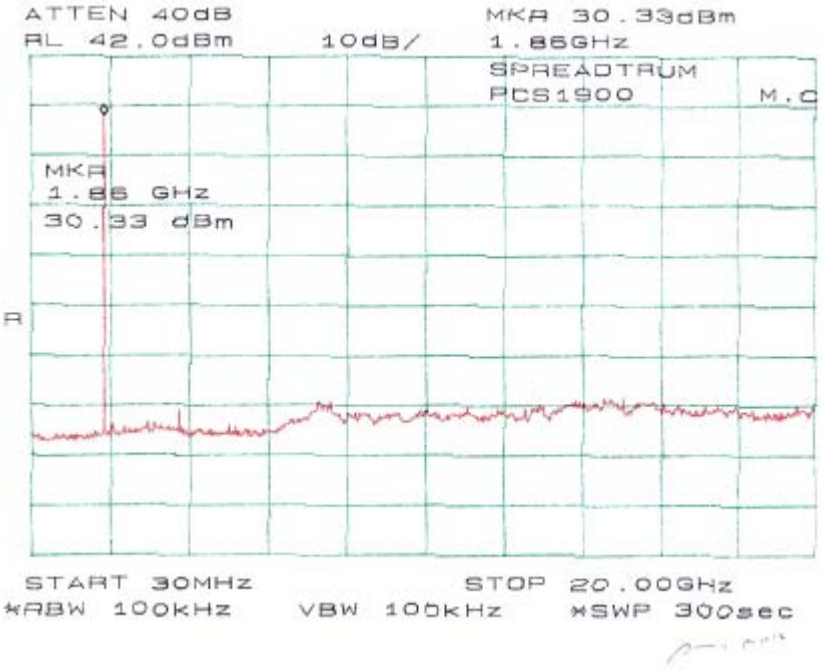
Test Results

Please refer to the hereinafter plots.

Plots of Spurious Emission for GSM 850



Plots of Spurious Emission for PCS1900



§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)	Base, fixed (ppm)	Mobile [SU][le][/SU]3 watts (ppm)	Mobile [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 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. Due Date
HP	Frequency Counter	5342A	2232A06380	2004-09-07
HP	Plotter	HP7470A	2541A49659	Not Required
Tenney	Oven, Temperature	VersaTenn	12222-193	2004-06-04

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

Environmental Conditions

Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

The testing was performed by Ming Jin on 2005-01-12.

Test Results

GSM 850

Reference Frequency : 836.6000 MHz, Limit : 2.5 ppm			
		Frequency Measure with Time Elapsed	
Temperature C	Power supplied Vdc	MCF (MHz)	Error ppm
50	3.6	836.5999	-0.12
40	3.6	836.5999	-0.12
30	3.6	836.6	0
20	3.6	836.6	0
10	3.6	836.6001	0.12
0	3.6	836.6001	0.12
-10	3.6	836.6001	0.12
-20	3.6	836.6002	0.24
-30	3.6	836.6002	0.24

Reference Frequency : 836.6000 MHz, Limit : 2.5 ppm		
	Frequency Measure with Time Elapsed	
Power supplied Vdc	Frequency (MHz)	Error ppm
3.1	836.6001	0.12

GSM 1900

Reference Frequency : 1880.0000 MHz, Limit : 2.5 ppm			
		Frequency Measure with Time Elapsed	
Temperature C	Power supplied Vdc	MCF (MHz)	Error ppm
50	3.6	1879.9994	-0.35
40	3.6	1879.9996	-0.21
30	3.6	1879.9998	-0.11
20	3.6	1880	0
10	3.6	1880	0
0	3.6	1880.0002	0.11
-10	3.6	1880.0002	0.11
-20	3.6	1880.0004	0.22
-30	3.6	1880.0004	0.22

Reference Frequency : 1880 MHz, Limit : 2.5 ppm		
	Frequency Measure with Time Elapsed	
Power supplied Vdc	Frequency (MHz)	Error ppm
3.1	1880.0002	0.11

