

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

For

Waxess Inc.

34 Executive Park, Suite 250, Irvine, CA 92614

FCC ID: SNBDM1200E

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Product Type: CDMA phone
Test Engineer: Oscar Au	
Report No.: R0701043-22	
Report Date: 2007-01-10	
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TABLE OF CONTENTS

1 - GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 MECHANICAL DESCRIPTION	3
1.3 EUT PHOTO	3
1.4 OBJECTIVE	3
1.5 RELATED SUBMITTAL(S)/GRANT(S)	3
1.6 TEST METHODOLOGY	4
1.7 MEASUREMENT UNCERTAINTY	4
1.8 TEST FACILITY	4
2 - SYSTEM TEST CONFIGURATION	5
2.1 JUSTIFICATION	5
2.2 EQUIPMENT MODIFICATIONS	5
2.3 POWER SUPPLY AND LINE FILTERS	5
2.4 LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	5
2.5 INTERFACE PORTS AND CABLING	5
3 - SUMMARY OF TEST RESULTS	6
4 - §2.1047 - MODULATION CHARACTERISTIC	7
4.1 APPLICABLE STANDARD	7
6 - §2.1053 - SPURIOUS RADIATED EMISSIONS	8
6.1 APPLICABLE STANDARD	8
6.2 TEST PROCEDURE	8
6.3 TEST EQUIPMENT LIST AND DETAILS	8
6.4 TEST RESULT	9
7 - §2.1046, §22.913(A), & §24.232 – RF OUTPUT POWER	10
7.1 APPLICABLE STANDARD	10
7.2 TEST PROCEDURE	10
7.3 TEST EQUIPMENT LIST AND DETAILS	10
7.4 TEST RESULTS	11
8 - §2.1049, §22.917, §22.905, & §24.238 - OCCUPIED BANDWIDTH	15
8.1 APPLICABLE STANDARD	15
8.2 TEST PROCEDURE	15
8.3 TEST EQUIPMENT LIST AND DETAILS	15
8.4 TEST RESULTS	15
9 - §2.1051, §22.917, & §24.238(A) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS	19
9.1 APPLICABLE STANDARD	19
9.2 TEST PROCEDURE	19
9.3 TEST EQUIPMENT LIST AND DETAILS	19
9.4 TEST RESULTS	19
10 - §2.1055 (A), §2.1055 (D), §22.355, & §24.235 - FREQUENCY STABILITY	24
10.1 APPLICABLE STANDARD	24
10.2 TEST PROCEDURE	24
10.3 TEST EQUIPMENT LIST AND DETAILS	25
10.4 TEST RESULTS	25
11 – §22.917 & §24.238 – BAND EDGE	27
11.1 APPLICABLE STANDARD	27
11.2 TEST PROCEDURE	27
11.3 TEST EQUIPMENT LIST AND DETAILS	27
11.4 TEST RESULTS	27

1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *Waxess Inc.*'s product, FCC ID: SNBDM1200E or the "EUT" as referred to in this report is a dual-band device that operates on both Code Division Multiple Access (CDMA) frequencies: cellular services at 800 MHz, and Personal Communication Services (PCS) at 1900 MHz.

1.2 Mechanical Description

Approximate measurement is: 190mm (L) x 175 mm (W) x 45 mm (H) for base.

** The test data gathered are from typical production sample, serial number: 0004021, provided by the manufacturer.*

1.3 EUT Photo



Base

Please see additional photos in Exhibit C

1.4 Objective

This type approval report is prepared on behalf of *Waxess Inc* 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 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

Part 24 Subpart E - PCS

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 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 have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11, 1997 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 have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-2463 and C-2698. 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 Corp. 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 Equipment Modifications

No modifications were made to the EUT.

2.3 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
I.T.E. Power Supply	AC Adaptor (handset)	RGD41090500	N/A
I.T.E. Power Supply	AC Adaptor (base)	AD-48091000	N/A

2.4 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Agilent	Wireless Communications Test Set	8960 Series 10 E5515C	GB44051221
Mini-Circuits	Splitter	ZFRSC-42	SF874700404
Midwest Microwave	10dB attenuator pad	ATT-0263-10-000-02	N/A
Inmet Corp.	DC Block	8055	N/A

2.5 Interface Ports and Cabling

Cable Description	Length (M)	From	To
RF cable	0.2	Communications test set	Splitter
RF cable	0.2	Antenna port on EUT	Splitter

3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§ 2.1091	RF Exposure	Compliant
§ 2.1046, § 22.912 (d) § 24.232	RF Output Power	Compliant
§ 2.1049 § 22.917 § 22.905 § 24.238	Out of Band Emissions, 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

4 - §2.1047 - MODULATION CHARACTERISTIC

4.1 Applicable Standard

According to FCC § 2.1047(d), part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

6 - §2.1053 - SPURIOUS RADIATED EMISSIONS

6.1 Applicable Standard

Requirements: CFR 47, § 2.1053, § 22.917, § 24.238.

6.2 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 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts)

Environmental Conditions

Temperature:	20° C
Relative Humidity:	55%
ATM Pressure:	1020mbar

* The testing was performed by Oscar Au on 2007-01-05.

6.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06
HP	Amplifier, Pre	8447D	2944A10198	2007-01-08
HP	Amplifier, Pre, Microwave	8449B	3147A00400	2006-08-21
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2006-04-20
HP	Generator, Signal	83650B	3614A00276	2006-05-10
A.R.A.	Antenna, Horn	DRG-118/A	1132	2006-08-17

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

6.4 Test Result

Worst case reading as follows:

-22.4 dB at 1672.8 MHz

PCS Band, Part24:

-16.2 dB at 5640.00 MHz

Run # 1: 30MHz -10GHz Cellular Band Middle Channel

Indicated		Table	Test Antenna		Substituted				Absolute	Limit	Margin
Frequency MHz	Amp. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Antenna Gain Correction	Cable Loss dB	Level dBm	dBm	dB
1672.8	66.33	337	1.7	v	1672.8	-42.6	8.7	1.5	-35.4	-13	-22.4
2509.2	60.1	10	1.7	v	2509.2	-43.1	9.5	1.9	-35.5	-13	-22.5
2509.2	57	60	1.7	h	2509.2	-46.2	9.5	1.9	-38.6	-13	-25.6
1672.8	56	220	1.7	h	1672.8	-52.7	8.7	1.5	-45.5	-13	-32.5
3345.6	47.7	10	1.5	v	3345.6	-65.3	10.1	2.1	-57.3	-13	-44.3
3345.6	45.3	200	1.6	h	3345.6	-67.5	10.1	2.1	-59.5	-13	-46.5

Run # 2: 30MHz -20GHz PCS Band Middle Channel

Indicated		Table	Test Antenna		Substituted				Absolute	Limit	Margin
Frequency MHz	Amp. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Antenna Gain Correction	Cable Loss dB	Level dBm	dBm	dB
5640	63.2	290	2	v	5640	-36.7	10.5	3	-29.2	-13	-16.2
3760	61.5	350	1.3	v	3760	-38.5	10.4	2.3	-30.4	-13	-17.4
3760	60.8	20	2.2	h	3760	-39.4	10.4	2.3	-31.3	-13	-18.3
5640	58.5	320	2	h	5640	-41.8	10.5	3	-34.3	-13	-21.3
7520	49.7	330	2	v	7520	-49.6	9.8	3.6	-43.4	-13	-30.4
7520	45.9	140	2.1	h	7520	-53.5	9.8	3.6	-47.3	-13	-34.3

7 - §2.1046, §22.913(a), & §24.232 – RF OUTPUT POWER

7.1 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.

