FCC Type Approval

EMI MEASUREMENT AND TEST REPORT

For

Waxess Inc.

34 Executive Park, Suite 250
Irvine, CA 92614

FCC ID: SNBDM1000

This Report Concerns:	**Equipment Type:**
☒ Permissive II Change Report – Base Only	Transceiver, Dual Mode GSM850/1900 & 2.4GHz FHSS Cordless Phone

Test Engineer:	Daniel Deng /
Report No.:	R0505026(B)b
Report Date:	2005-06-17
Reviewed By:	Richard Lee /
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Waxess Inc.'s* product, model no.: *DM1000G, DM100HS* or the "EUT" as referred to this report is Dual Mode GSM850/1900 & 2.4GHz FHSS Cordless Phone. The EUT is composed of two parts, Base and Handset. The base unit measures approximately 200mmL x 195mmW x 170mmH. The handset unit measures approximately 195mmL x 53mmW x 28mmH. This report is for Base only.

** The test data gathered are from typical production sample, serial number: 444, provided by the manufacturer.*

Objective

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

This is a Permissive II Change application. The original application was granted on 2005-01-18. Waxess Inc. added conductive paint on the bottom part of plastic to eliminate the coupling of RF signal radiated from antenna to the audio circuit which caused annoyed noise during phone conversation using GSM. The location of RF cable which is connecting ANT and the module's RF port was changed also. Before changes, it was connected via PCB. After changes, the ANT and RF port of the module are connected directly.

Related Submittal(s)/Grant(s)

This application was originally granted on 2005-01-18. Please refer to BACL test report R0410203.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003& TIA/EIA-603.

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 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 ANSI C63.4-2003 & 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
Southern Telecom	Telephone	None	None	None
Teltone Corp	Simulator	TLS-3B-01	80071	None

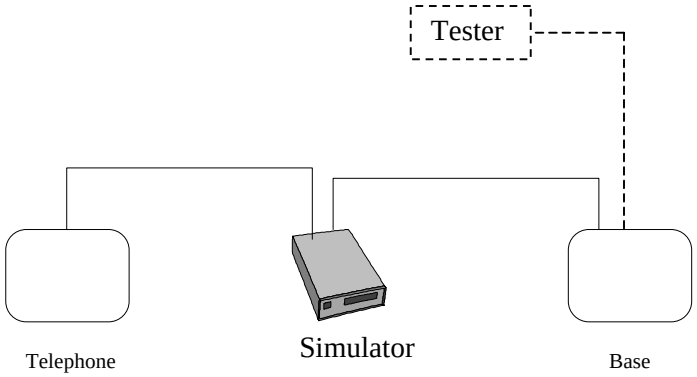
Remote Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Agilent	Wireless Communication Tester	Agilent 8960	GB44051221	None

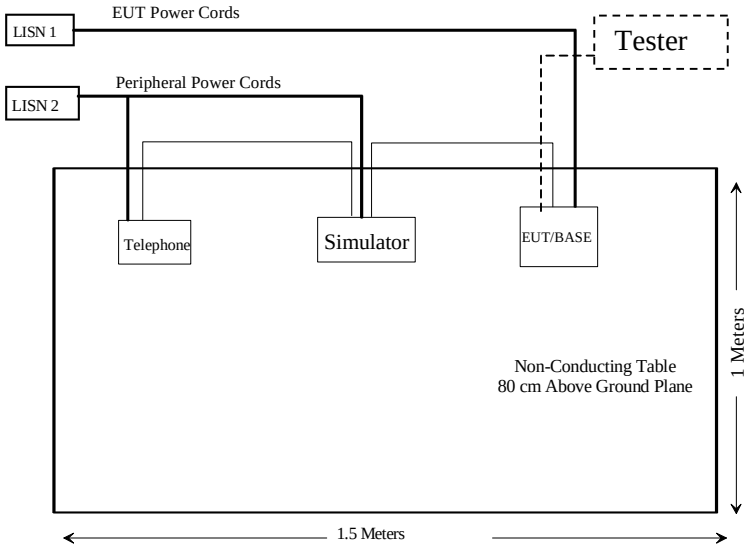
Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Waxess	AC Adaptor	AD-48081000	None	None