§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	2004-10-04
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

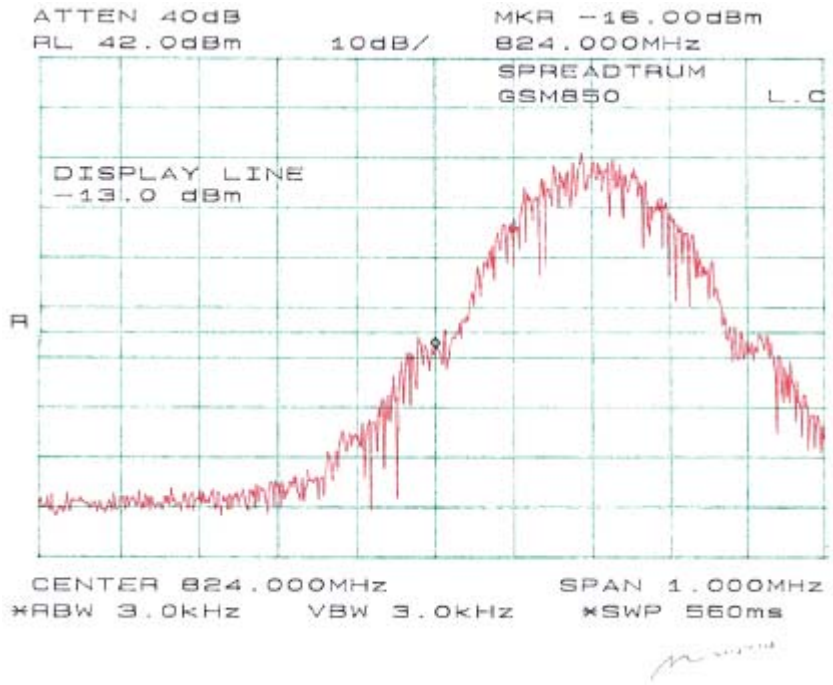
Temperature:	21° C
Relative Humidity:	37%
ATM Pressure:	1032 mbar