7.2 Test Procedure

Conducted:

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

Environmental Conditions

Temperature:	20° C
Relative Humidity:	58%
ATM Pressure:	1018mbar

** The testing was performed by Oscar Au on 2007-01-04.*

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

7.4 Test Results*Cellular band, Part22:*

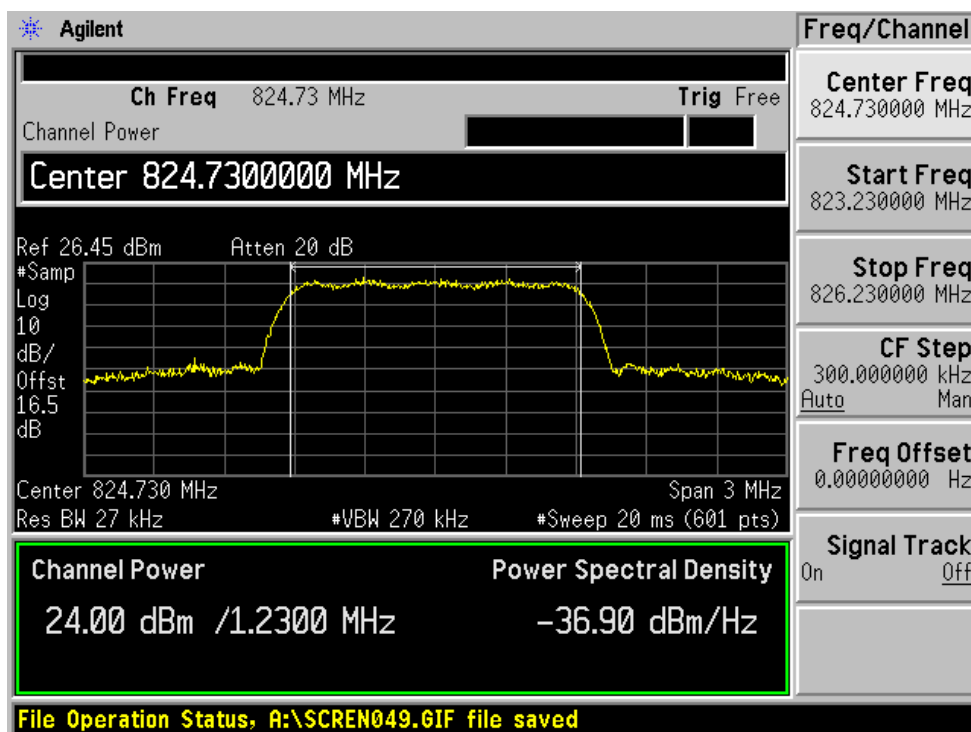
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Antenna in dBi	Limit in W
LOW	824.70	24.00	0.251	0	7
MIDDLE	836.52	24.35	0.272	0	7
HIGH	848.30	24.07	0.255	0	7

PCS band, Part24:

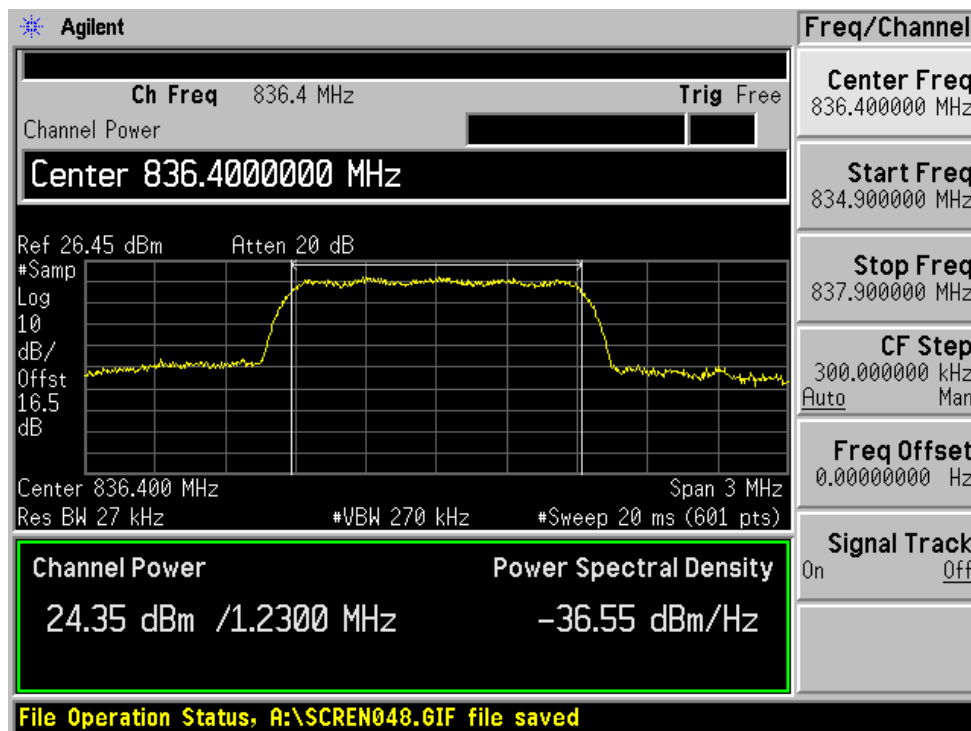
Channel	Frequency (MHz)	Output Power in dBm	Output Power in W	Antenna in dBi	Limit in W
LOW	1851.25	23.80	0.240	0	2
MIDDLE	1880.00	24.22	0.264	0	2
HIGH	1908.75	23.93	0.247	0	2