Configuration of Test System



Test Setup Block Diagram



SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	N/A
§ 15.205	Restricted Bands	N/A
§15.207 (a)	Conducted Emission	N/A
§15.209	Radiated Emission	Compliant
§15.247 (a) (1)	Hopping Channel Separation	N/A
§15.247 (a) (1)	Channel Bandwidth	N/A
§15.247 (a) (1) (iii)	Number of Hopping Frequencies Used	N/A
§15.247 (a) (1) (iii)	Dwell Time of Each Frequency within a 10 Second Period of time (0.4 x Number of Channel)	N/A
§15.247 (b) (1)	Maximum Peak Output Power	Compliant
§ 15.247 (b)(4) § 2.1093	RF Safety Requirements	N/A
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	N/A
	Spurious Emission at Antenna Port	N/A

§15.205 & §15.209 - RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

Test Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Amplifier, Pre, microwave	8449B	3147A00400	2005-03-14
HP	Amplifier, Pre	8447E	1937A01057	2004-08-04
Agilent	Analyzer, Spectrum	E4446A	US44300386	2004-11-10
ETS	Antenna, Biconical	3110B	9603-2315	2004-12-14
A.R.A.	Antenna, Horn, DRG	DRG-118/A	1132	2004-09-30
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	2455-261	2005-04-20
ETS	Antenna, logperiodic	3148	0004-1155	2004-12-14

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-05-13.

Test Procedure

For the radiated emissions test, both the laptop and all peripheral power cords were connected to the AC floor outlet since the power supply used in the laptop did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**Qp**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

Summary of Test Results

According to the recorded data in following table, for base, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

Base:

-14.25 dB at **2390 MHz** in the **Vertical** polarization, Low Channel

-17.43 dB at **7324.992 MHz** in the **Vertical** polarization, Mid Channel

-16.74 dB at **7446.816 MHz** in the **Vertical** polarization, High Channel

-3.09 dB at **439.83 MHz** in the **Vertical** polarization, Unintentional Emission

Base, Radiated Emission Test Data @ 3 Meter

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Comments
MHz	dBμV/m	Degree	Meter	H/V	dB	dB	dB	dBμV/m	dBμV/m	dB	
Low Channel: 2401.0560 MHz											
2390	64.93	180	1.6	v	28.65	2.0	35.83	59.75	74	-14.25	Peak
7203.168	30.49	270	1.4	v	36.71	4.3	34.67	36.83	54	-17.17	Ave
2390	61.56	270	1.7	h	28.65	2.0	35.83	56.38	74	-17.62	Peak
7203.168	29.87	30	1.6	h	36.71	4.3	34.67	36.21	54	-17.79	Ave
4802.112	50.43	180	1.4	v	32.53	3.1	34.83	51.23	74	-22.77	Peak
4802.112	30.11	180	1.4	v	32.53	3.1	34.83	30.91	54	-23.09	Ave
7203.168	43.27	30	1.6	h	36.71	4.3	34.67	49.61	74	-24.39	Peak
2390	34.76	180	1.6	v	28.65	2.0	35.83	29.58	54	-24.42	Ave
7203.168	43.08	270	1.4	v	36.71	4.3	34.67	49.42	74	-24.58	Peak
4802.112	28.61	90	1.5	h	32.53	3.1	34.83	29.41	54	-24.59	Ave
2390	33.87	270	1.7	h	28.65	2.0	35.83	28.69	54	-25.31	Ave
4802.112	42.54	90	1.5	h	32.53	3.1	34.83	43.34	74	-30.66	Peak
Middle Channel: 2441.664 MHz											
7324.992	30.23	180	1.7	v	36.71	4.3	34.67	36.57	54	-17.43	Ave
7324.992	29.65	120	1.5	h	36.71	4.3	34.67	35.99	54	-18.01	Ave
4883.328	31.47	180	1.5	v	32.53	3.1	34.83	32.27	54	-21.73	Ave
4883.328	30.77	180	1.6	h	32.53	3.1	34.83	31.57	54	-22.43	Ave
7324.992	43.69	180	1.7	v	36.71	4.3	34.67	50.03	74	-23.97	Peak
7324.992	42.63	120	1.5	h	36.71	4.3	34.67	48.97	74	-25.03	Peak
4883.328	47.15	180	1.5	v	32.53	3.1	34.83	47.95	74	-26.05	Peak
4883.328	43.85	180	1.6	h	32.53	3.1	34.83	44.65	74	-29.35	Peak