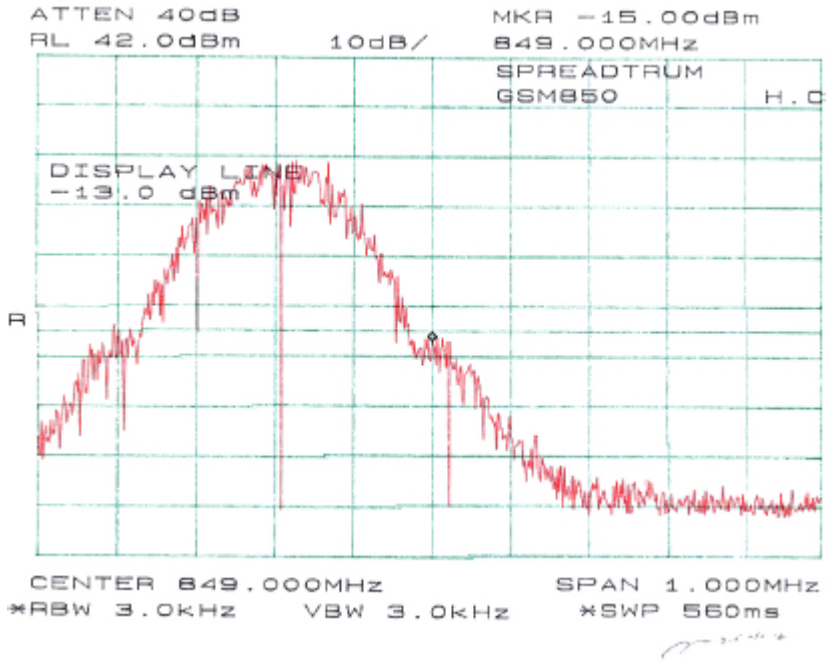
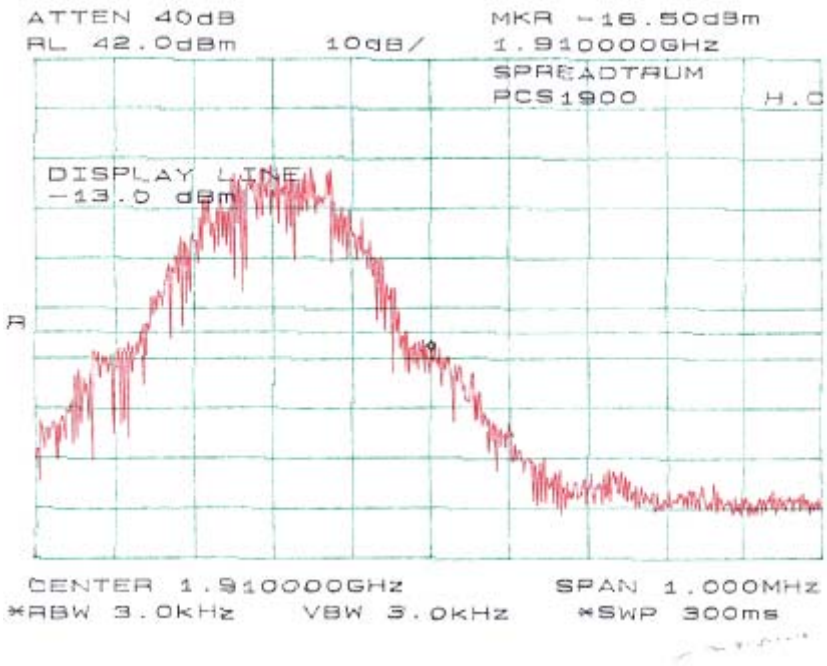
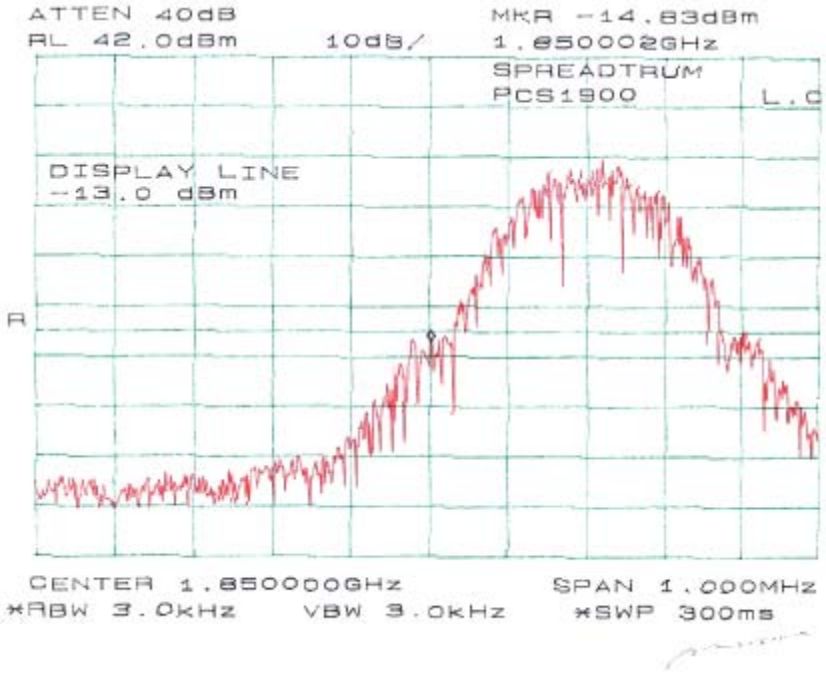
The testing was performed by Ming Jin on 2005-01-12.

Test Results

Please refer to the following plots.

Plots of Band Edge for GSM 850





Plots of Band Edge for PCS 1900