Plots of Conducted Output Power for Part 22

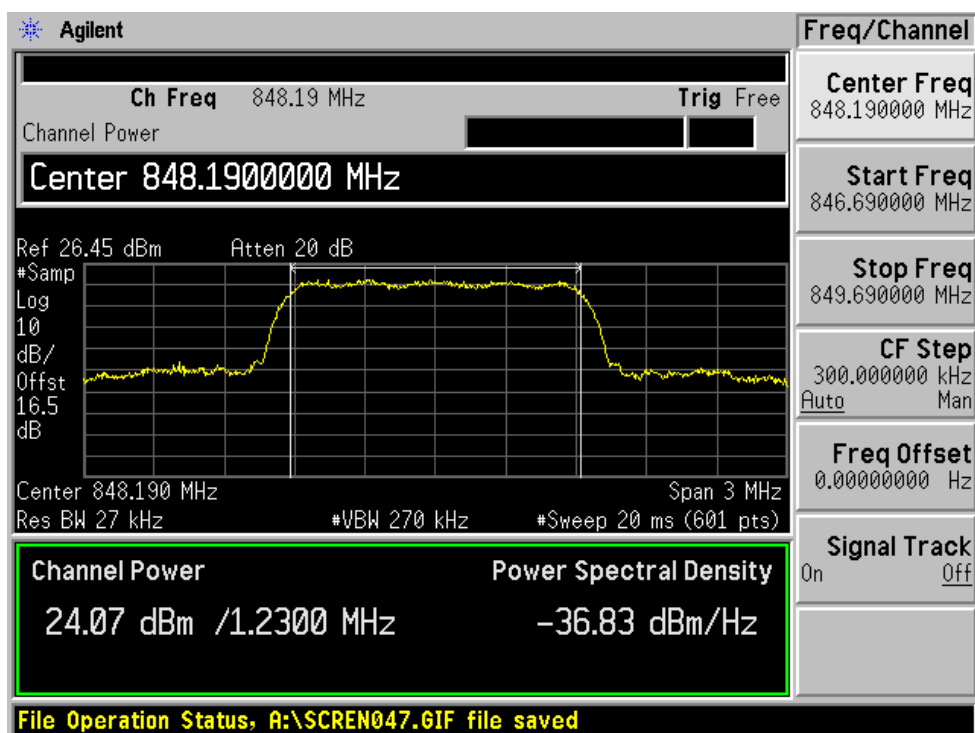
Low Channel



Middle Channel

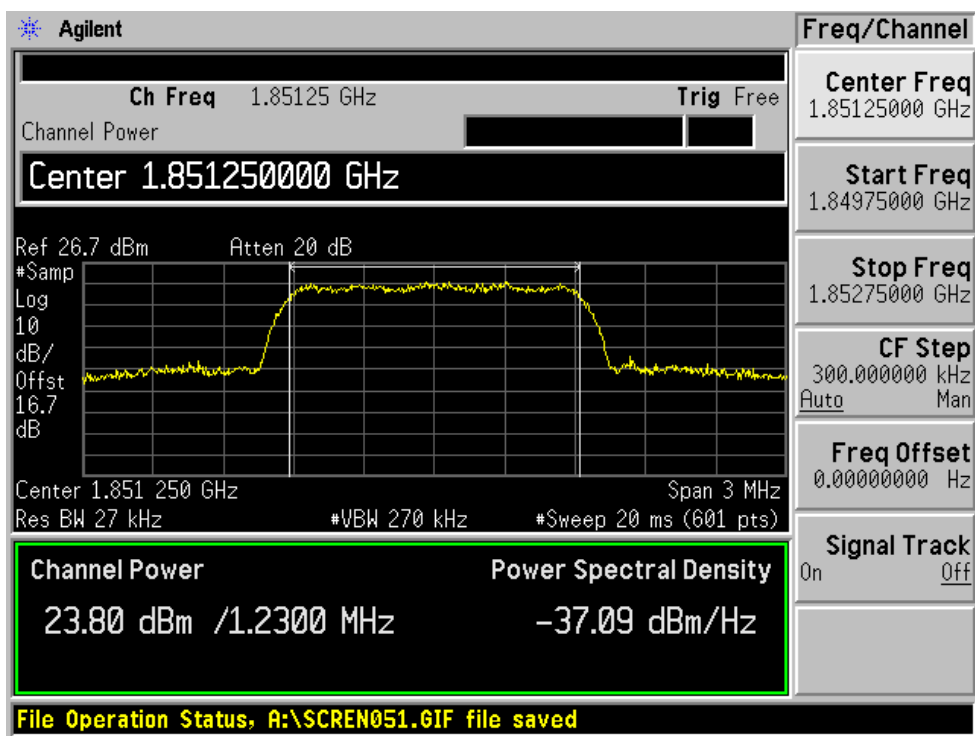


High Channel

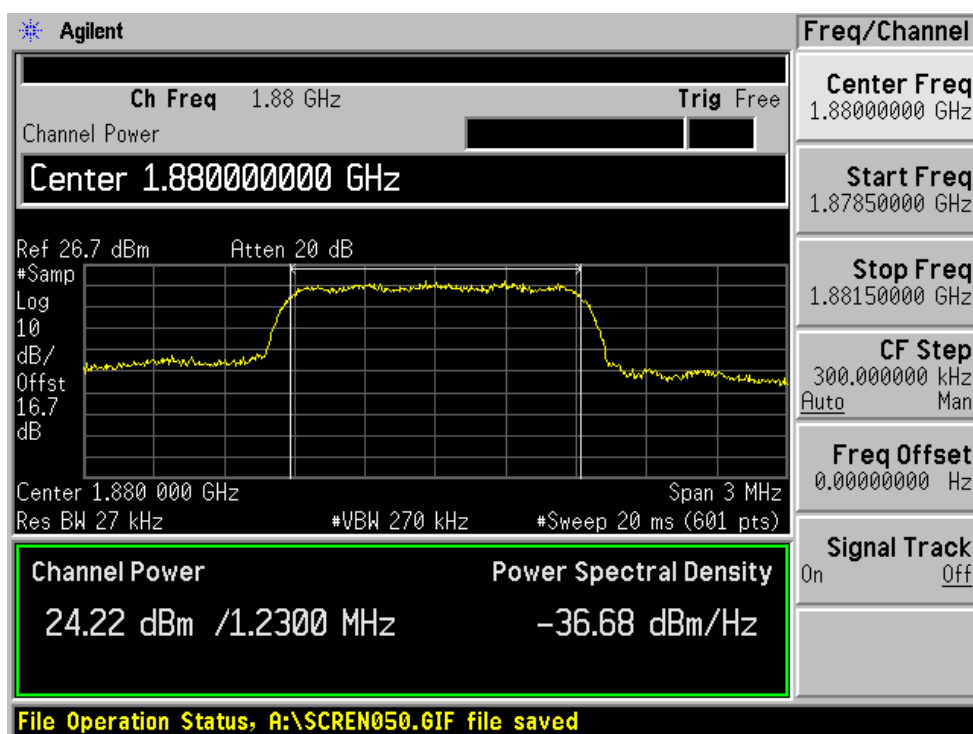


Plots of Conducted Output Power for Part 24

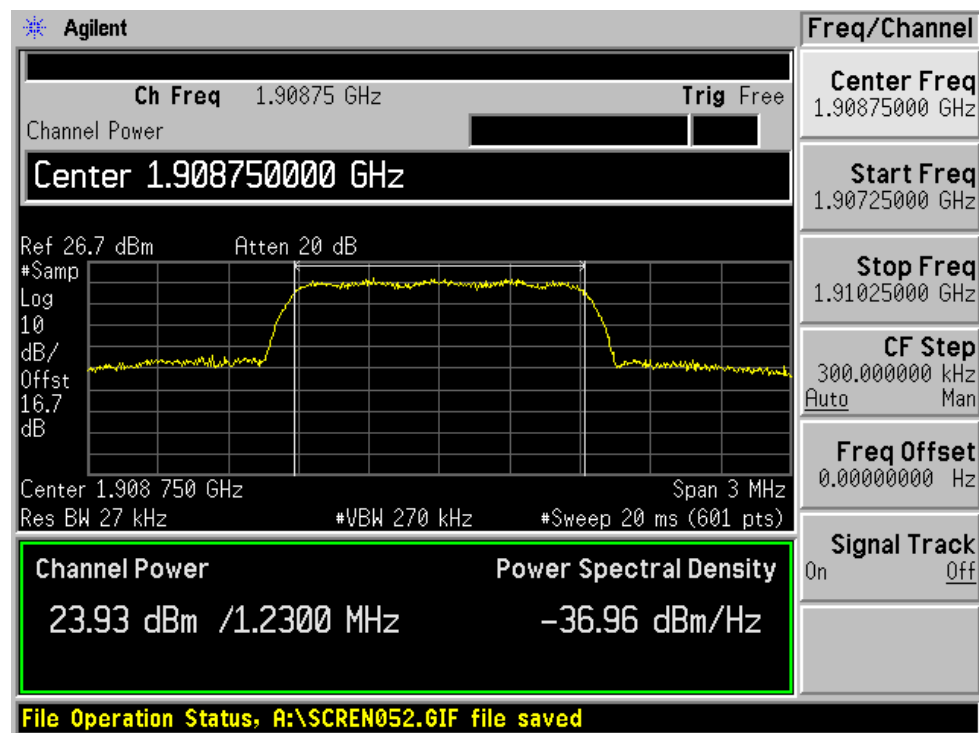
Low Channel



Middle Channel



High Channel



8 - §2.1049, §22.917, §22.905, & §24.238 - OCCUPIED BANDWIDTH

8.1 Applicable Standard

Requirements: CFR 47, Section 2.1049, Section 22.901, Section 22.917 and Section 24.238.

8.2 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 30 kHz(Cellular /PCS) and the 26 dB & 99% bandwidth was recorded.

Environmental Conditions

Temperature:	20° C
Relative Humidity:	58%
ATM Pressure:	1018mbar

* The testing was performed by Oscar Au on 2007-01-04.