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Comments
MHz	dBμV/m	Degree	Meter	H/V	dB	dB	dB	dBμV/m	dBμV/m	dB	
High Channel: 2482.2720 MHz											
7446.816	30.92	0	1.4	v	36.71	4.3	34.67	37.26	54	-16.74	Ave
7446.816	30.25	180	1.6	h	36.71	4.3	34.67	36.59	54	-17.41	Ave
2483.5	41.23	0	1.5	v	28.65	2	35.83	36.05	54	-17.95	Ave
7446.816	45.71	0	1.4	v	36.71	4.3	34.67	52.05	74	-21.95	Peak
4964.544	29.88	0	1.4	v	32.53	3.1	34.83	30.68	54	-23.32	Ave
7446.816	43.62	180	1.6	h	36.71	4.3	34.67	49.96	74	-24.04	Peak
4964.544	29.12	180	1.6	h	32.53	3.1	34.83	29.92	54	-24.08	Ave
4964.544	46.89	0	1.4	v	32.53	3.1	34.83	47.69	74	-26.31	Peak
2483.5	29.89	180	1.6	h	28.65	2	35.83	24.71	54	-29.29	Ave
4964.544	42.85	180	1.6	h	32.53	3.1	34.83	43.65	74	-30.35	Peak
2483.5	43.68	0	1.5	v	28.65	2	35.83	38.5	74	-35.5	Peak
2483.5	30.11	180	1.6	h	28.65	2	35.83	24.93	74	-49.07	Peak

AVG: Average

Unintentional Emission

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Comments
MHz	dBμV/m	Degree	Meter	H/V	dB	dB	dB	dBμV/m	dBμV/m	dB	
439.83	51.7	180	1.1	V	16.9	2.79	28.48	42.91	46	-3.09	Peak
402.96	52.1	0	1.0	v	16.4	2.50	28.3	42.70	46	-3.30	Peak
571.26	47.3	0	1.3	V	19.3	3.04	28.9	40.74	46	-5.26	Peak
534.40	46.8	180	1.5	V	19.3	2.97	28.9	40.17	46	-5.83	Peak
458.26	48.2	0	1.4	H	17.1	3.00	28.6	39.70	46	-6.30	Peak
274.93	51.4	0	1.2	H	13.3	2.20	27.9	38.98	46	-7.02	Peak
238.06	50.8	180	1.5	H	12.6	2.17	28.1	37.49	46	-8.51	Peak
607.64	42.0	180	1.5	H	19.7	3.34	28.9	36.14	46	-9.86	Peak
626.06	41.0	180	1.2	H	19.8	3.14	28.9	35.04	46	-10.96	Peak

§15.247 (b) (1) - MAXIMUM PEAK OUTPUT POWER

Standard Applicable

According to §15.247(b) (1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt.

Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	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:	45%
ATM Pressure:	1025 mbar

The testing was performed by Daniel Deng on 2005-06-11.

Measurement Result

Unit	Channel	Frequency	Output Power in dBm	Output Power in mW	Standard	Result
Base	Low	2401.056	22.6	181.97	≤ 1W	Compliant
	Middle	2441.664	23.2	208.93	≤ 1W	Compliant
	High	2482.272	22.3	169.82	≤ 1W	Compliant
Handset	Low	2401.056	16.1	40.74	≤ 1W	Compliant
	Middle	2441.664	16.1	40.74	≤ 1W	Compliant
	High	2482.272	15.8	38.02	≤ 1W	Compliant

SUMMARY OF TEST RESULTS FOR FCC PART 22 & PART 24

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

§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	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
ETS	Biconical Antenna	3110B	9603-2315	2004-12-14
ETS	Log Periodic Antenna	3148	0004-1155	2004-12-14
AH System	Horn Antenna	SAS-200/571	261	2005-04-20
HP	Spectrum Analyzer	8564E	3943A01781	2004-08-25
HP	Amplifier, Pre, microwave	8449B	3147A00400	2005-03-14

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-05-13.

