



FCC PART 22H

TEST AND MEASUREMENT REPORT

For

Shireen Inc.

7636A Standish Place,
Rockville, MD 20855, USA

FCC ID: YEF18852-60-800
Model: 18-852

Report Type: Original Report	Product Type: Cellular Amplifier Repeater
Test Engineer: <u>Jack Liu</u> 	
Report Number: <u>R1005103-22</u>	
Report Date: <u>2010-06-03</u>	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*” 08-012

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1005103-22	Original Report	2010-06-03

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *Shireen Inc.* product, model: *18-852*, FCC ID: *YEF18852-60-800* or the "EUT" as referred to in this report, is a Cellular Amplifier Repeater with N female type connector.

General Specifications:

- Operating Frequency: *Downlink*: 869-894 MHz
Uplink: 824-849 MHz
- Emission Designator: GXW
- Modulation: GSM
- Power Source: Input: 110V/60Hz AC; Output: 5V DC

1.2 Mechanical Description

The EUT dimension is approximately 150mm (L) x 100 mm (W) x 24 mm (H) and weighs approximately 560g.
The test data gathered are from typical production sample, serial number: C1510040246, provided by Manufactory.

1.3 EUT Photo



Please see additional photos in Exhibit C

1.4 Objective

This type approval report is prepared on behalf of Shireen Inc. in accordance with Part 2, Subpart J, and Part 22 Subpart H, of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 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

Applicable Standards: TIA EIA 98-C, TIA/EIA603-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.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 values ranging from +2.0 dB for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have 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 C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, 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 can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

2 SYSTEM TEST CONFIGURATION

2.1 Justification

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

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

2.2 EUT Exercise Software

NA, signal was sent through EUT using a signal generator, device was set to normal operating mode.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Seung Bo Elecom Co., Ltd	AC/DC Adaptor	SP1013A	SB1002001032

2.5 Local Support Equipment List and Details

N/A

2.6 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 3m	Signal Generator	Input/ EUT
RF cable	< 3m	Output/ EUT	Spectrum analyzer

3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§ 2.1046;§ 22.913 (a)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	N/A ¹
§ 2.1049 § 22.905;§ 22.917	Occupied Bandwidth/Out of Band Emissions	Compliant
§ 2.1053;§ 22.917	Spurious Radiated Emissions	Compliant
§ 2.1051; § 22.917	Spurious Emissions at Antenna Terminals	Compliant
§ 22.917	Band Edge	Compliant
§ 2.1055; § 22.355	Frequency Stability	N/A ²
§2.1091	RF Exposure	Compliant

Note: ¹According to FCC §2.1047(d) and part 22H, there is no specific requirement for digital modulation and no oscillator circuit, therefore modulation characteristic is not presented.

² There is no oscillator circuit in the EUT, therefore there is no frequency stability measurement required.

4 FCC §2.1046 & §22.913(a) – RF OUTPUT POWER

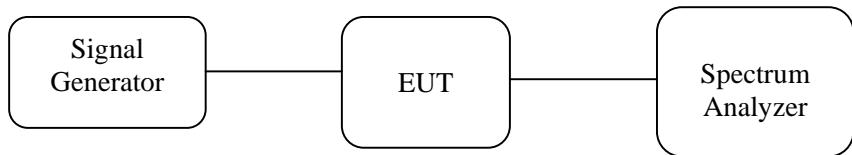
4.1 Applicable Standard

According to FCC §22.913 (a), the maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

4.2 Test Block Diagram and Procedure

Conducted:

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



4.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Generator, Signal	E4438C	MY45092925	2009-08-13
Agilent	Analyzer, Spectrum	E4440A	US45303156	2009-07-23

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

4.4 Test Environmental Conditions

Temperature:	20 °C
Relative Humidity:	35 %
ATM Pressure:	101.2 kPa

The testing was performed by Jack Liu on 2010-5-20 at RF Site.

4.5 Test Results

Maximum Output Power – Modulated Signal

Mode		Channel	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)	Limit (Watt)
GSM	850 MHz Uplink	Low	824.2	10.17	0.0104	500
		Middle	836.6	10.20	0.0105	500
		High	848.8	10.12	0.0103	500
	850 MHz Downlink	Low	869.2	15.12	0.0325	500
		Middle	881.6	15.15	0.0327	500
		High	893.8	15.14	0.0327	500

5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC §2.1047(d) and part 22H, there is no specific requirement for digital modulation and no oscillator circuit, therefore modulation characteristic is not presented.

5.2 Test Result

N/A

6 FCC §2.1049 & §22.917 - OCCUPIED BANDWIDTH

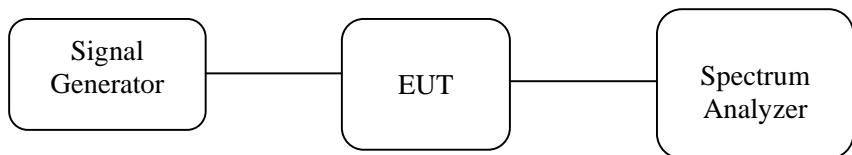
6.1 Applicable Standard

Requirements: FCC §2.1049 and § 22.917.

6.2 Test Block Diagram and 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 30 kHz (Cellular/PCS) and the 26 dB & 99% bandwidth was recorded.



6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date
Agilent	Generator, Signal	E4438C	MY45092925	2009-08-13
Agilent	Analyzer, Spectrum	E4440A	US45303156	2009-07-23
R & S	Signal Generator	SMIQ03	849192/0085	2008-10-14

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

6.4 Test Environmental Conditions

Temperature:	20 °C
Relative Humidity:	35 %
ATM Pressure:	101.2 kPa

The testing was performed by Victor Zhang on 2010-5-20 at RF Site.

6.5 Test Results

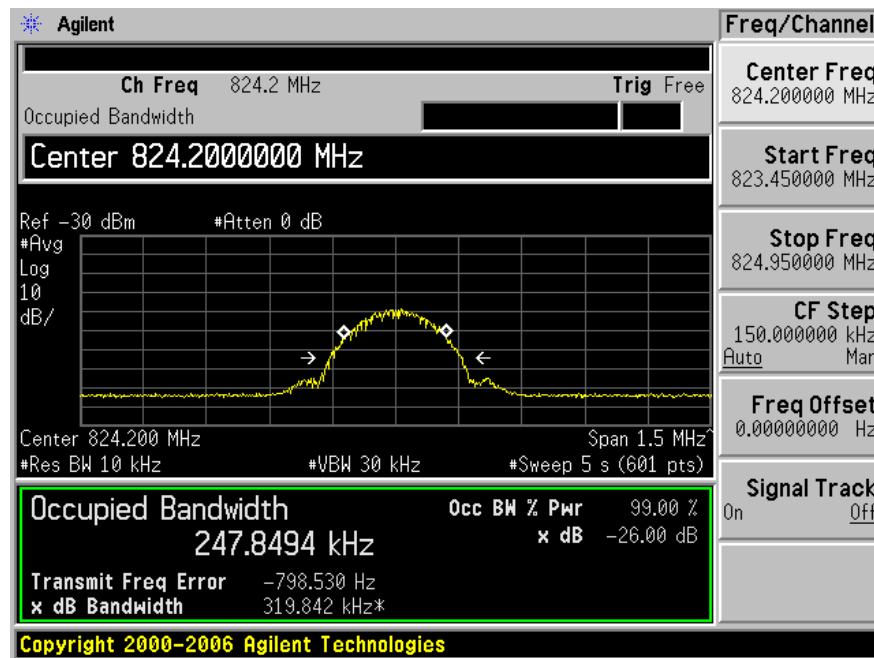
Mode		Channel	Frequency (MHz)	26 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)
GSM	850 MHz Uplink	Low	824.2	317.245	247.9259
		Middle	836.6	317.679	247.2855
		High	848.8	321.506	249.5038
	850 MHz Downlink	Low	869.2	321.355	247.2618
		Middle	881.6	318.091	247.9779
		High	893.8	319.080	245.9971

Please refer to the following plots.

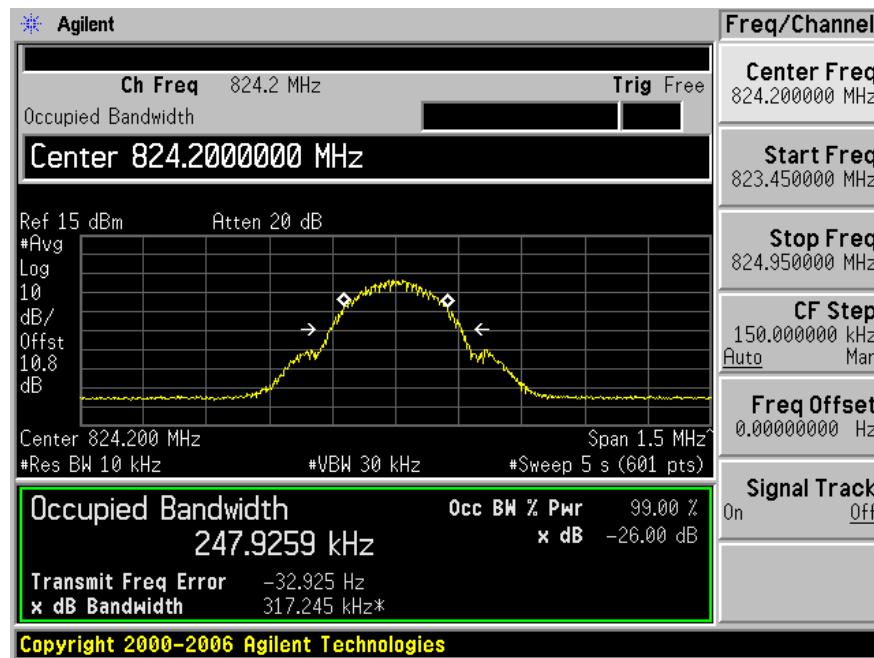
GSM 850 MHz Band (Uplink)