8.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

8.4 Test Results

Cellular Band:

Channel	Frequency (MHz)	Occupied Bandwidth (MHZ)
LOW	824.70	1.2550
MIDDLE	836.52	1.2577
HIGH	848.30	1.2563

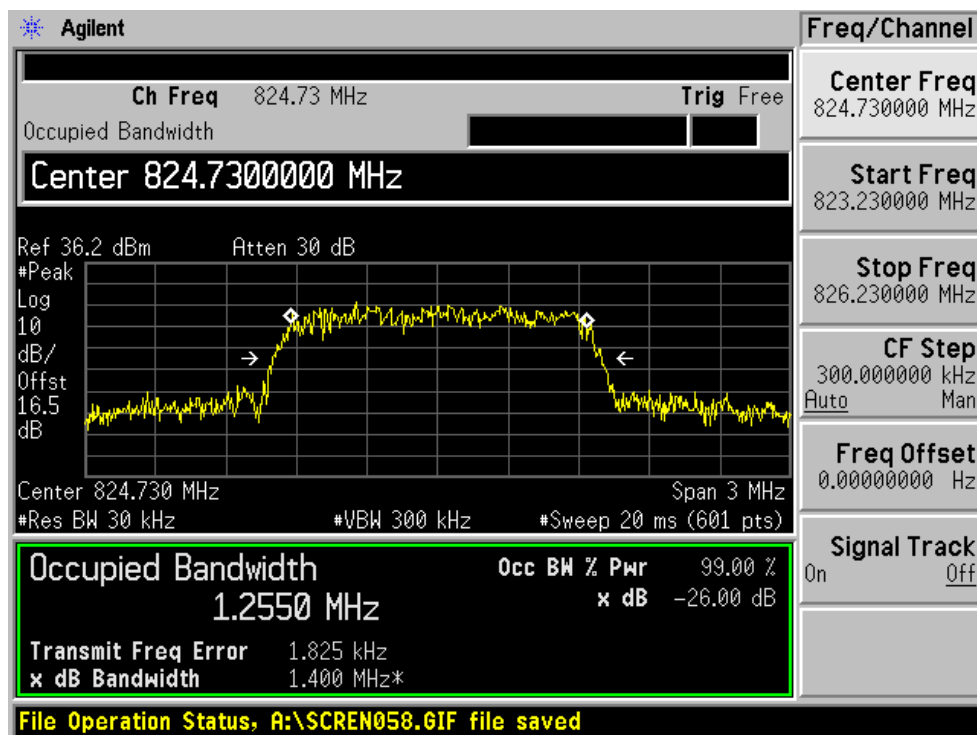
PCS Band:

Channel	Frequency (MHz)	Occupied Bandwidth (MHZ)
LOW	1851.25	1.2549
MIDDLE	1880.00	1.2509
HIGH	1908.75	1.2590

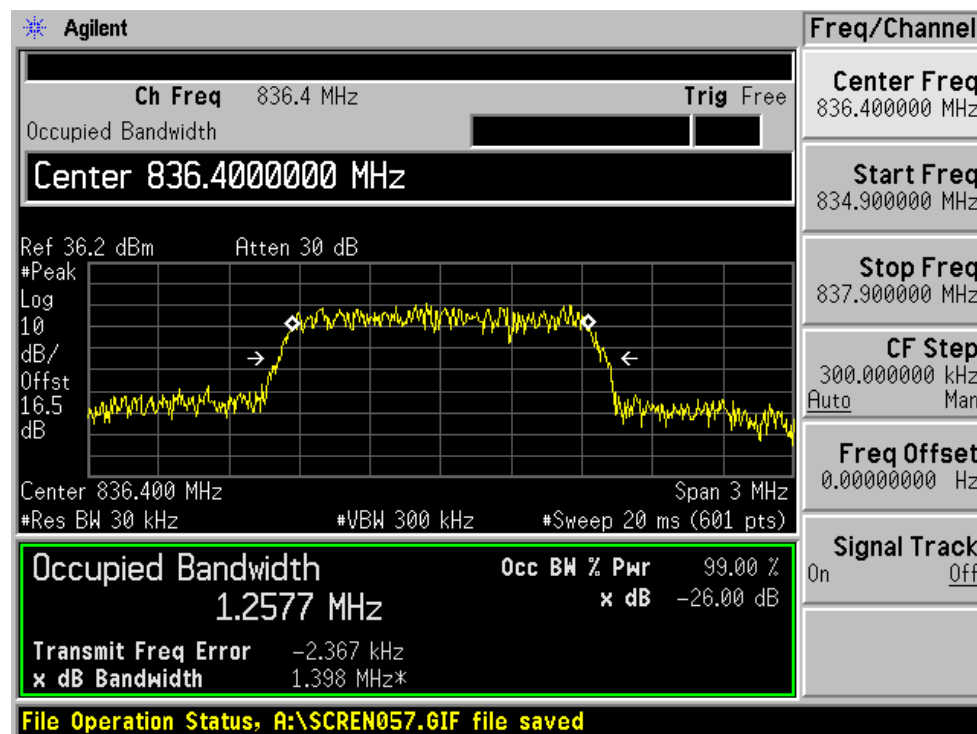
Please refer to the following plots.

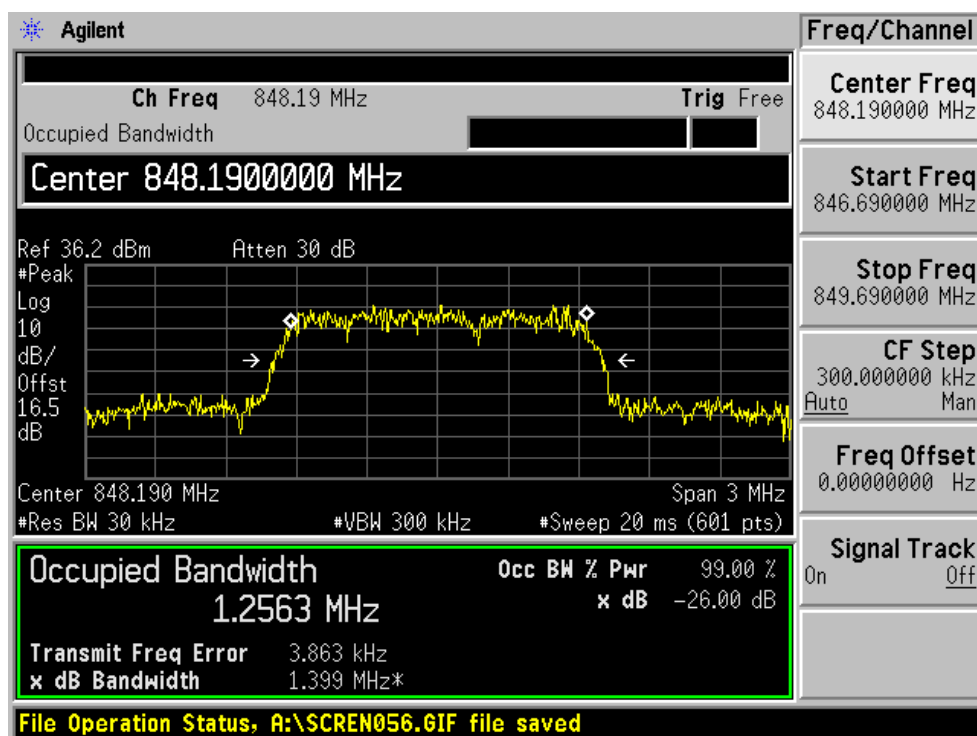
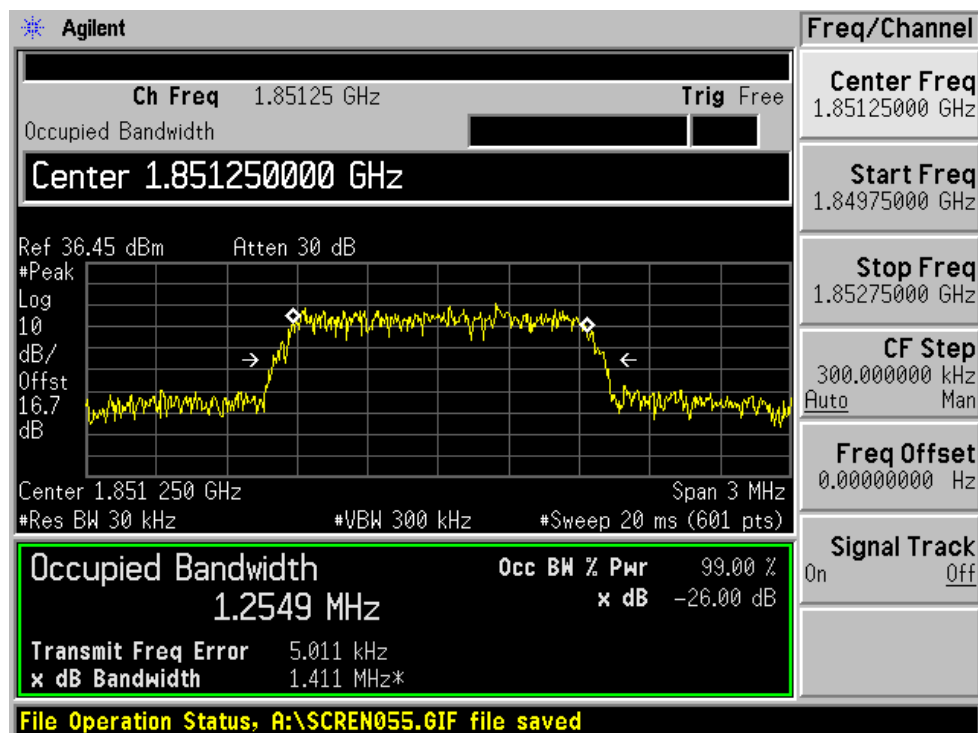
Cellular Band:

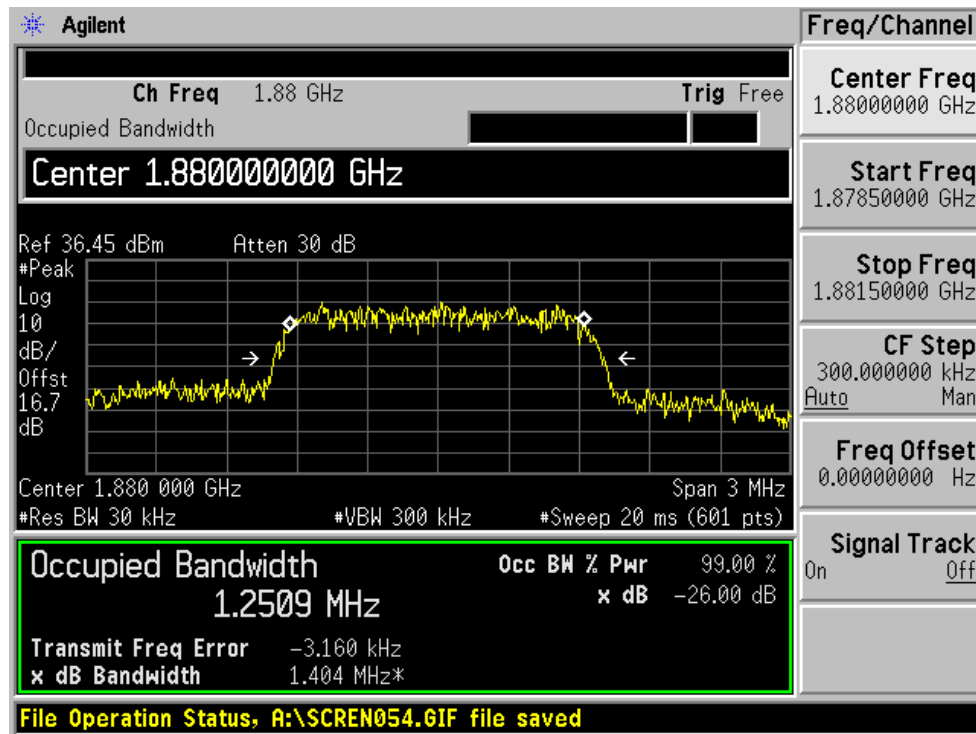
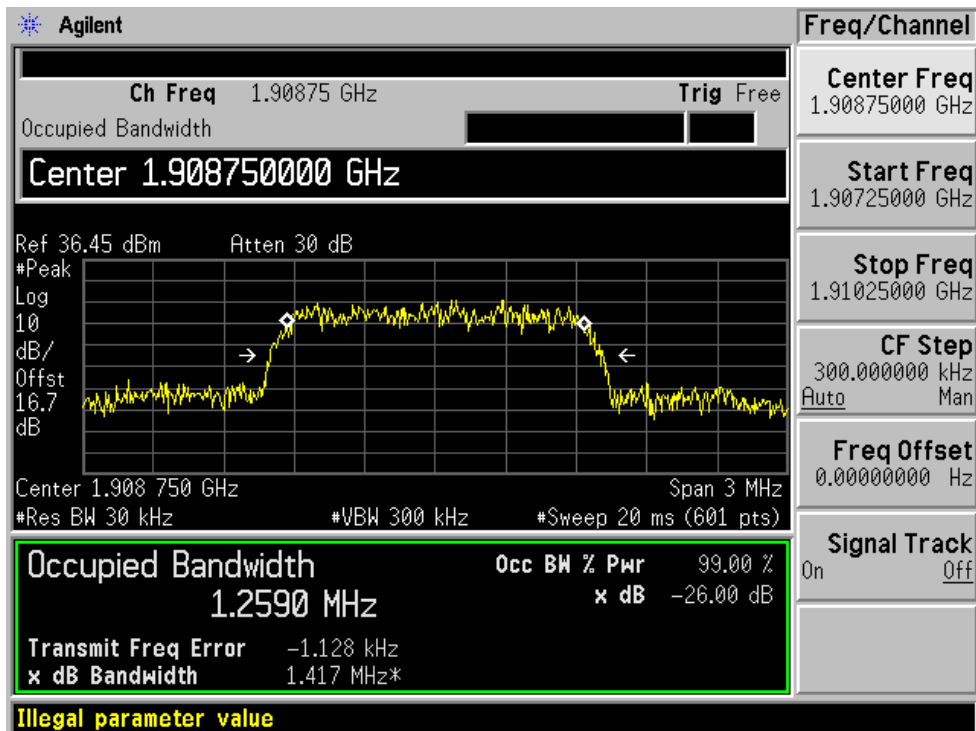
Low Channel



Middle Channel



High Channel**PCS Band:***Low Channel*

Middle Channel*High Channel*

9 - §2.1051, §22.917, & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

9.1 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.

9.2 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.