Test Result

FCC Part 22: GSM850

-9.4 dBm at 2509.8 MHz in the **Vertical** polarization,

FCC Part 24: GSM1900

-27.6 dBm at 3760 MHz in the **Vertical** polarization,

Test Data for GSM850, Part22

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna				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
2509.8	46.56	150	1.5	v	2509.8	-30.1	9.3	1.6	-22.4	-13	-9.4
1673.2	48.05	120	1.4	v	1673.2	-31.6	9.3	1.3	-23.6	-13	-10.6
1673.2	40.69	90	1.7	h	1673.2	-38.1	9.3	1.3	-30.1	-13	-17.1
2509.8	34.42	90	1.6	h	2509.8	-42.1	9.3	1.6	-34.4	-13	-21.4
1763.0	19.45	0	1.6	v	1763.0	-60.2	9.3	1.3	-52.2	-13	-39.2
1763.0	17.56	270	1.6	h	1763.0	-61.7	9.3	1.3	-53.7	-13	-40.7
1747.1	18.47	0	1.6	v	1747.1	-61.8	9.3	1.3	-53.8	-13	-40.8
896.0	21.97	300	1.8	v	896.0	-60.1	6.4	0.7	-54.4	-13	-41.4
1747.1	17.85	180	1.8	h	1747.1	-62.5	9.3	1.3	-54.5	-13	-41.5
896.0	19.75	0	1.5	h	896.0	-62.2	6.4	0.7	-56.5	-13	-43.5

Test Data for GSM1900, Part24

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna				Antenna	Cable	Absolute	FCC	FCC
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dB	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
3760.0	23.74	0	1.5	v	3760.0	-50.2	11.5	1.9	-40.6	-13	-27.6
3760.0	21.13	330	1.8	h	3760.0	-52.8	11.5	1.9	-43.2	-13	-30.2
1867.0	23.99	180	1.4	v	1867.0	-53.2	9.2	1.3	-45.3	-13	-32.3
1867.0	19.10	180	1.4	h	1867.0	-58.1	9.2	1.3	-50.2	-13	-37.2
1400.0	19.56	180	1.5	v	1400.0	-61.3	8.3	1.2	-54.2	-13	-41.2
1400.0	18.85	150	1.7	h	1400.0	-61.6	8.3	1.2	-54.5	-13	-41.5
1382.4	18.25	90	1.5	v	1382.4	-61.8	8.3	1.2	-54.7	-13	-41.7
1382.4	17.96	120	1.4	h	1382.4	-61.9	8.3	1.2	-54.8	-13	-41.8

§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 (b), 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	2004-08-01
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.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

Environmental Conditions

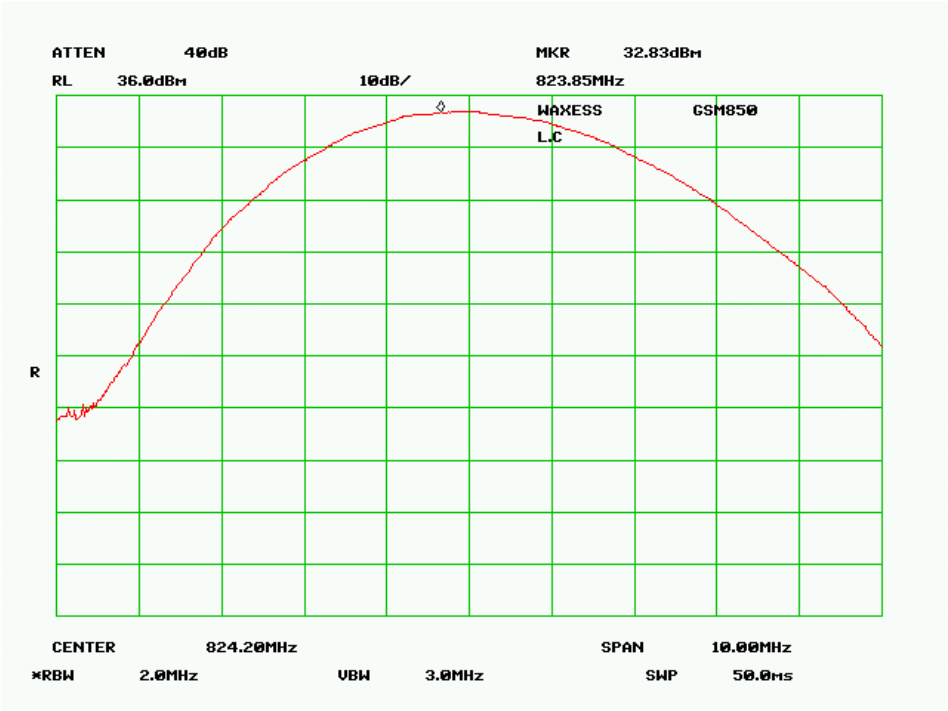
Temperature:	22° C
Relative Humidity:	45%
ATM Pressure:	1025 mbar