Low Channel (824.2 MHz)

Input

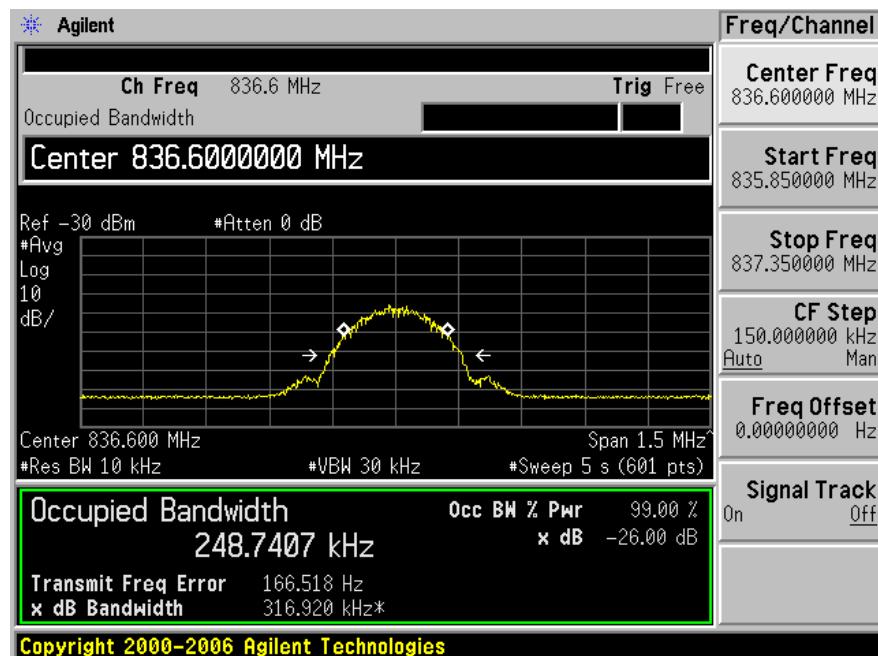


Output

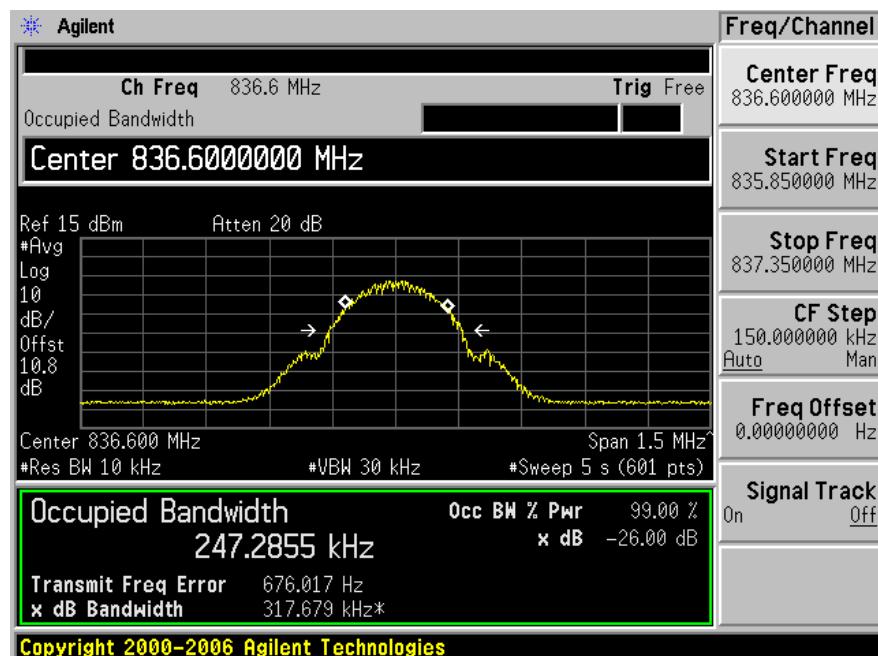


Middle Channel (836.6 MHz)

Input

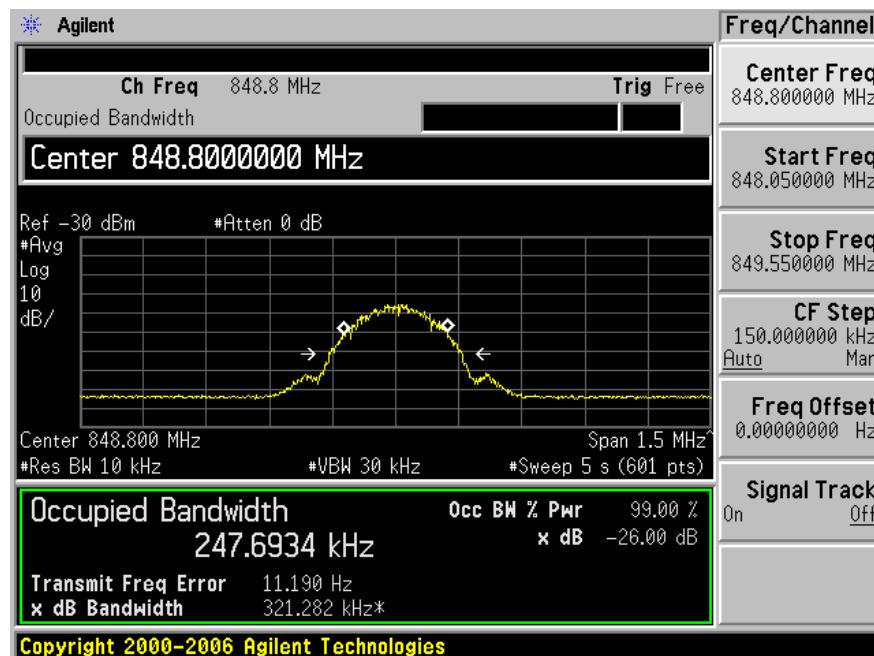


Output

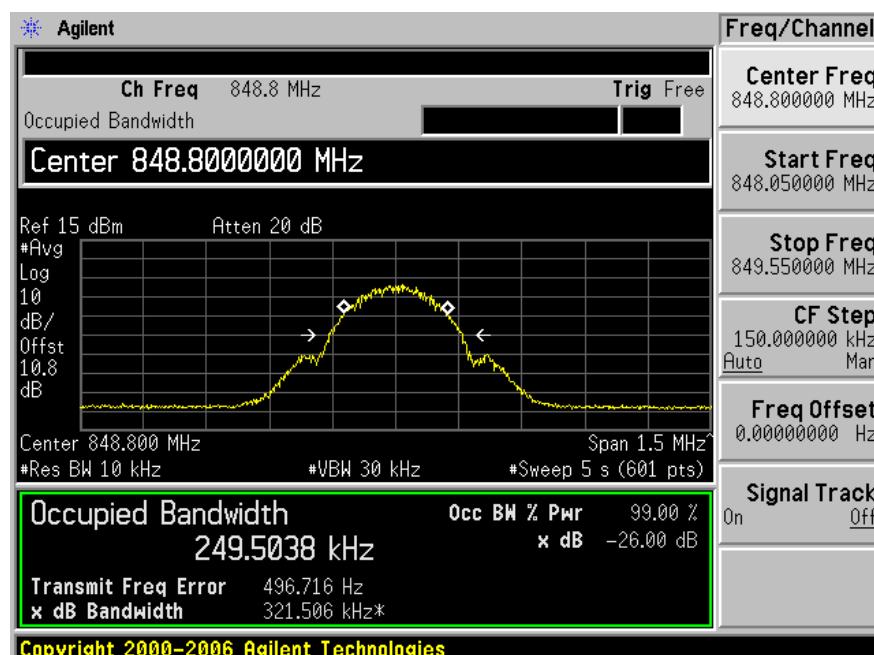


High Channel (848.8 MHz)