Environmental Conditions

Temperature:	20° C
Relative Humidity:	58%
ATM Pressure:	1018mbar

** The testing was performed by Oscar Au on 2007-01-04.*

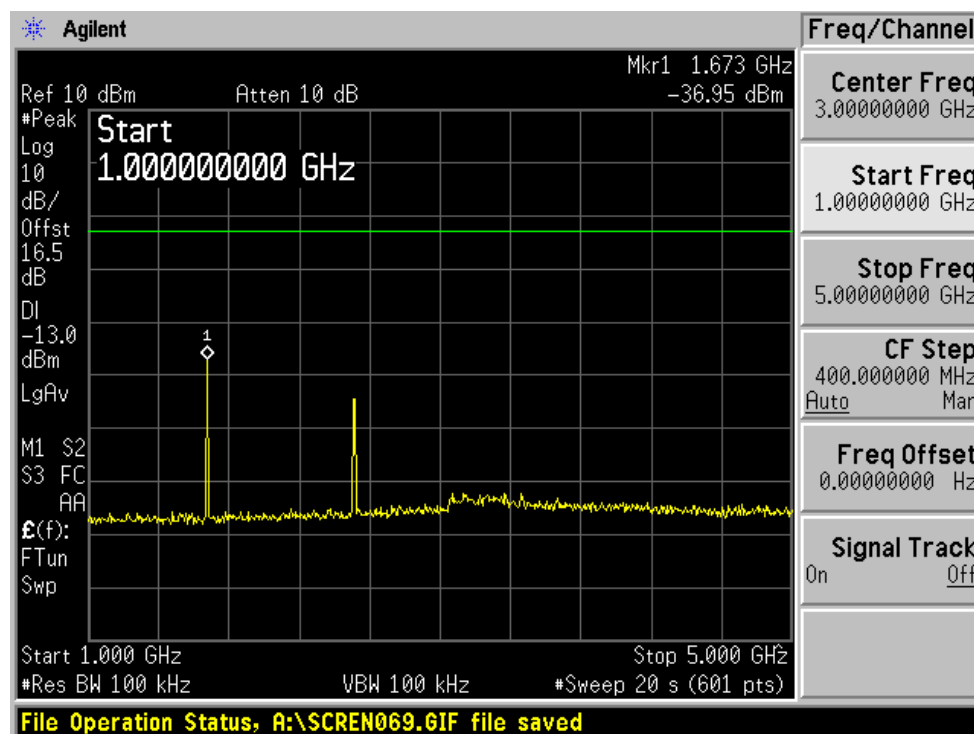
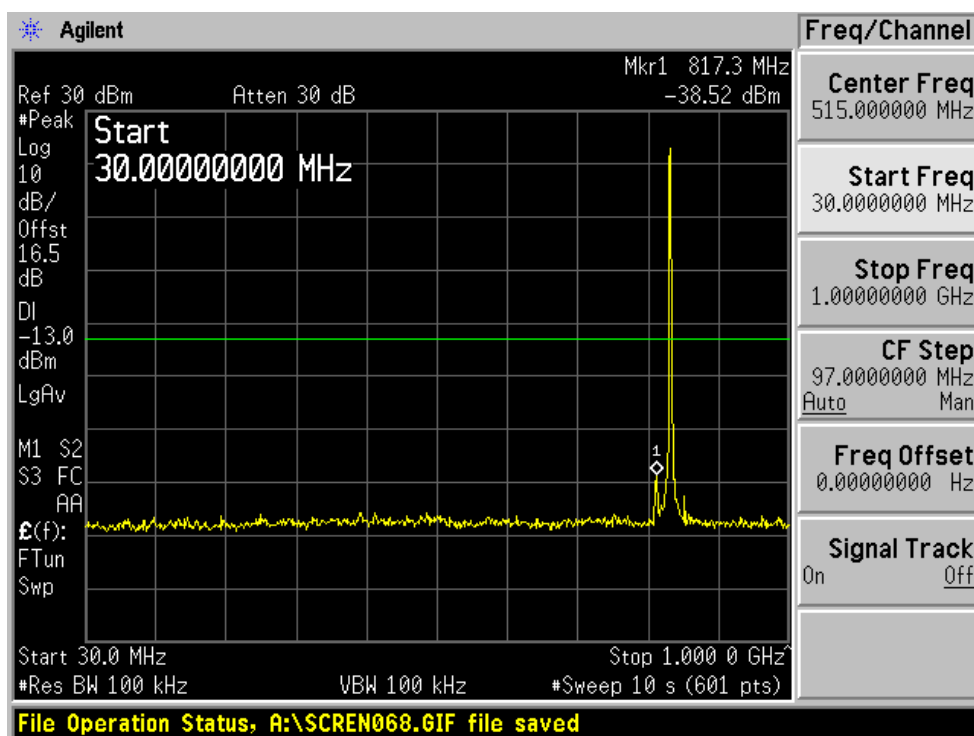
9.3 Test Equipment List and Details

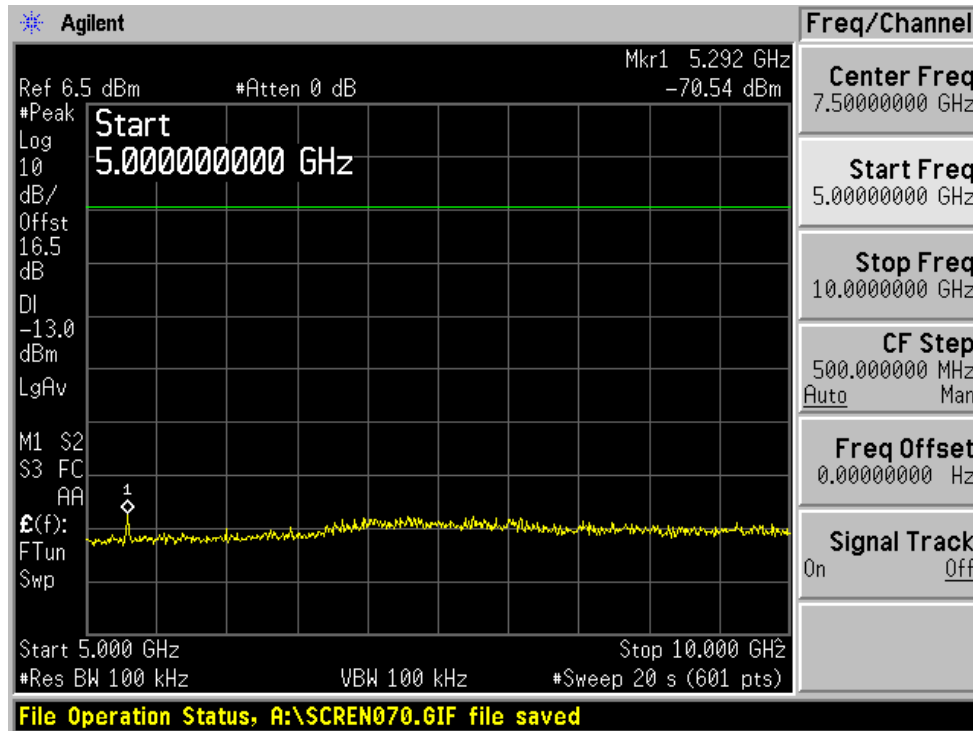
Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