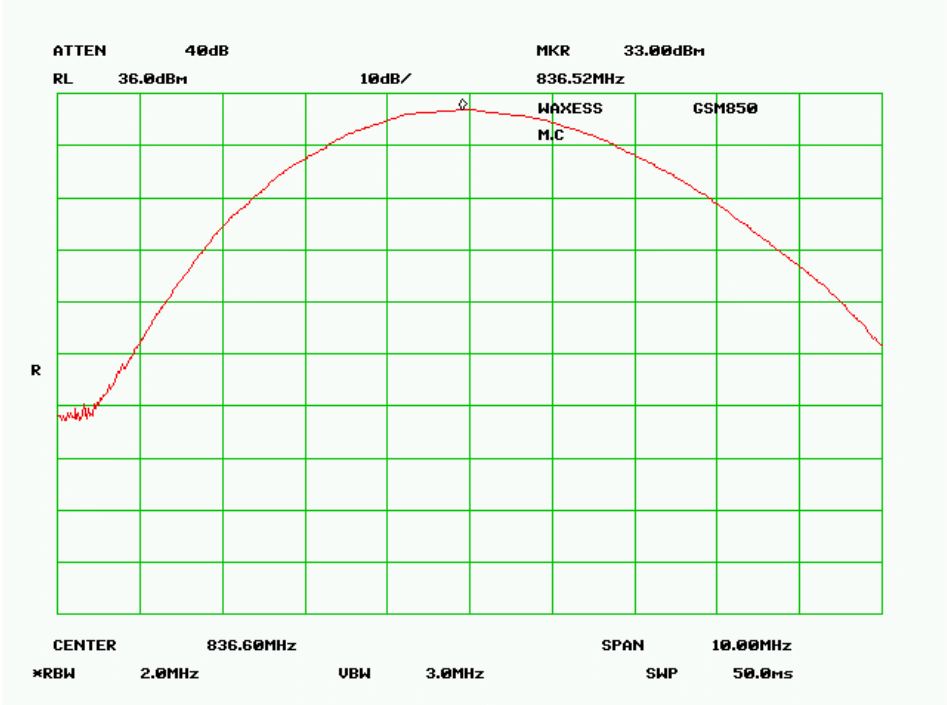
The testing was performed by Daniel Deng on 2005-06-11.