Input



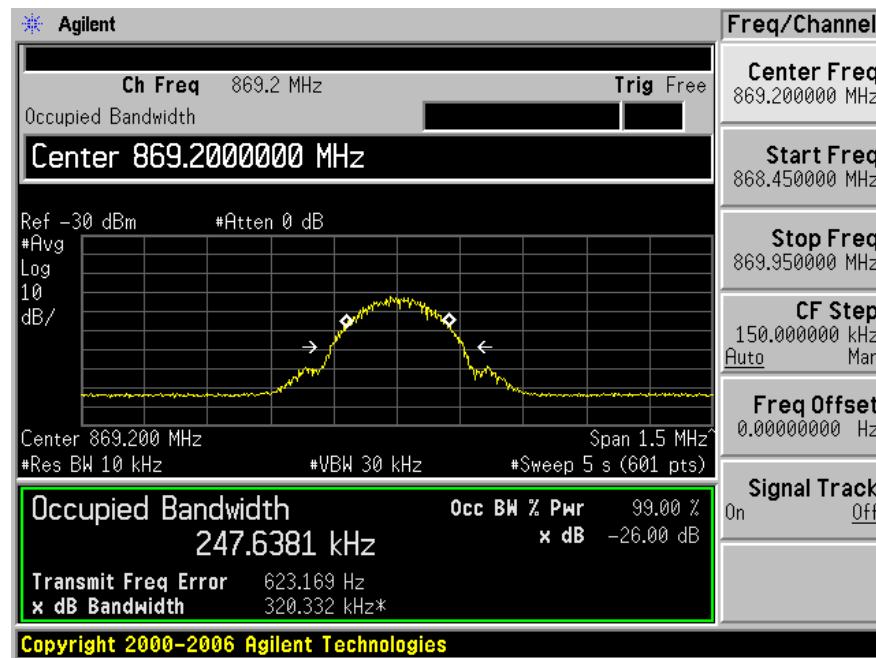
Output



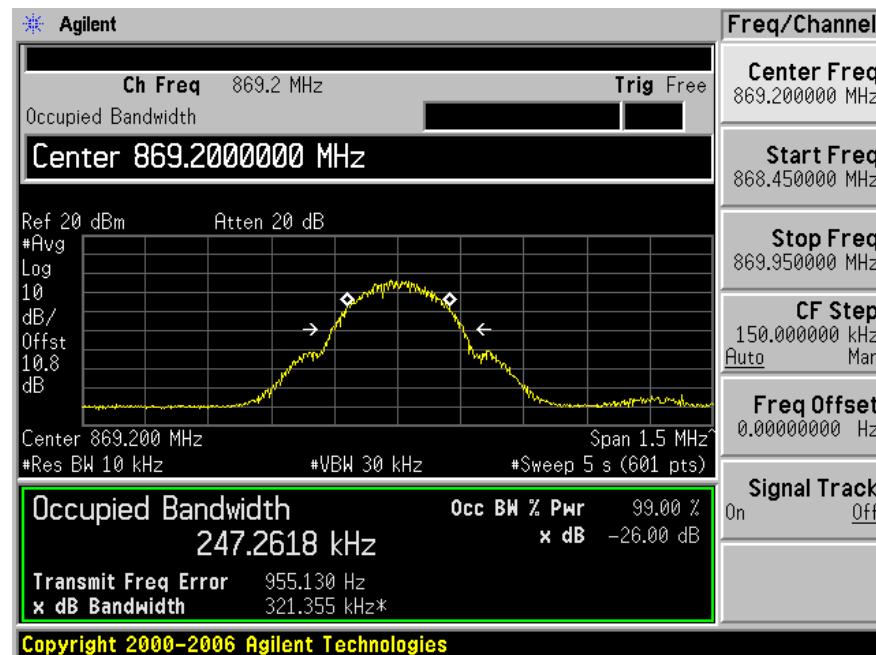
GSM 850 MHz Band (Downlink)

Low Channel (869.2 MHz)

Input

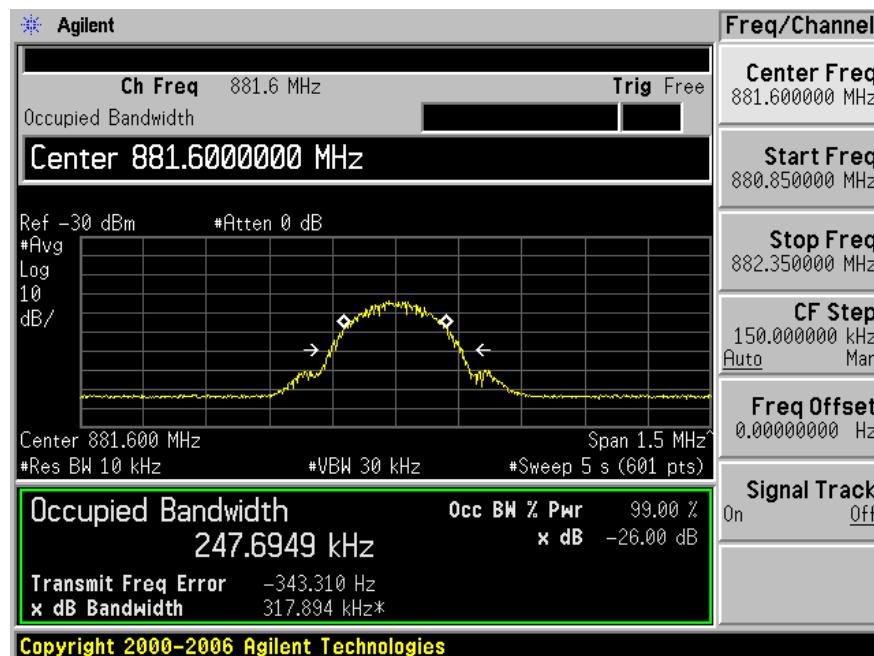


Output

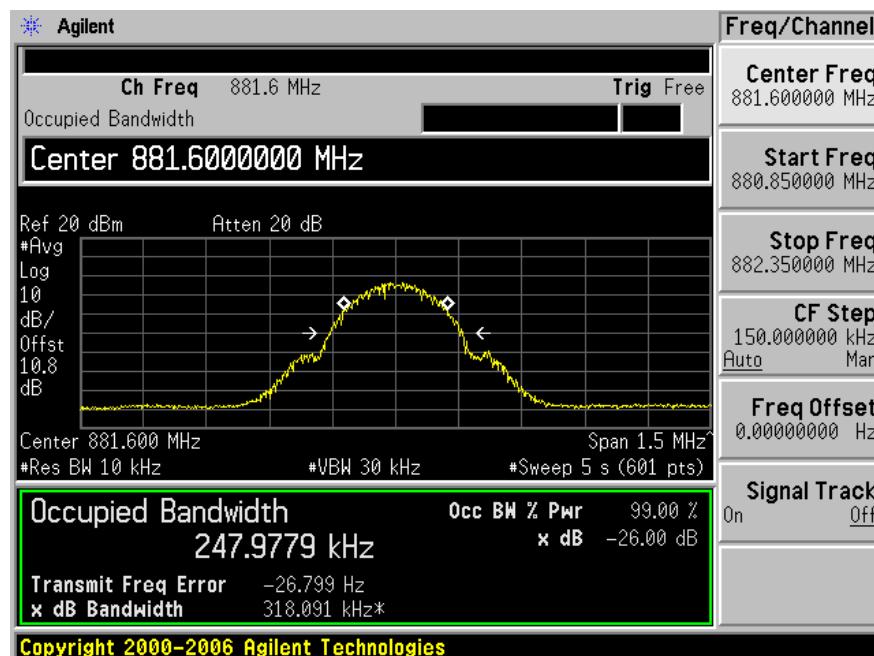


Middle Channel (881.6 MHz)

Input

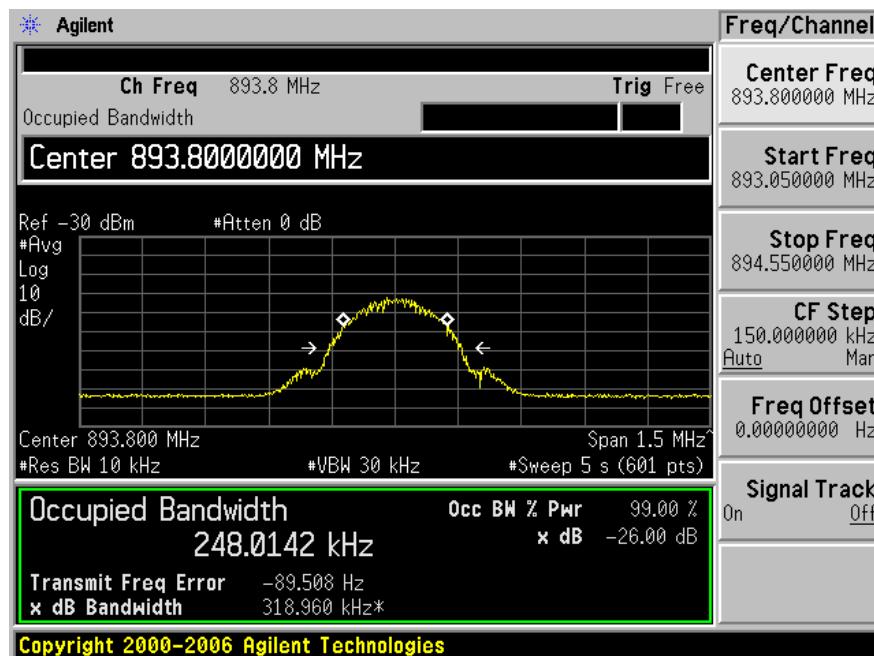


Output

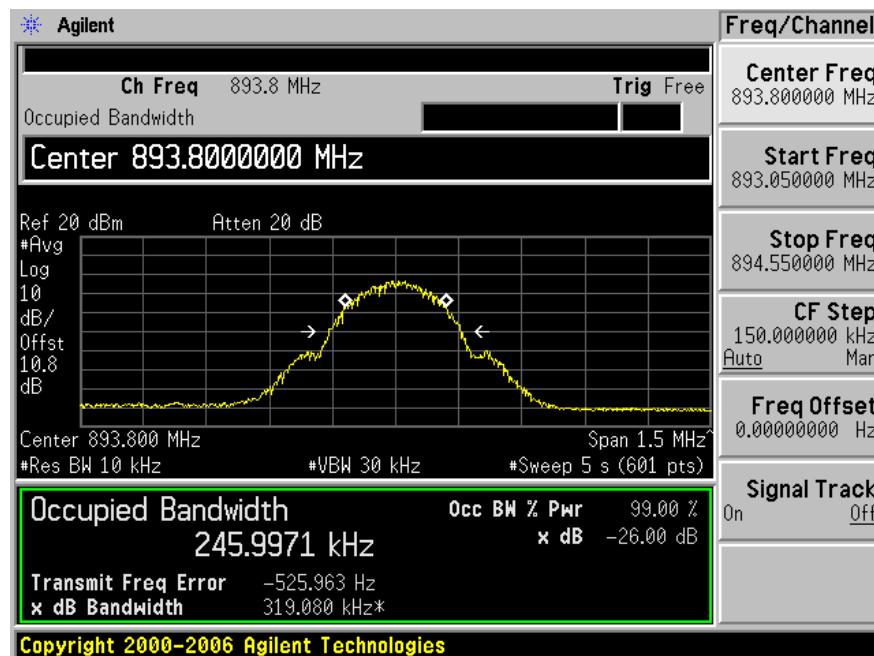


High Channel (893.8 MHz)

Input



Output



7 FCC §2.1053 & §22.917 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

Requirements: FCC §2.1053 and §22.917.