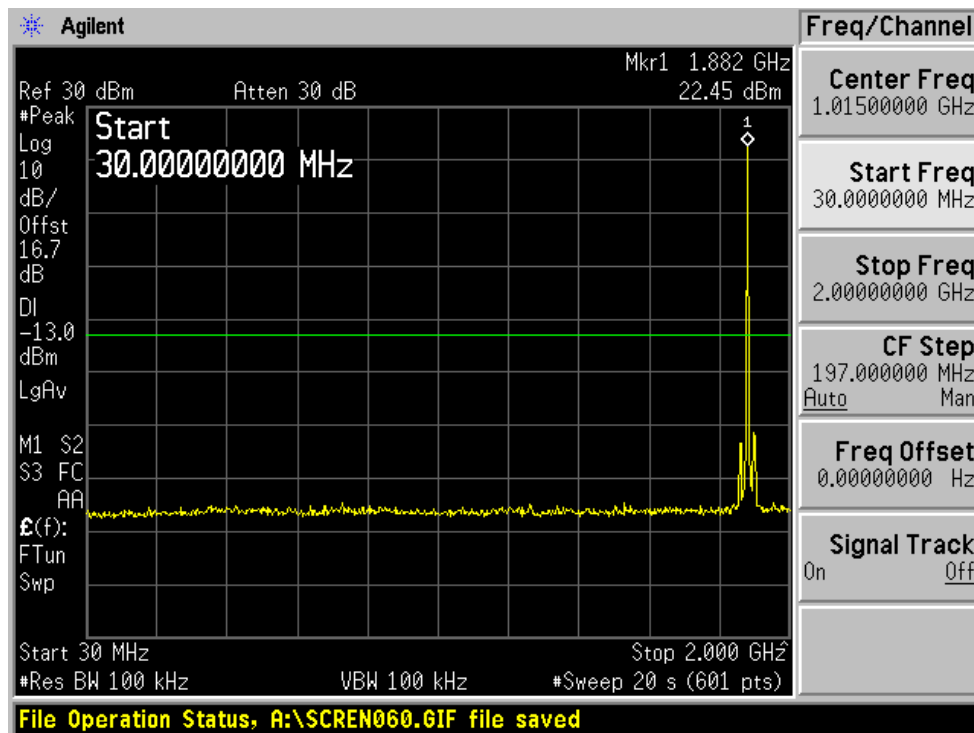
9.4 Test Results

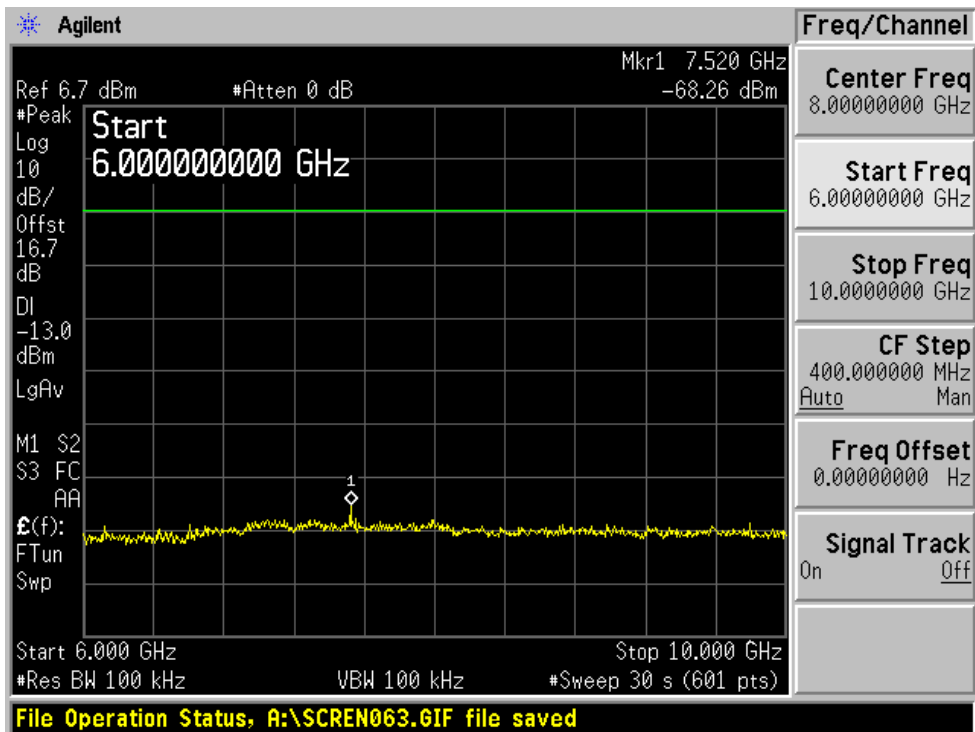
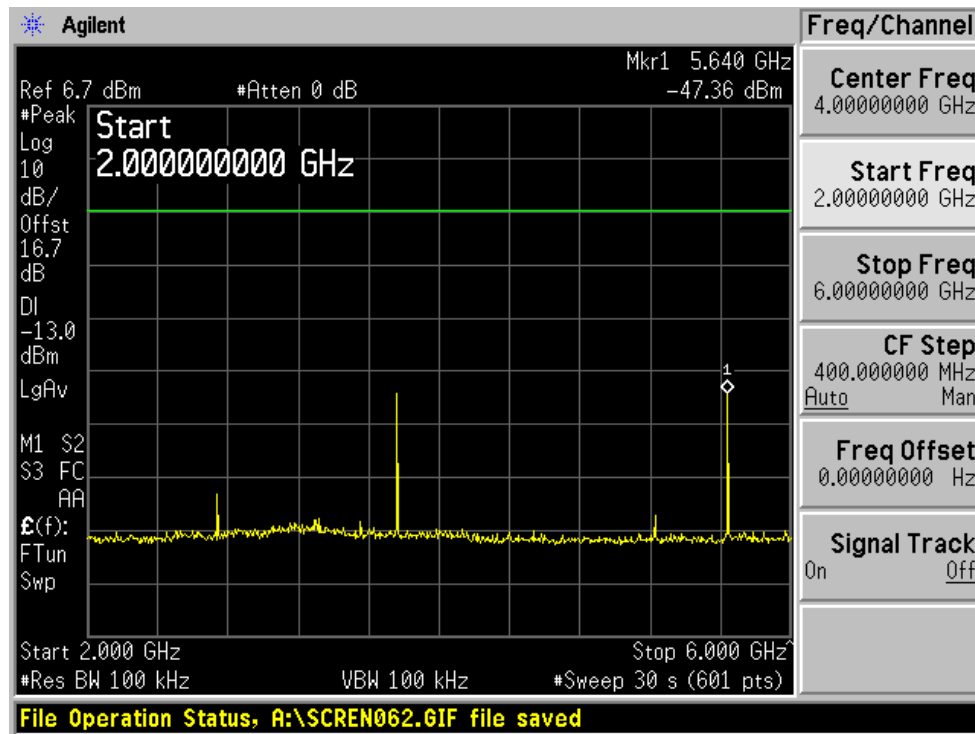
Please refer to the hereinafter plots.

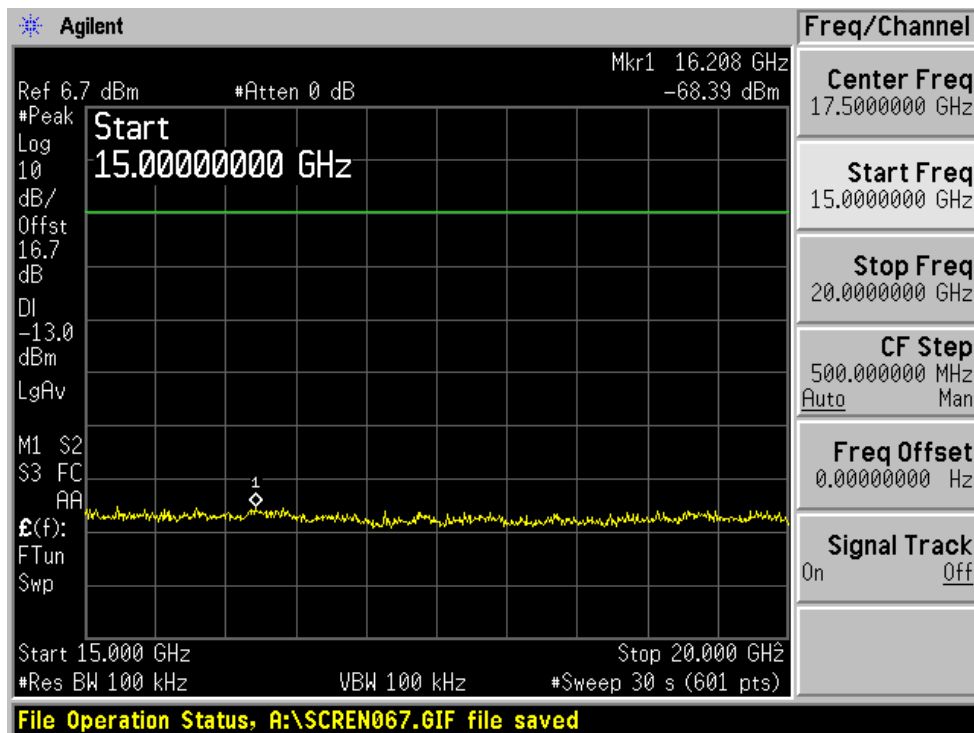
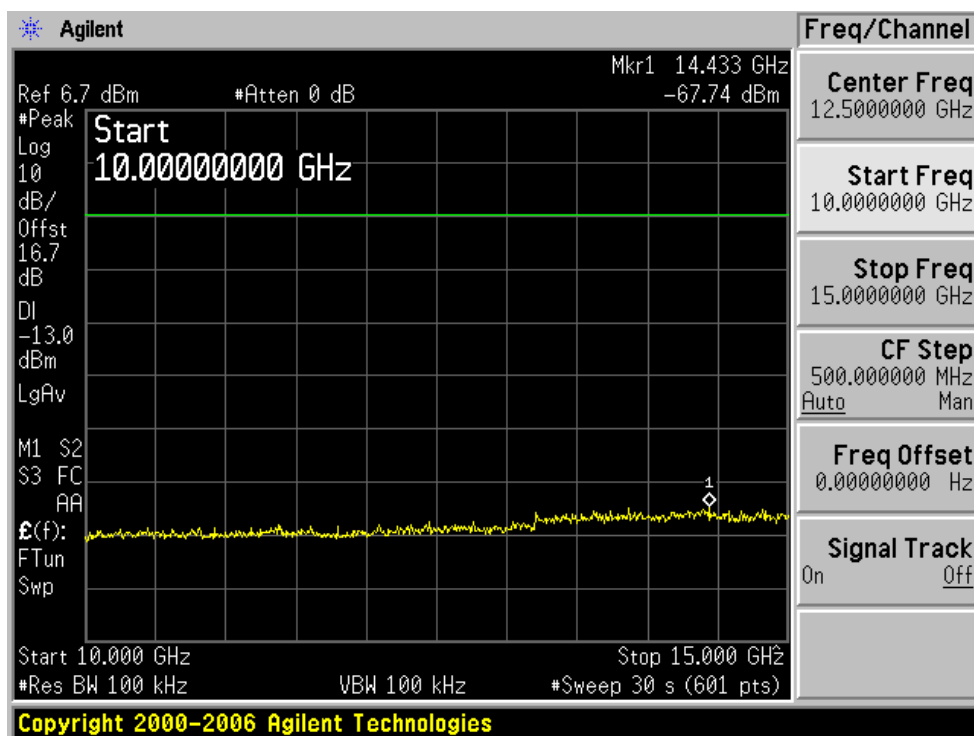
Plots of Spurious Emissions for Part22



Plots of Spurious Emissions for Part24







10 - §2.1055 (a), §2.1055 (d), §22.355, & §24.235 - FREQUENCY STABILITY

10.1 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

Table C-1_Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile [le]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 emissions stays within the authorized frequency block.

10.2 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.

Environmental Conditions

Temperature:	20° C
Relative Humidity:	58%
ATM Pressure:	1018mbar

* The testing was performed by Oscar Au on 2007-01-04.

10.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Frequency Counter	5342A	2232A06380	2006-12-12
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06
Tenney	Oven, Temperature	VersaTenn	12.222-193	2006-06-27

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

10.4 Test Results

Cellular Band:

Frequency Stability versus Temperature

Reference Frequency: 836.52 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	PPM Error
50	120	836.5215	1.7931
40	120	836.5211	1.3150
30	120	836.5205	0.5977
20	120	836.5201	0.1195
10	120	836.5201	0.1195
0	120	836.5203	0.3586
-10	120	836.5196	-0.4782
-20	120	836.5210	1.1954
-30	120	836.5189	-1.3150

Frequency Stability versus Voltage

Reference Frequency: 836.52 MHz, Limit: 2.5ppm			
Power Supplied (VDC)	Environment Temperature (°C)	Measured Frequency (MHz)	PPM Error
102	20	836.5213	1.5541

PCS Band:

Frequency Stability versus Temperature

Reference Frequency: 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Measured Frequency (MHz)	PPM Error
50	120	1880.0031	1.6489
40	120	1880.0026	1.3830
30	120	1880.0025	1.3298
20	120	1880.0012	0.6383
10	120	1880.0013	0.6803
0	120	1880.0011	0.5851
-10	120	1880.0012	0.6383
-20	120	1880.0011	0.5851
-30	120	1879.9987	-0.6915

Frequency Stability versus Voltage

Reference Frequency: 1880 MHz, Limit: 2.5ppm			
Power Supplied (VDC)	Environment Temperature (°C)	Measured Frequency (MHz)	PPM Error
102	20	1880.0011	0.5851

11 – §22.917 & §24.238 – BAND EDGE

11.1 Applicable Standard

According to § 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.

According to §24.238, 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.

11.2 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 10 kHz.

Environmental Conditions

Temperature:	19° C
Relative Humidity:	58%
ATM Pressure:	1018 mbar

** The testing was performed by Oscar Au on 2006-08-02.*

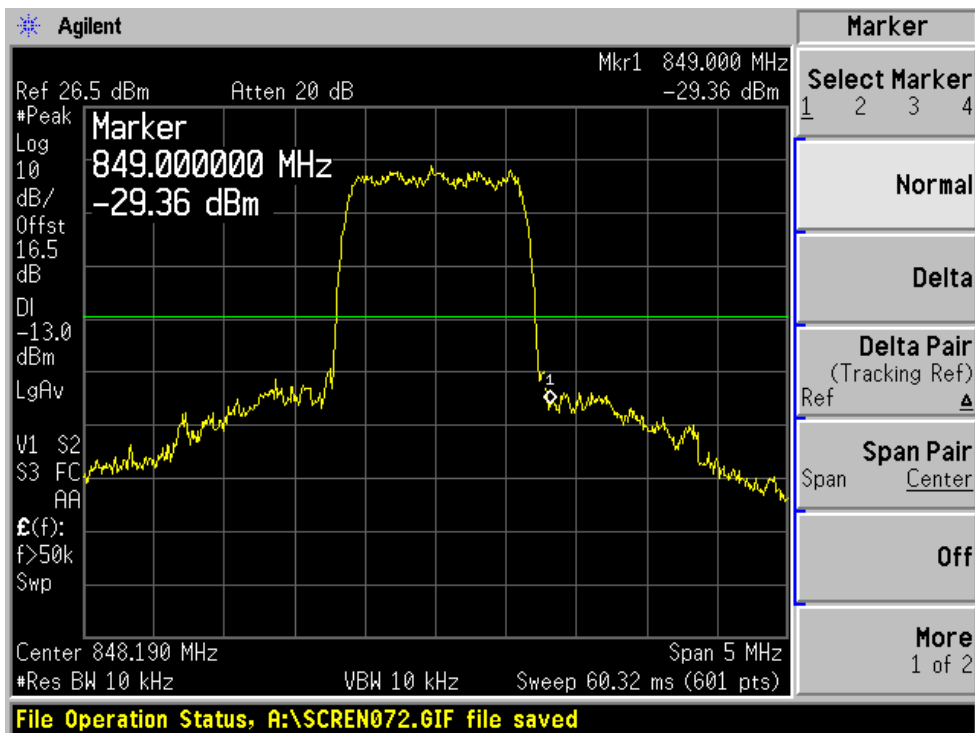
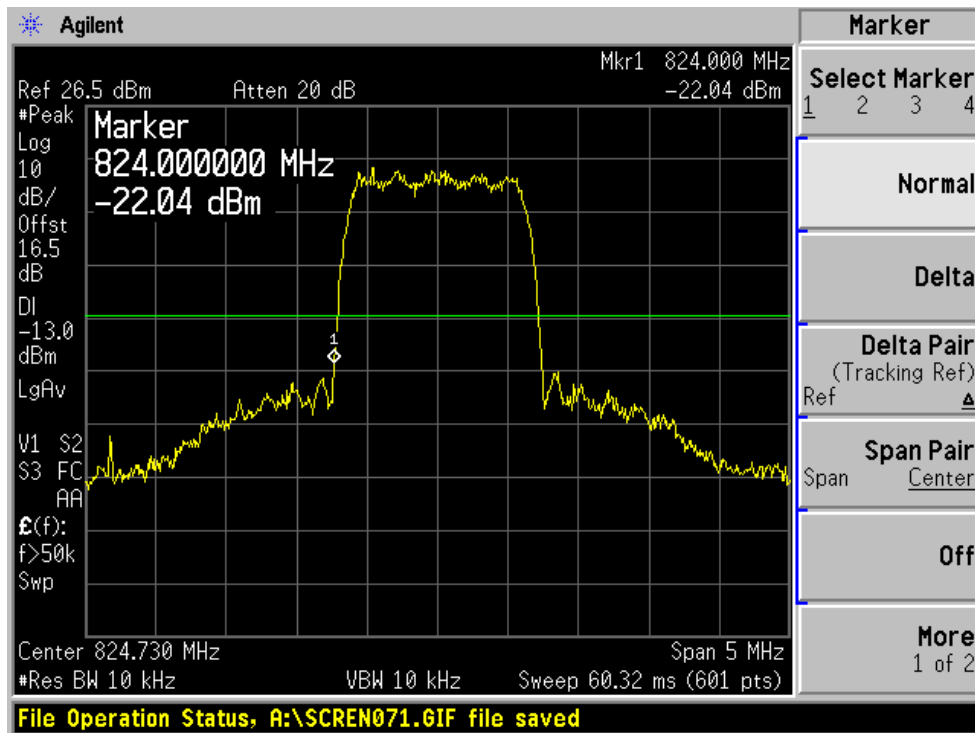
11.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

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

11.4 Test Results

Please refer to the following plots.

Plots of Band Edge for Part 22

Plots of Band Edge for Part 24