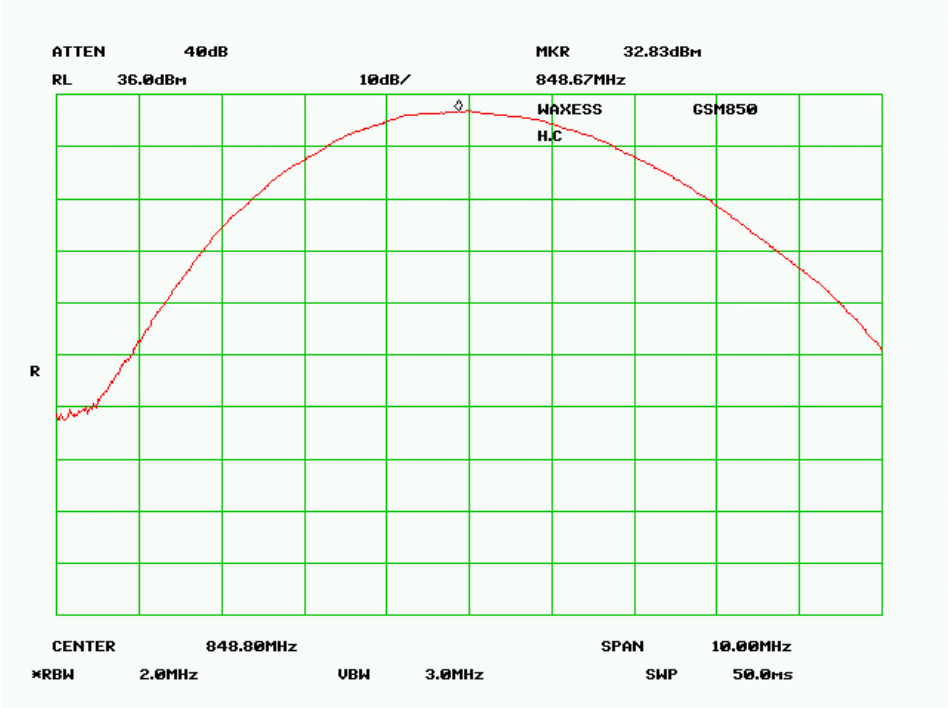
Test Results

MODE	Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
GSM850	LOW	824.20	32.83	1.919	7
	MIDDLE	836.60	33.00	1.995	7
	HIGH	848.80	32.83	1.919	7
GSM1900	LOW	1850.2	29.83	0.962	2
	MIDDLE	1880.0	29.17	0.826	2
	HIGH	1909.8	27.83	0.607	2

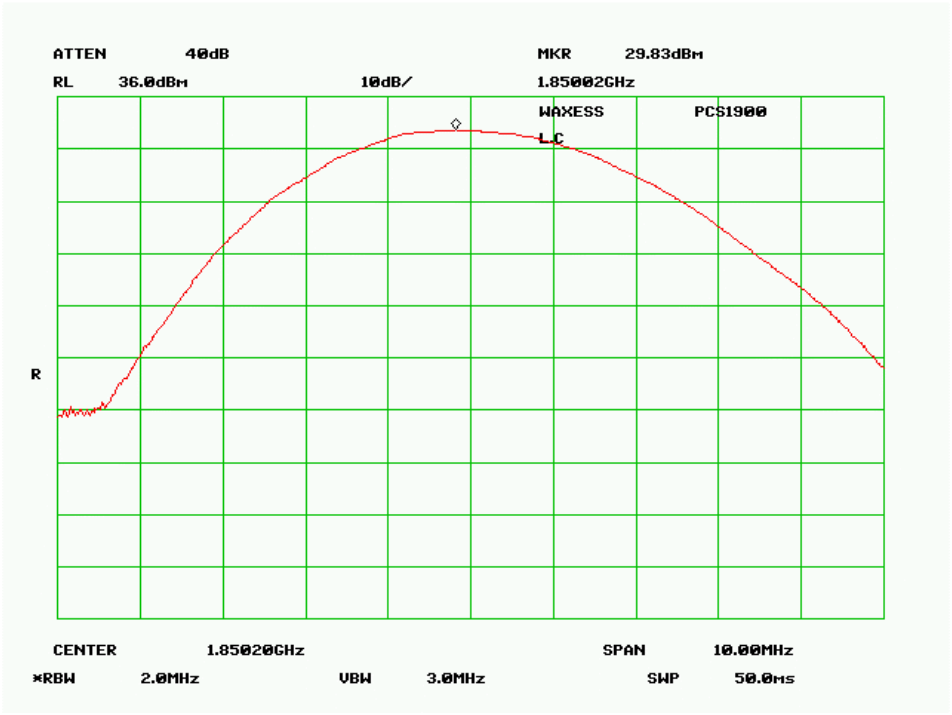
Plots of Conducted Output Power for GSM850, Part 22