7.2 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 = $10 \log (\text{TX Power in Watts}/0.001)$ – the absolute level
 Spurious attenuation limit in dB = $43 + 10 \log_{10} (\text{power out in Watts})$

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Generator, Signal	E4438C	MY45092925	2009-08-13
A.H Systems	Antenna, Horn	SAS-200/571	261	2009-09-23
Hewlett Packard	Pre amplifier	8447D	2944A06639	2009-06-05
Sunol Science Corp	Combination Antenna	JB3	A0020106-2	2009-08-20
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2010-03-24
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
A.R.A Inc	Horn antenna	DRG-1181A	1132	2009-10-27
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23
HP	Pre Amplifier	8449B	3147A00400	2010-02-01

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

7.4 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	45 %
ATM Pressure:	102.2 kPa

The testing was performed by Jack Liu on 2010-5-25 in 5 meter Chamber #3.

7.5 Summary of Test Results

Mode: GSM 850 MHz, Downlink				
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Input Frequency	
-	-	-	881.6	
Mode: GSM 850 MHz, Uplink				
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Input Frequency	
-	-	-	836.6	

Note: All Frequencies are 20 dB below the limit or/and on the noise floor level

7.6 Test Results

GSM 850 MHz Band, Downlink, Input frequency = 881.6 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
-	-	-	-	-	-	-	-	-	-	-13	-

Note: All Frequencies are 20 dB below the limit or/and on the noise floor level

GSM 850 MHz Band, Uplink, Input frequency = 836.6 MHz

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Cord. (dB)	Cable Loss (dB)	Absolute Level (dBm)		
-	-	-	-	-	-	-	-	-	-	-13	-

Note: All Frequencies are 20 dB below the limit or/and on the noise floor level

8 FCC §2.1051 & §22.917- SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Applicable Standard

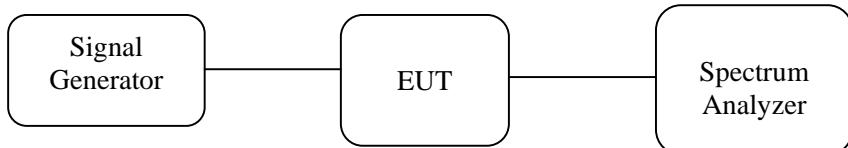
Requirements: FCC §2.1051 and §22.917.

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

According FCC §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

8.2 Test Block Diagram and 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.



8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2008-10-14
Agilent	Generator, Signal	E4438C	MY45092925	2009-08-13
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

8.4 Test Environmental Conditions

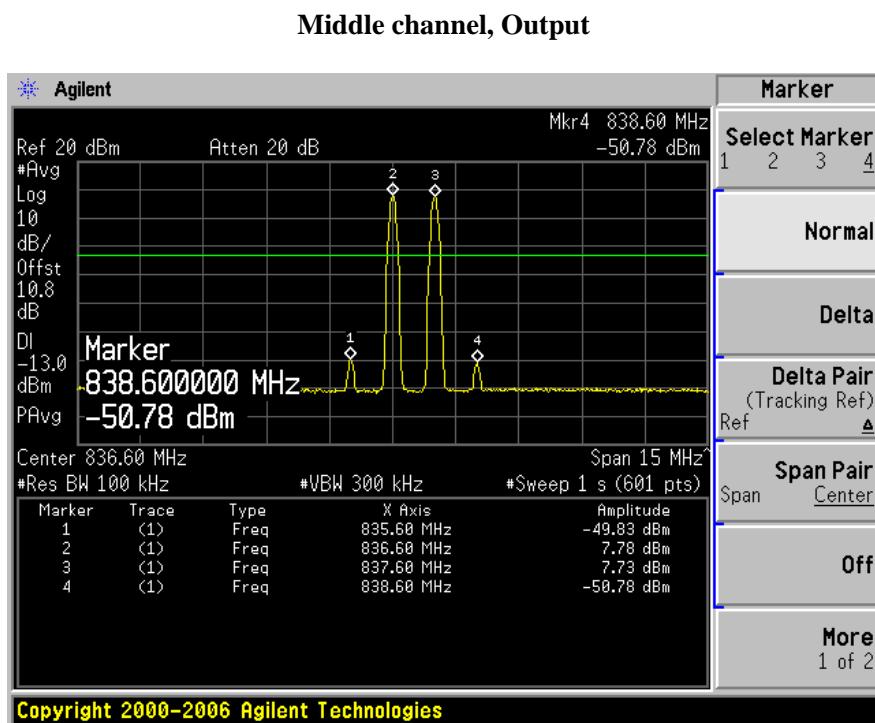
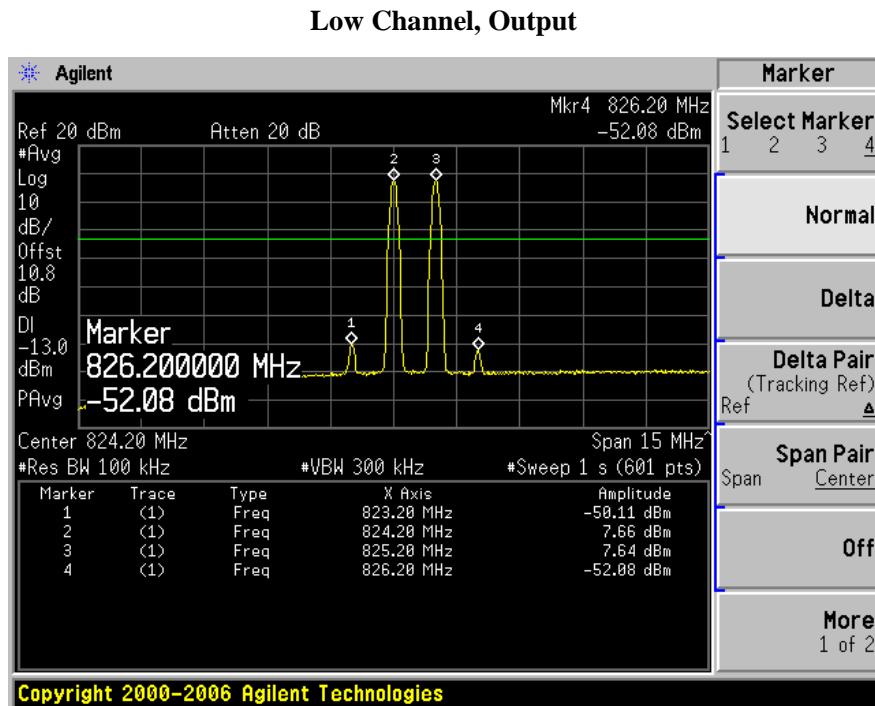
Temperature:	20 °C
Relative Humidity:	35 %
ATM Pressure:	101.2 kPa

The testing was performed by Victor Zhang on 2010-5-20 at RF Site.

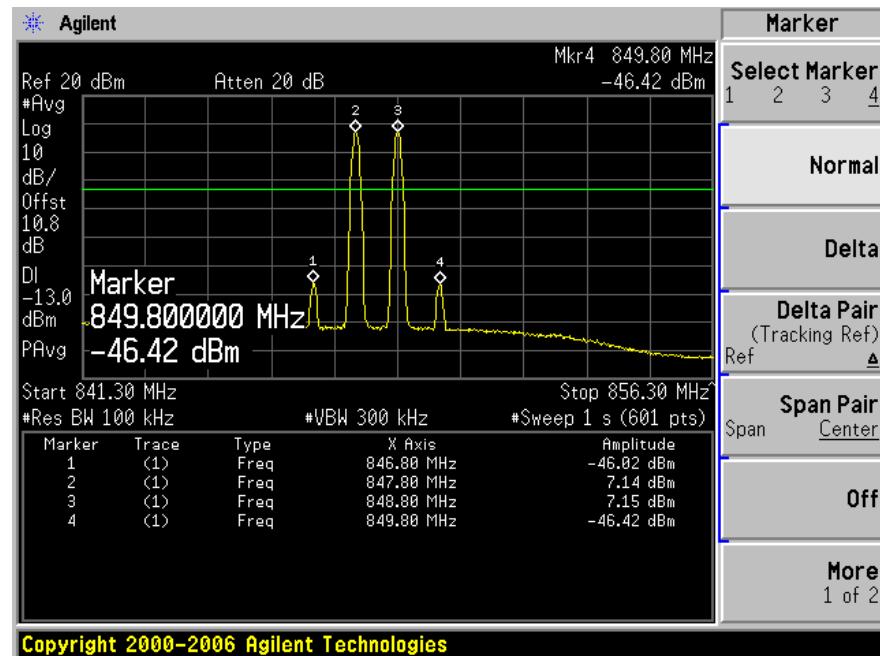
8.5 Test Results

Please refer to the hereinafter plots.

GSM 850 MHz Band, Uplink

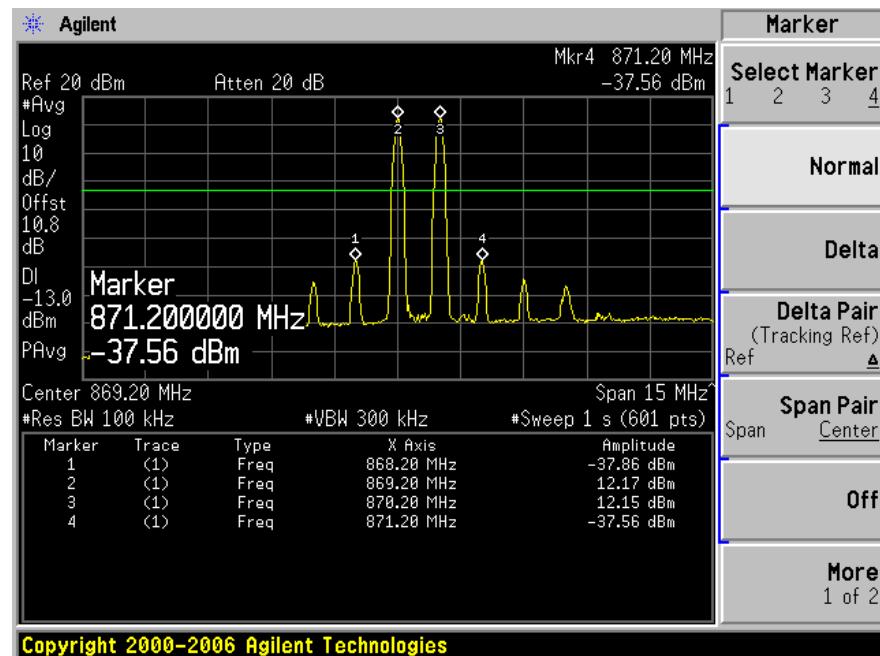


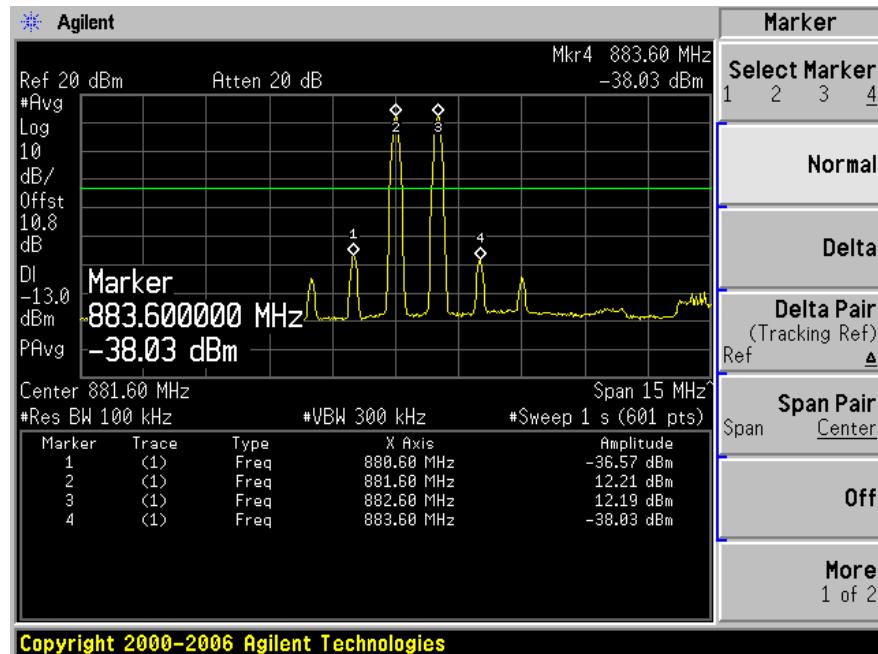
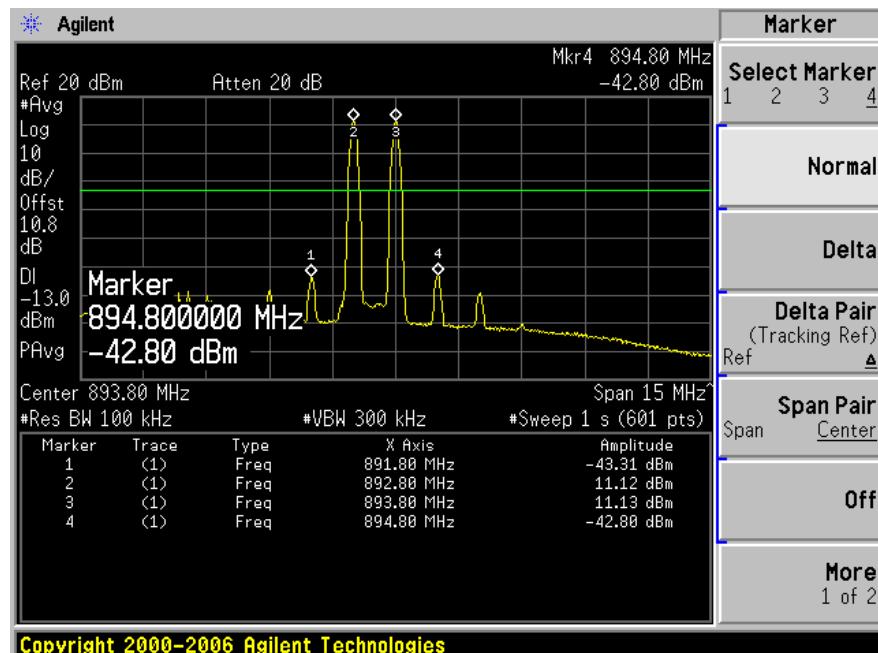
High Channel, Output

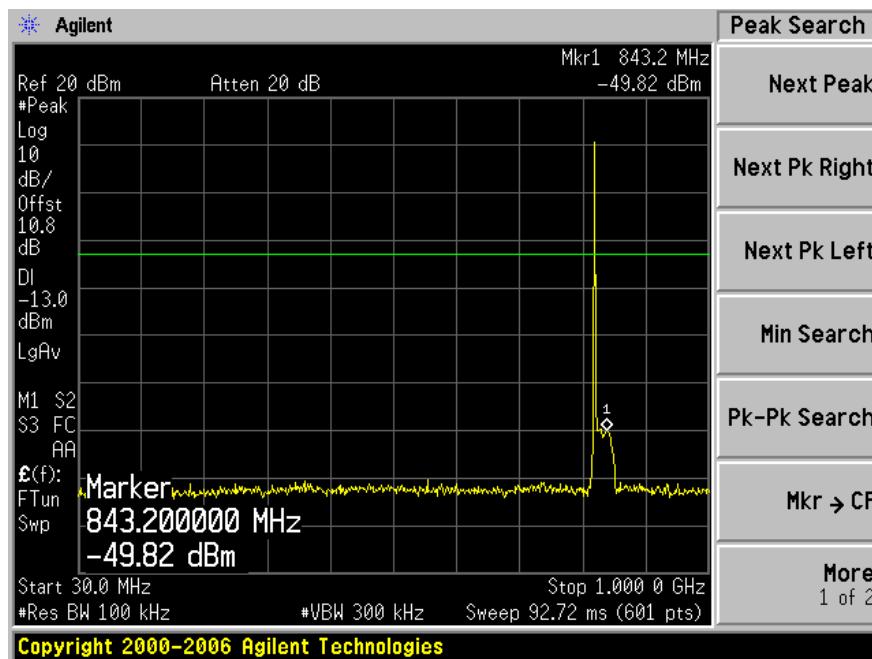


GSM 850 MHz Band, Downlink:

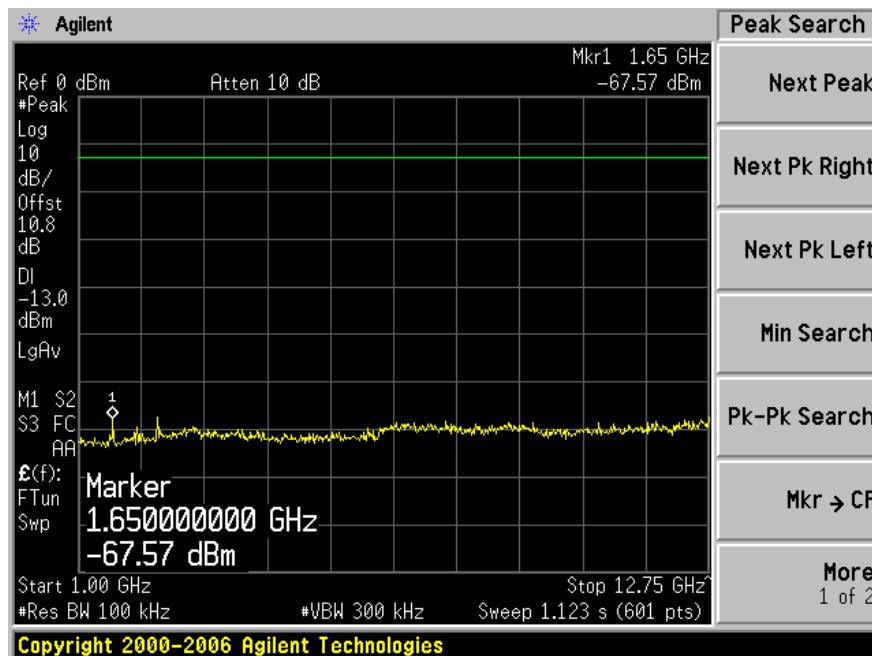
Low Channel, Output



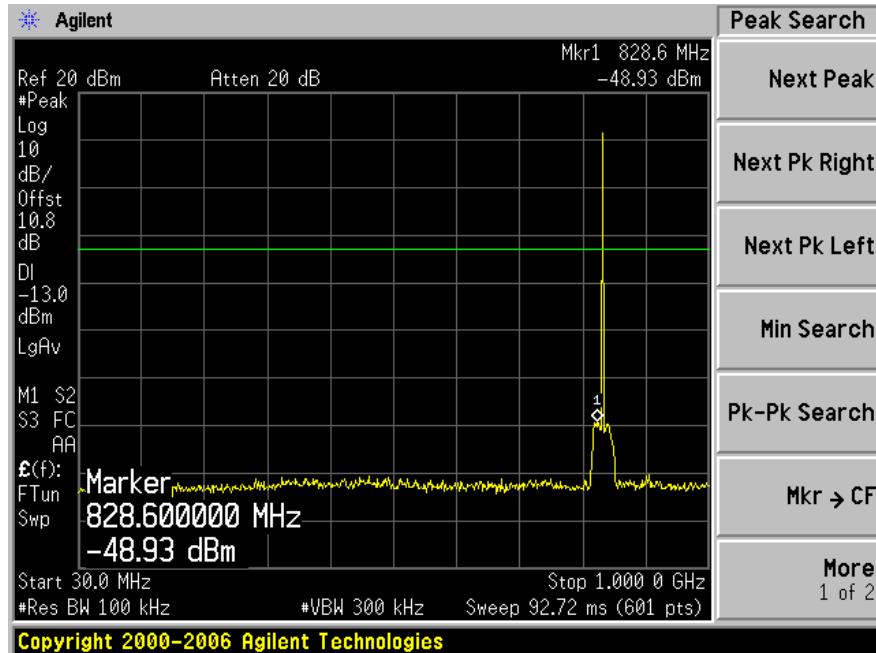
Middle Channel, Output**High Channel, Output**

GSM 850 MHz Band, Uplink:**Low Channel (824.2 MHz)**

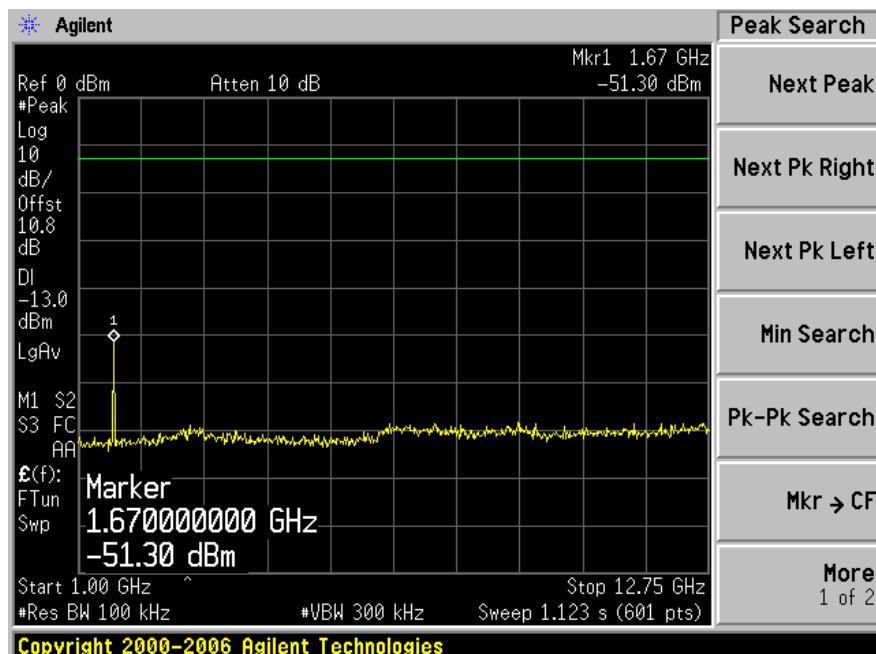
30 MHz to 1 GHz



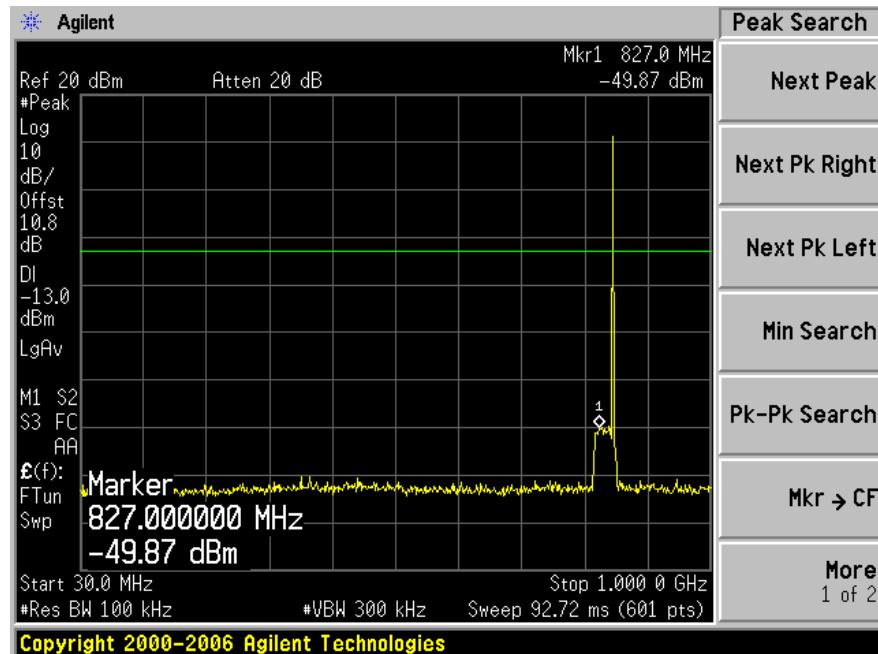
1 GHz to 12.75 GHz

Middle Channel (836.6 MHz)

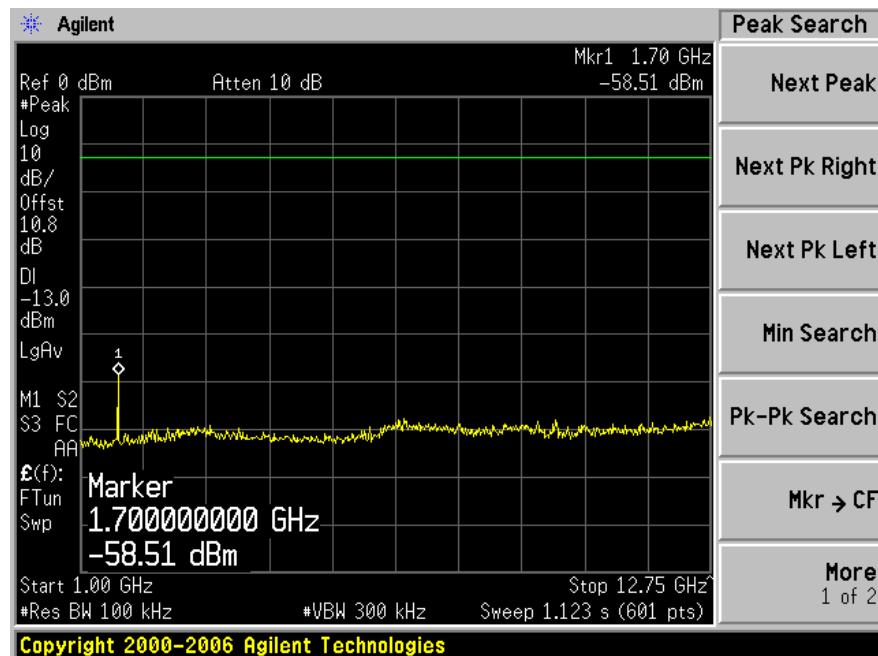
30 MHz to 1 GHz



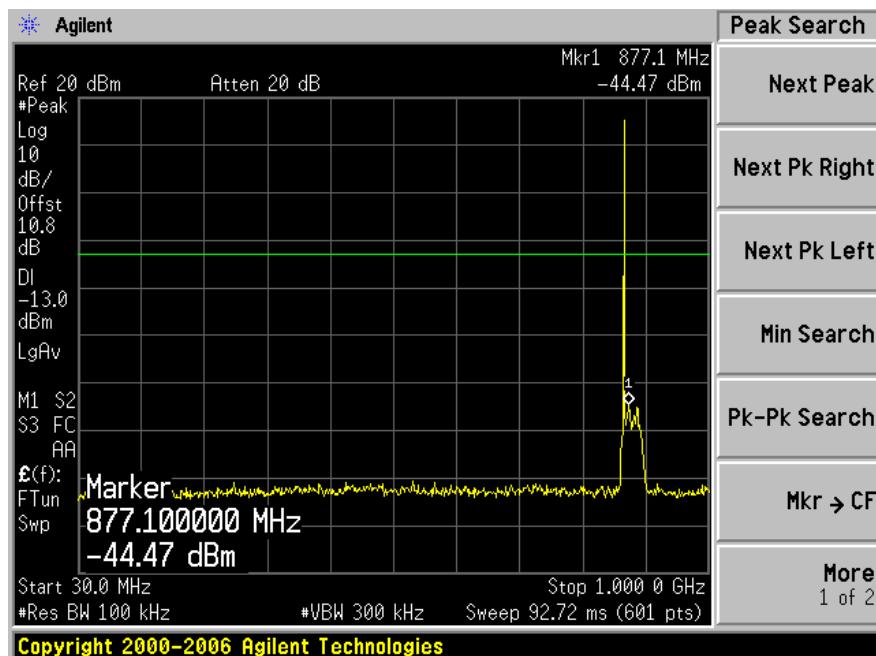
1 GHz to 12.75 GHz

High Channel (848.8 MHz)

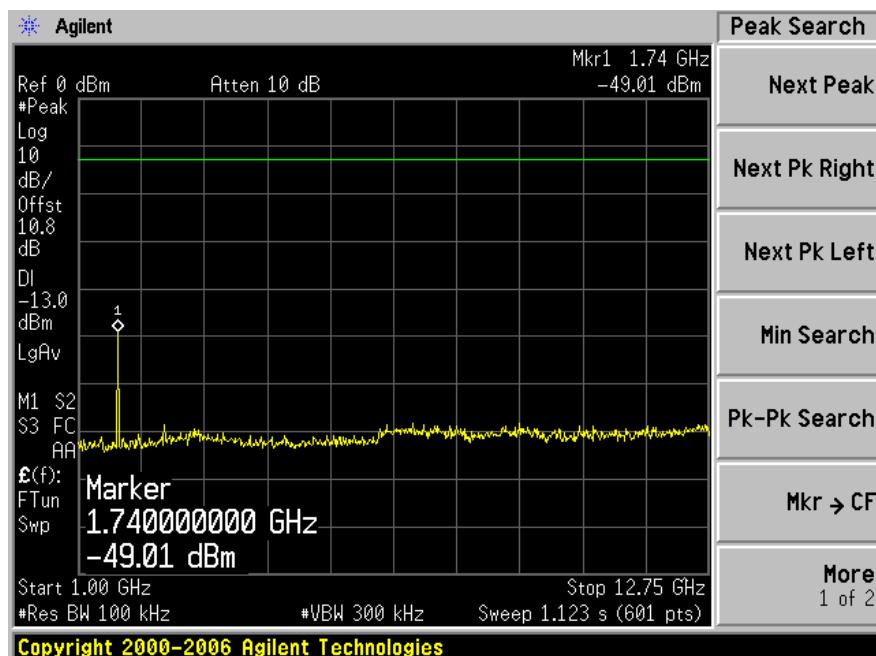
30 MHz to 1 GHz



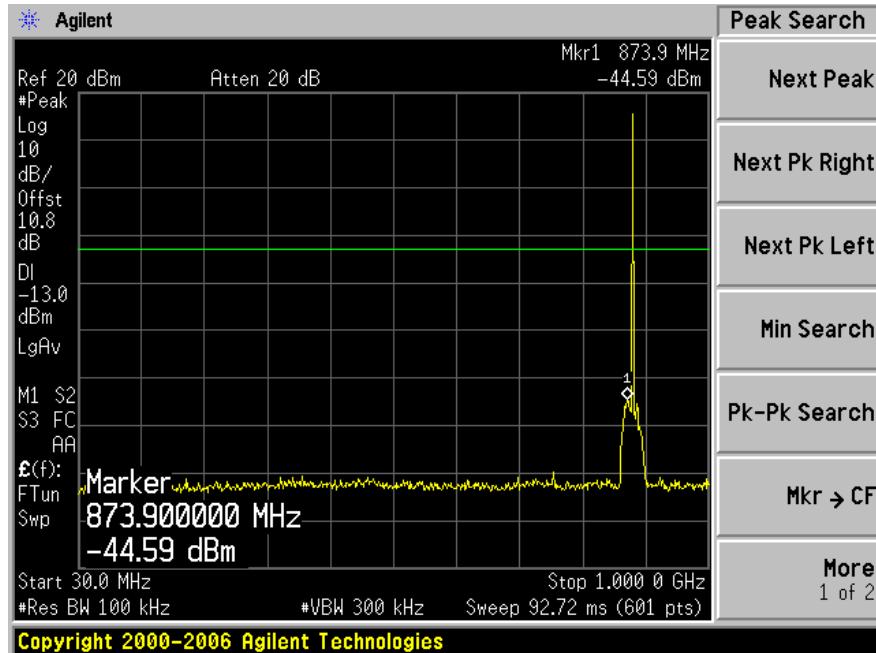
1 GHz to 12.75 GHz

GSM 850 MHz Band, Downlink:**Low Channel (869.2 MHz)**

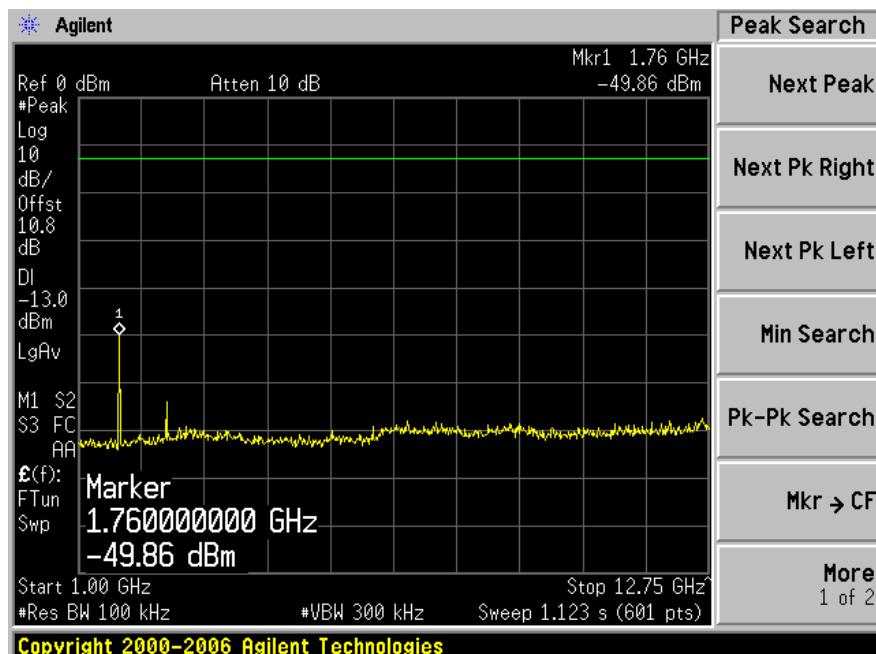
30 MHz to 1 GHz



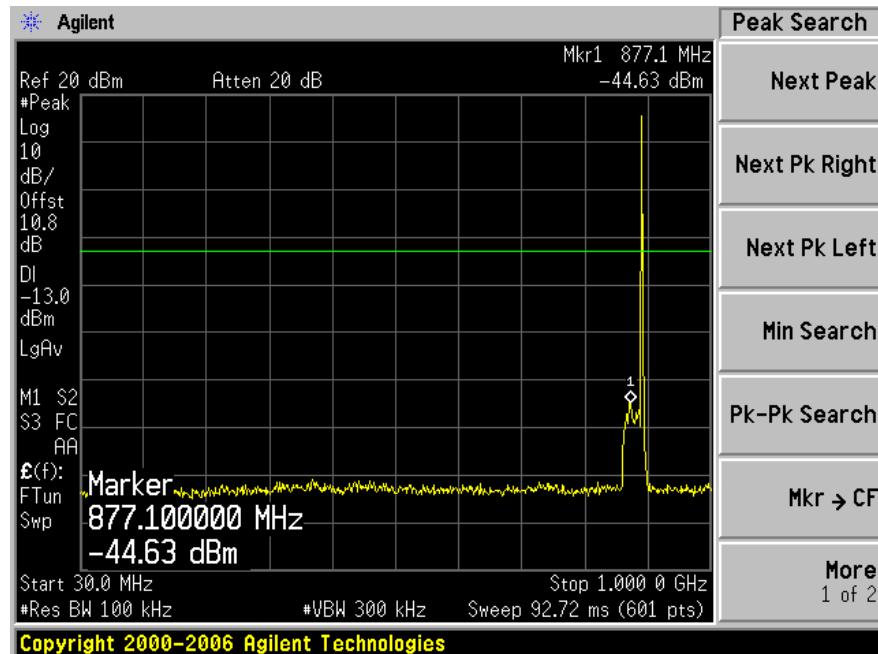
1 GHz to 12.75 GHz

Middle Channel (881.6 MHz)

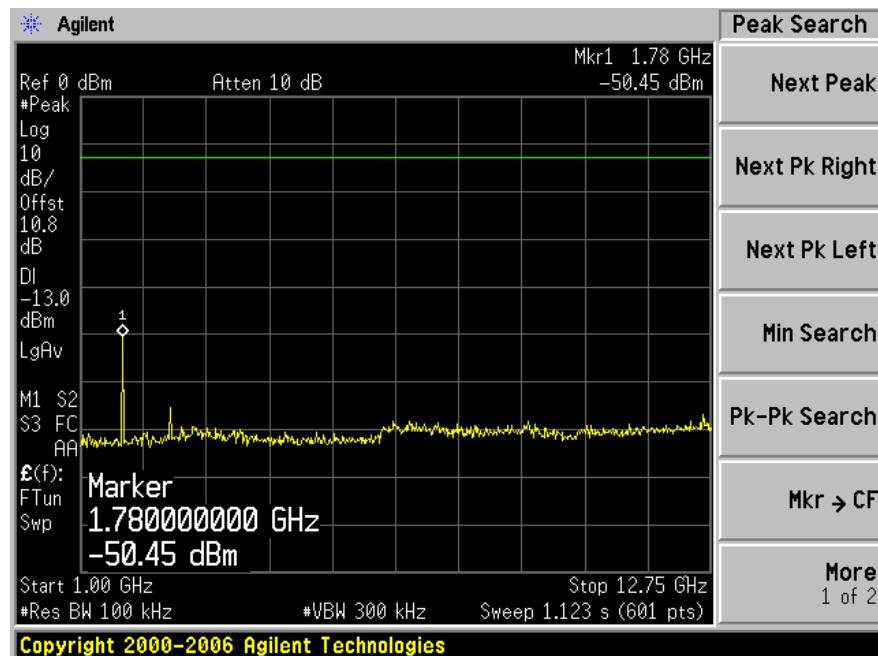
30 MHz to 1 GHz



1 GHz to 12.75 GHz

High Channel (893.8 MHz)

30 MHz to 1 GHz



1 GHz to 12.75 GHz

9 FCC §2.1051 & §22.917 – BAND EDGE

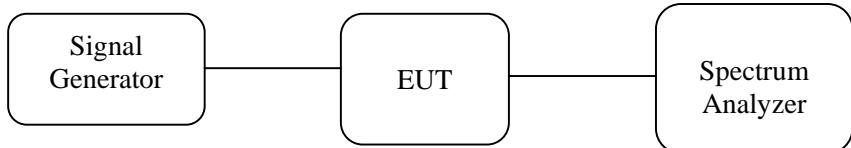
9.1 Applicable Standard

According to FCC §22.917, the power of any emissions 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.

9.2 Test Block Diagram and 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.



9.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Generator, Signal	E4438C	MY45092925	2009-08-13
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23

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

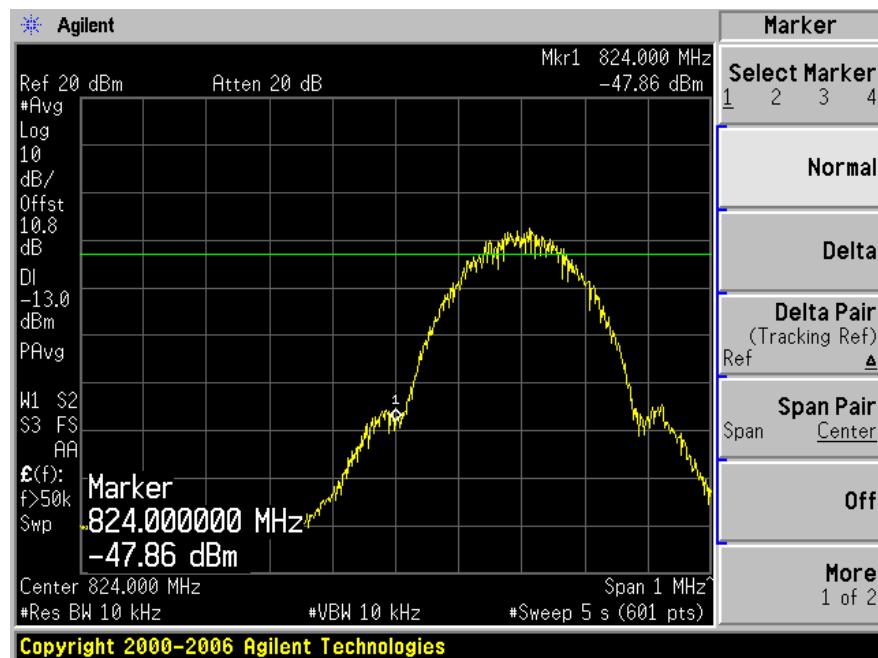
9.4 Test Environmental Conditions

Temperature:	20 °C
Relative Humidity:	35 %
ATM Pressure:	101.2 kPa

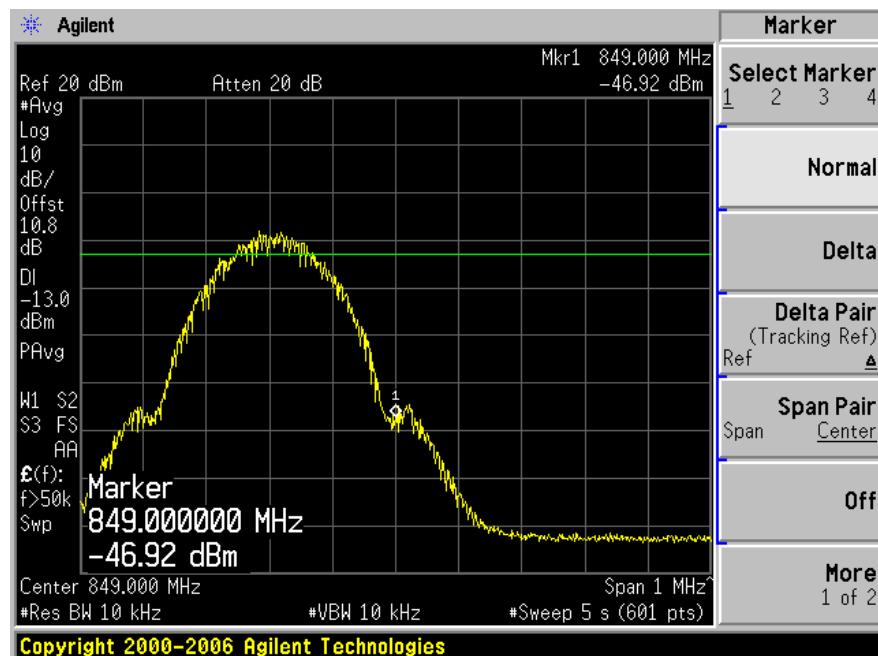
The testing was performed by Victor Zhang on 2010-5-20 at RF Site.

9.5 Test Results

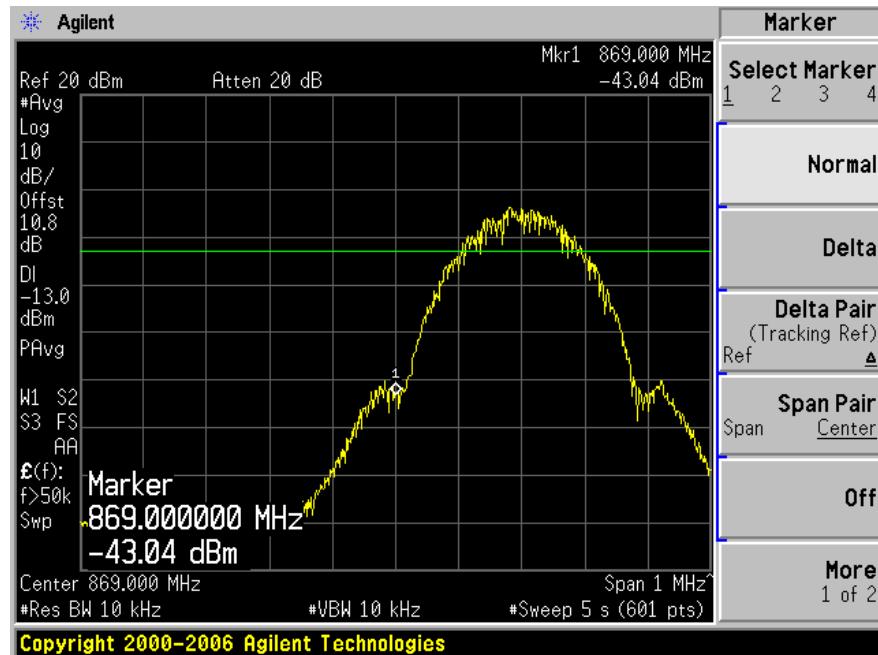
Please refer to the following plots.

GSM 850 MHz Band, Uplink Band Edge

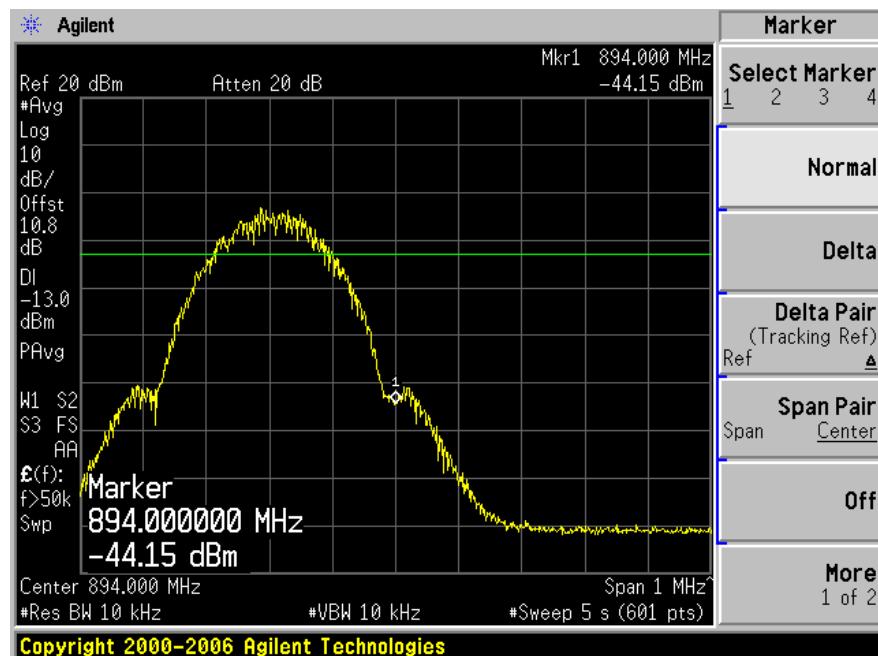
Lowest Channel



Highest Channel

GSM 850 MHz Band, Downlink Band Edge

Lowest Channel



Highest Channel

10 FCC §2.1055 – FREQUENCY STABILITY

This EUT is an amplifier, not a transmitter. There is no oscillator circuit in the EUT, therefore there is no frequency stability measurement required.

10.1 Test Result

N/A

11 FCC §1.1307(b) (1) & §2.1091 - RF EXPOSURE

11.1 Applicable Standard

According to FCC §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz

* = Plane-wave equivalent power density

11.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from FCC OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

850 MHz Cellular Band, Uplink:

Maximum peak output power at antenna input terminal (dBm): 10.2

Maximum peak output power at antenna input terminal (mW): 10.47

Prediction distance (cm): 20

Prediction frequency (MHz): 836.6

Antenna Gain, typical (dBi): 3.0

Maximum Antenna Gain (numeric): 2

Power density at predication frequency and distance (mW/cm²): 0.0042

MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.558

850 MHz Cellular Band, Downlink:Maximum peak output power at antenna input terminal (dBm): 15.15Maximum peak output power at antenna input terminal (mW): 32.73Prediction distance (cm): 20Prediction frequency (MHz): 881.6Antenna Gain, typical (dBi): 6.0Maximum Antenna Gain (numeric): 3.98Power density at predication frequency and distance (mW/cm²): 0.0259MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 0.588**Test Result**

For Uplink, the highest power density level at 20 cm is 0.0042mW/cm², which is below the uncontrolled exposure limit of 0.558 mW/cm² at 836.6 MHz.

For Downlink, the highest power density level at 20 cm is 0.0259mW/cm², which is below the uncontrolled exposure limit of 0.588 mW/cm² at 881.6 MHz.

So the indoor antenna prediction distance should be greater then 20 cm, and outdoor antenna prediction distance should be greater then 20 cm.