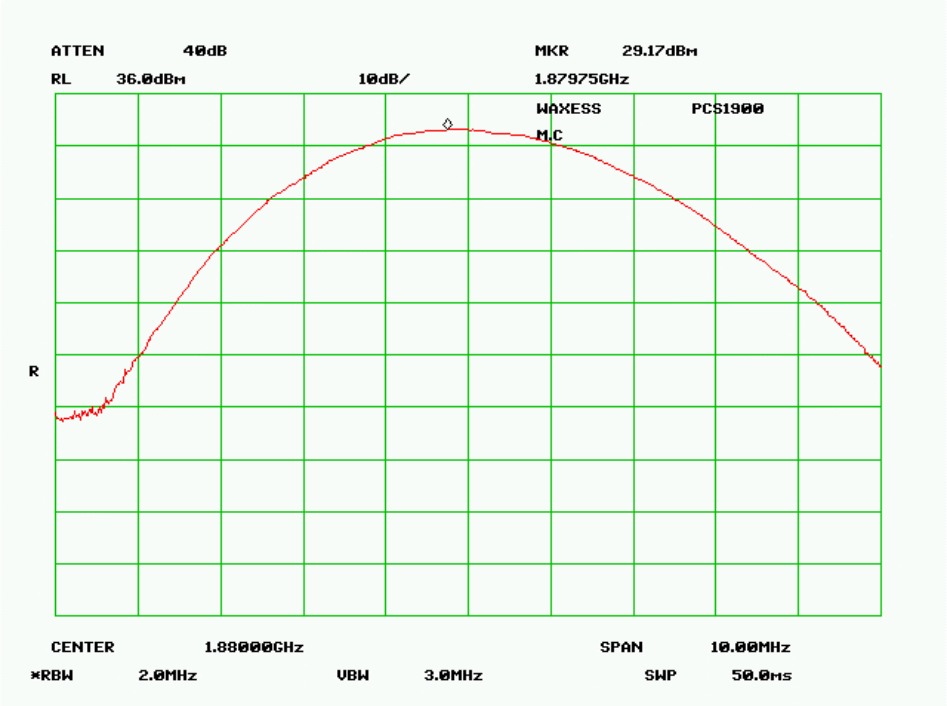


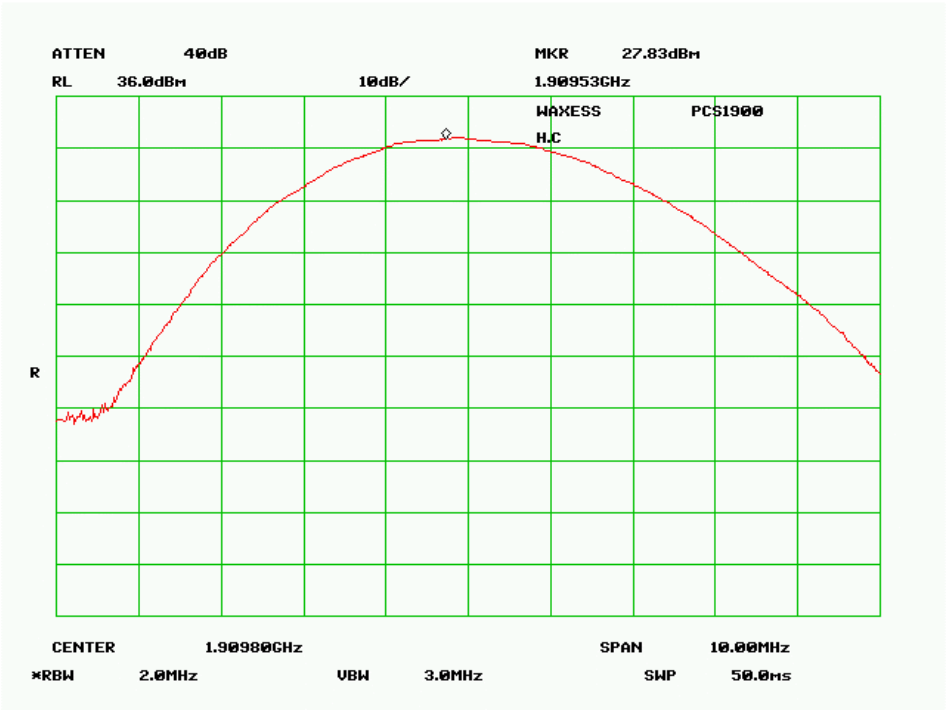



ATTEN 40dB
RL 36.0dBm
10dB/
MKR 32.83dBm
848.67MHz
WAXESS
GSM850
H.C
R
CENTER 848.80MHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms

Plots of Conducted Output Power for GSM1900, Part 24






ATTEN 40dB
MKR 27.83dBm
RL 36.0dBm
10dB/
1.90953GHz
WAXESS
PCS1900
H.C
R
CENTER 1.90980GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms