Lab Code: 200167-0

FCC PART 22H

TEST AND MEASUREMENT REPORT

For

TX RX Systems, Inc.

30303 Aurora Rd., Solon, OH 44139, USA

FCC ID: EZZ5PI62

Report Type:	**Product Type:**
Original Report	Signal Booster (Bi-directional Amplifier)

Test Engineer:	Victor Zhang
Report Number:	R0902232-22
Report Date:	2009-03-27
Reviewed By:	Boni Baniqued Sr. RF Engineer
Prepared By: **(66)**	Bay Area Compliance Laboratories Corp. 1274 Anvilwood Ave Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0902232-22	Original	2009-03-27

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The TX RX Systems, Inc. FCC ID: EZZ5PI62 or the "EUT" as referred to in this report, is a bi-directional amplifier that has dual RF paths (uplink and downlink) to extend coverage in RF shielded environments. The uplink and downlink amplifier modules are electrically identical with common ALC control and alarm circuitry.

1.2 Mechanical Description

The EUT Approximate measurement is: 388mm (L) x 391 mm (W) x 188 mm (H). It is of metallic construction.

** The test data gathered are from typical production sample, serial number: B2107, provided by BACL.*

1.3 EUT Photo

Please see additional photos in Exhibit C

1.4 Objective

This type approval report is prepared on behalf of TX RX Systems, Inc. in accordance with Part 2, Subpart J, 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 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Narda	30dB attenuator pad	768-30	N/A
Narda	10dB attenuator pad	768-10	N/A

2.5 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	0.2	Signal Generator	Input/ EUT
RF cable	0.2	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
§ 2.1049, § 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	Frequency Stability	N/A
§2.1091	RF Exposure	Compliant

4 §2.1046, §22.913(a) – RF OUTPUT POWER

4.1 Applicable Standard

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

4.2 Test Procedure

Conducted:

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

4.3 Environmental Conditions

Temperature:	23.2 °C
Relative Humidity:	43 %
ATM Pressure:	101.7 kPa

** The testing was performed by Victor Zhang on 2009-03-25 in RF Site.*

4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Signal Generator	8648C	3426A00417	2008-05-28
R & S	Signal Generator	SMIQ03	849192/0085	2007-12-03*

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

4.5 Summary of Test Results

Maximum Output Power – Modulated Signal

Modulation		Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	ERP Limit (W)
CDMA	Uplink	Low	824.8	36.78	4.764	500
		Middle	836.52	37.10	5.129	500
		High	848.2	36.42	4.385	500
	Downlink	Low	869.8	37.32	5.395	500
		Middle	881.52	36.91	4.909	500
		High	893.2	37.54	5.675	500
GSM	Uplink	Low	824.2	36.71	4.688	500
		Middle	836.6	37.06	5.082	500
		High	848.8	36.43	4.395	500
	Downlink	Low	869.2	37.29	5.358	500
		Middle	881.6	36.72	4.699	500
		High	893.8	37.41	5.508	500

5 §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, therefore modulation characteristic is not presented.

5.2 Test Result

N/A

6 §2.1049, §22.917 - OCCUPIED BANDWIDTH

6.1 Applicable Standard

Requirements: CFR 47, Section 2.1049 and Section 22.917.

6.2 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.

6.3 Environmental Conditions

Temperature:	23.2 °C
Relative Humidity:	43 %
ATM Pressure:	101.7 kPa

** The testing was performed by Victor Zhang on 2009-03-25 in RF Site.*

6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Signal Generator	8648C	3426A00417	2008-05-28
R & S	Signal Generator	SMIQ03	849192/0085	2007-12-03*

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

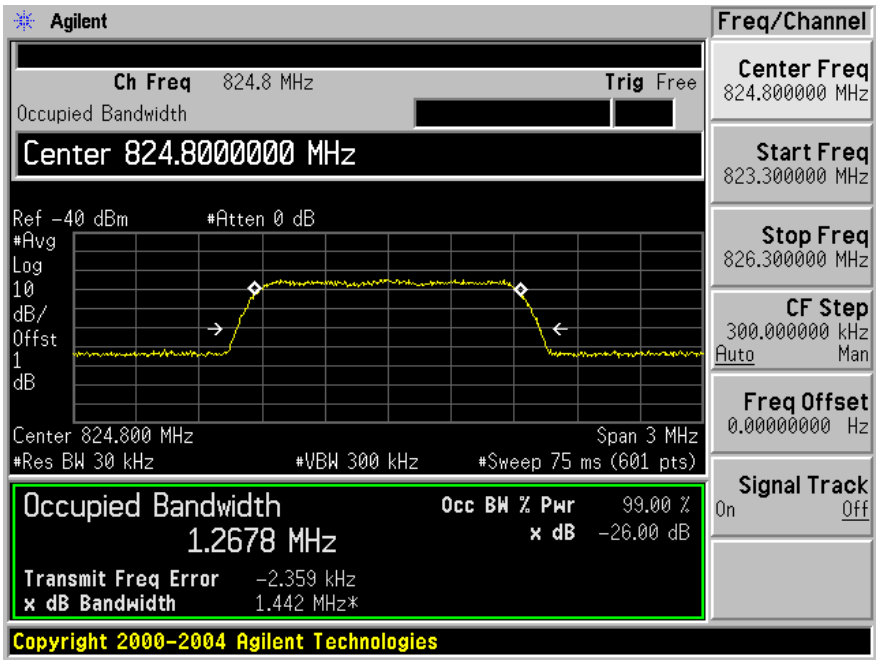
6.5 Summary of Test Results

Mode		Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
CDMA	Uplink	Low	824.8	1267.8	1267.4
		Middle	836.52	1265.6	1265.4
		High	848.2	1266.5	1268.8
	Downlink	Low	869.8	1266.7	1267.6
		Middle	881.52	1267.4	1267.6
		High	893.2	1267.1	1268.9
GSM	Uplink	Low	824.2	249.4797	249.1911
		Middle	836.6	249.3494	248.1749
		High	848.8	248.5555	246.5981
	Downlink	Low	869.2	248.7639	246.6964
		Middle	881.6	249.8840	248.4381
		High	893.8	248.3494	244.9030

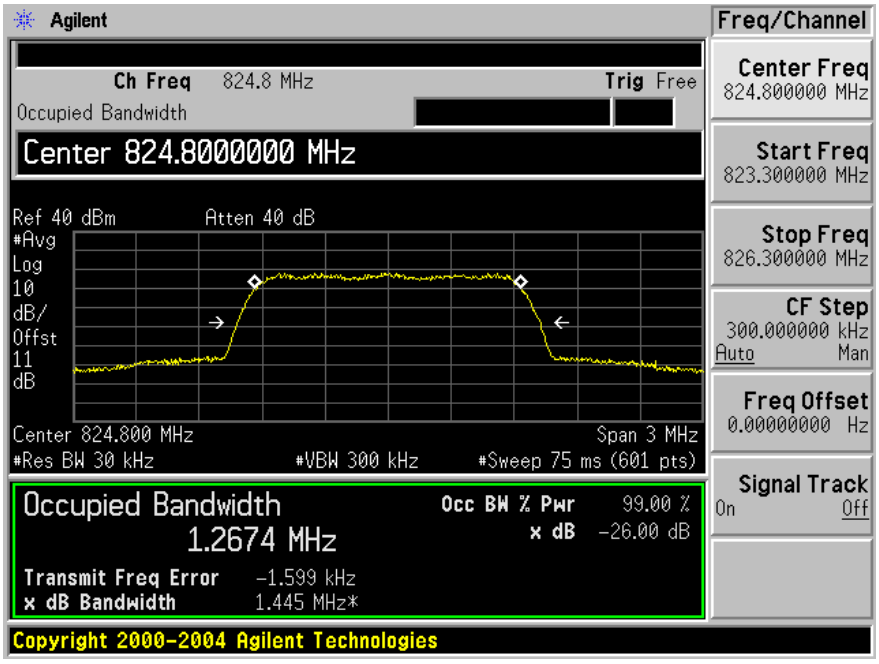
Please refer to the following plots.

CDMA Uplink, Low Channel: 824.8 MHz

Input

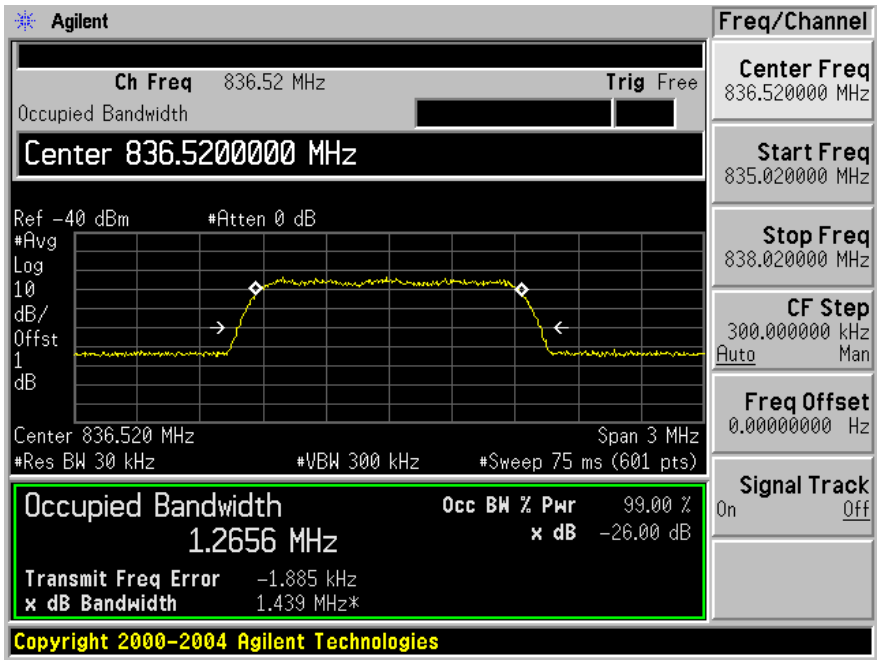


Output

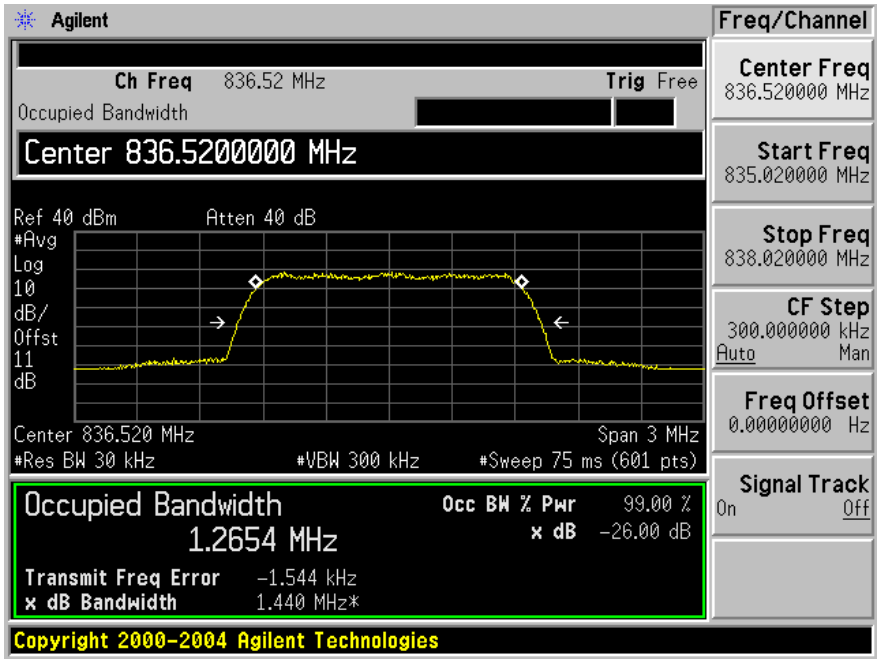


CDMA Uplink, Middle Channel: 836.52 MHz

Input

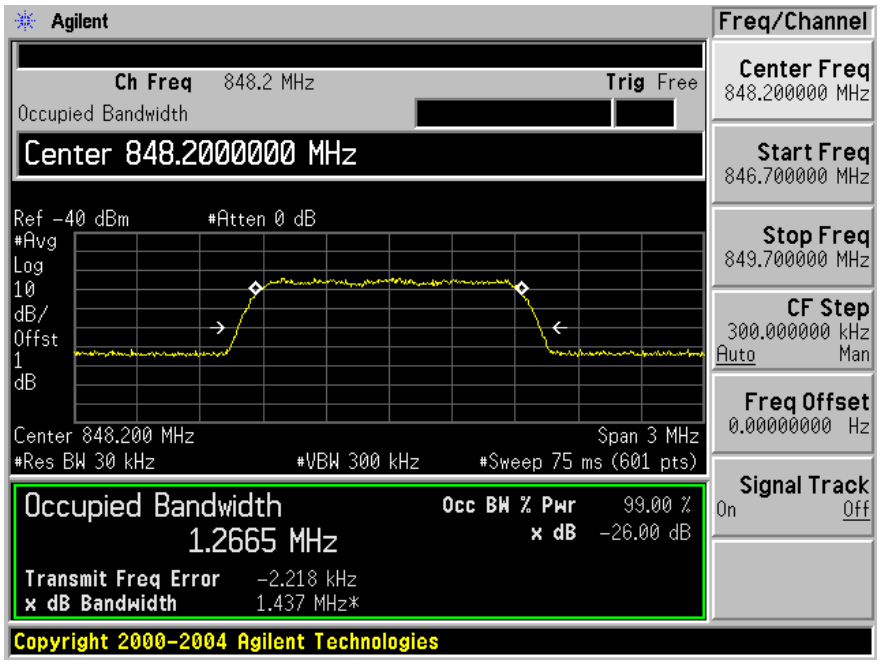


Output

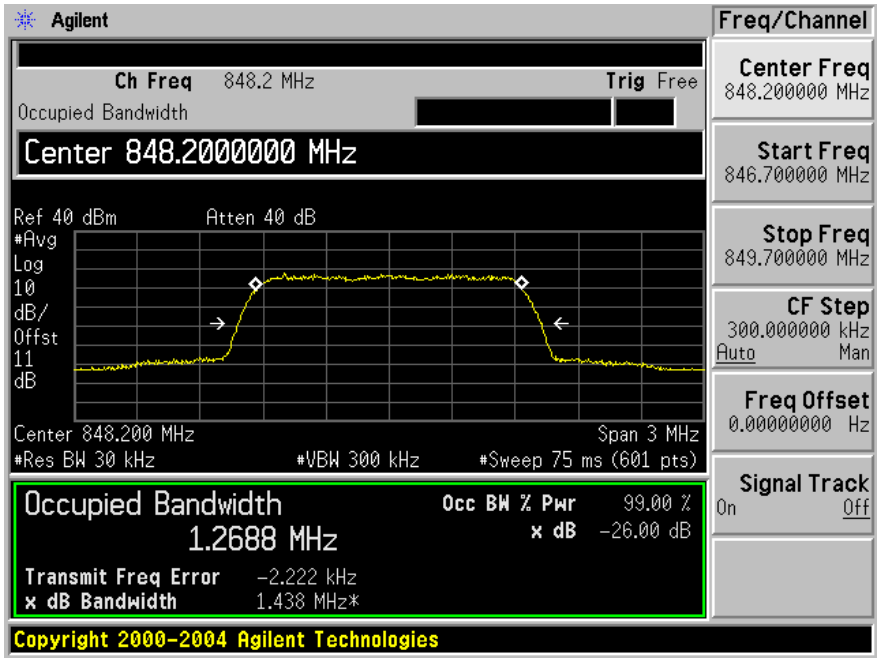


CDMA Uplink, High Channel: 848.2 MHz

Input

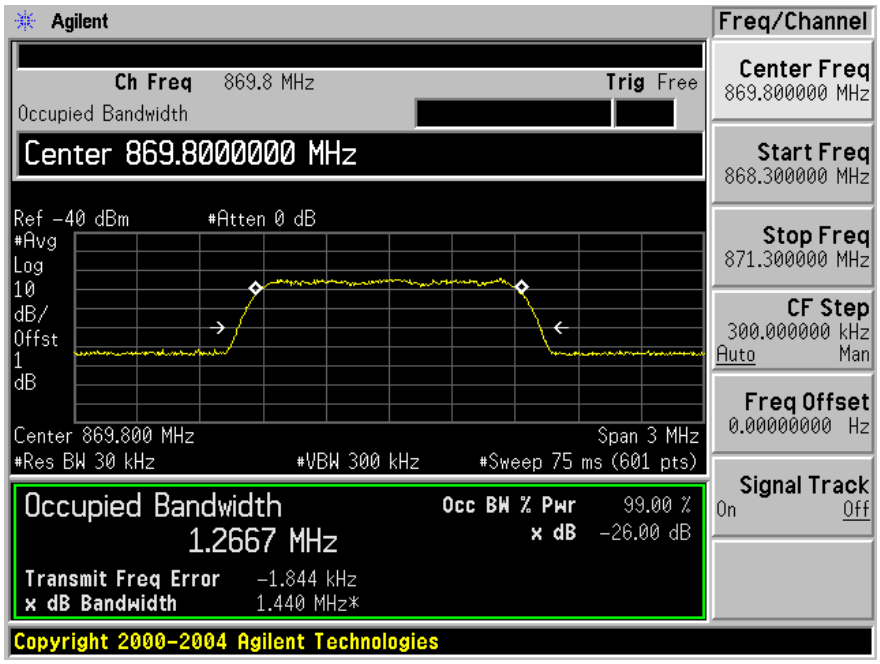


Output

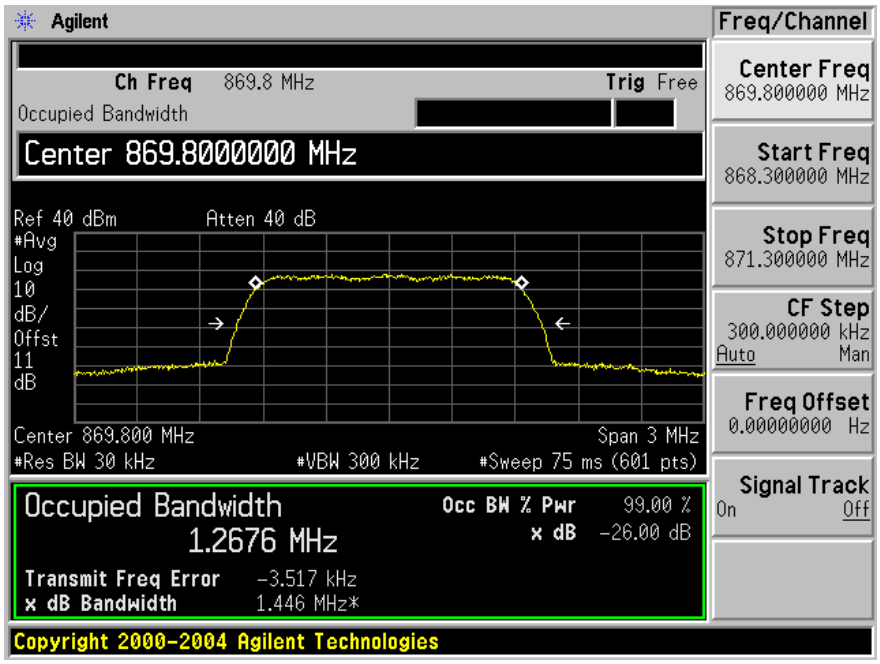


CDMA Downlink, Low Channel: 869.8 MHz

Input

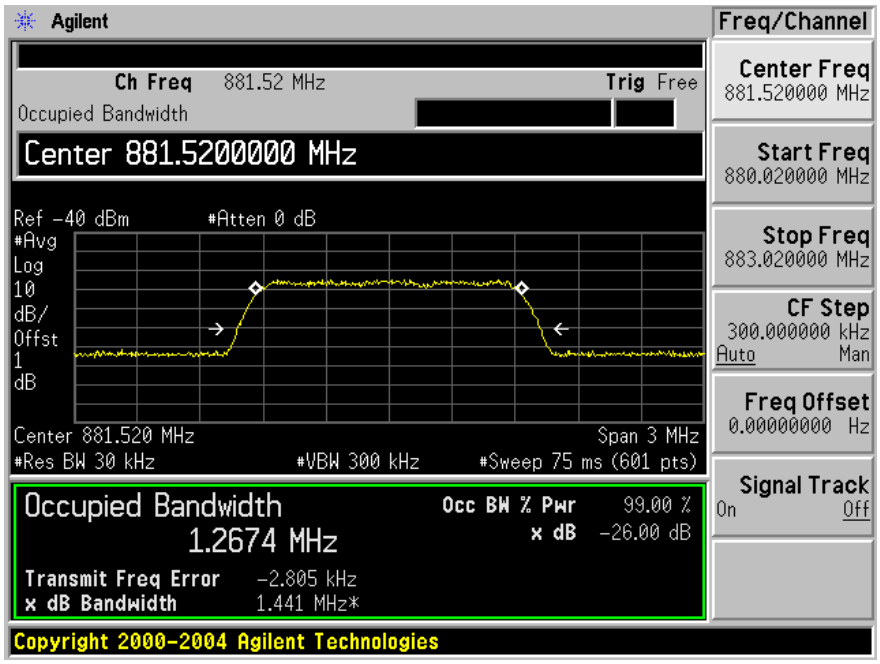


Output

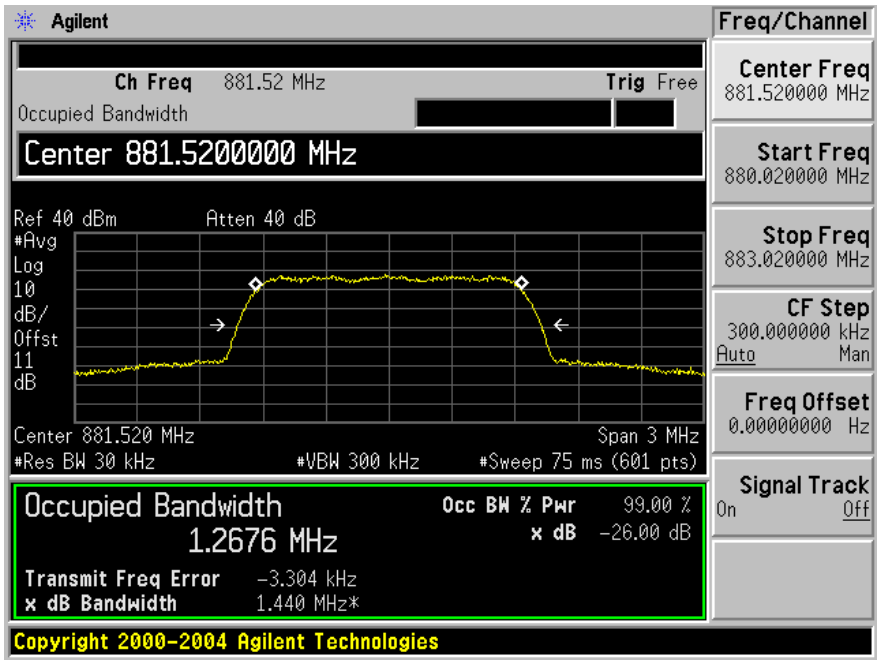


CDMA Downlink, Middle Channel: 881.52 MHz

Input

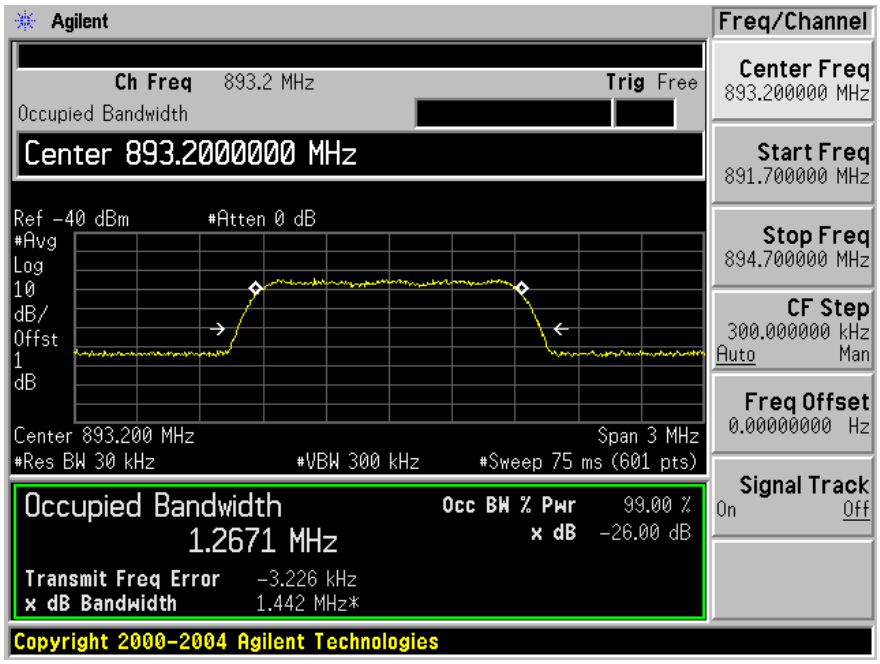


Output

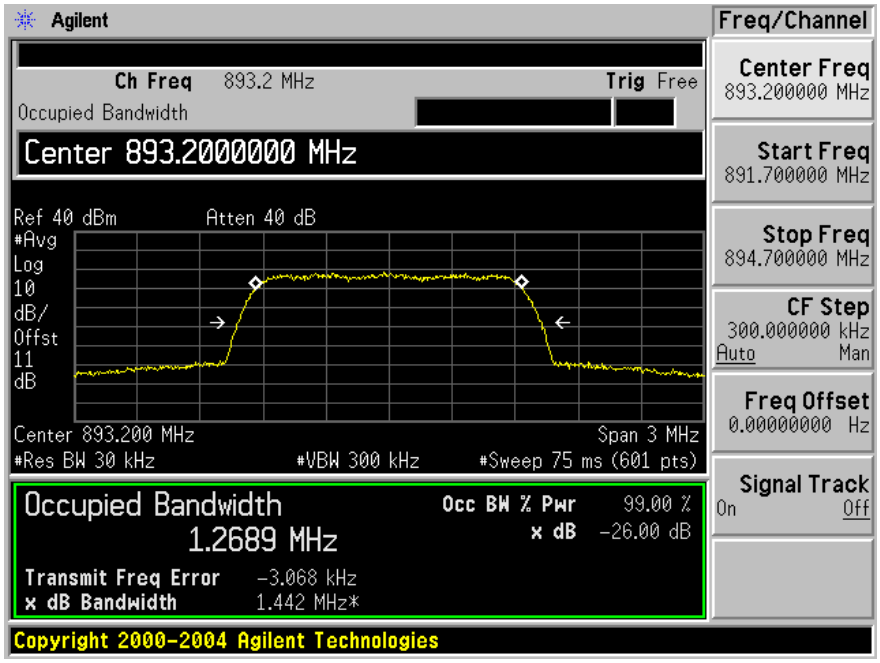


CDMA Downlink, High Channel: 893.2 MHz

Input

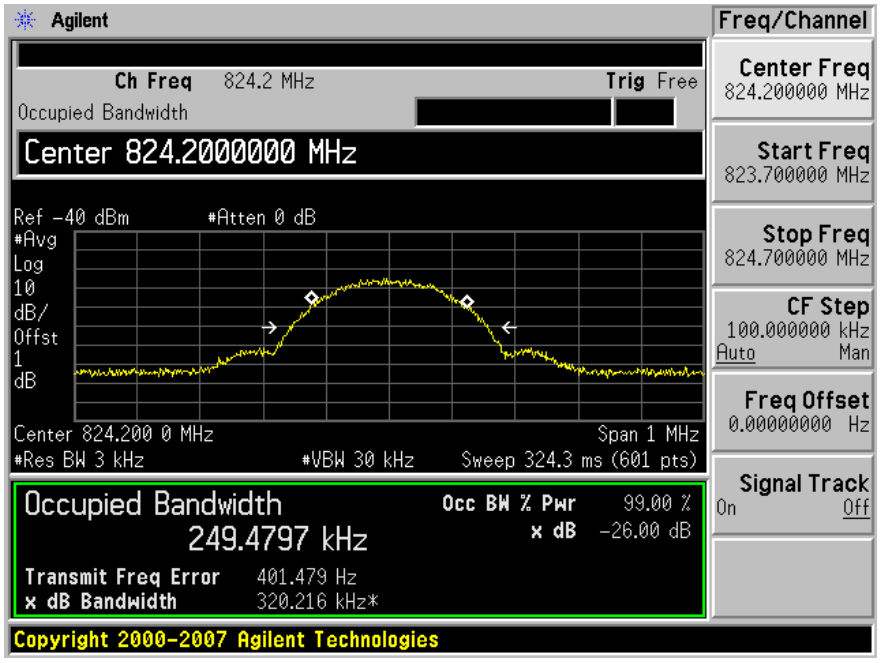


Output

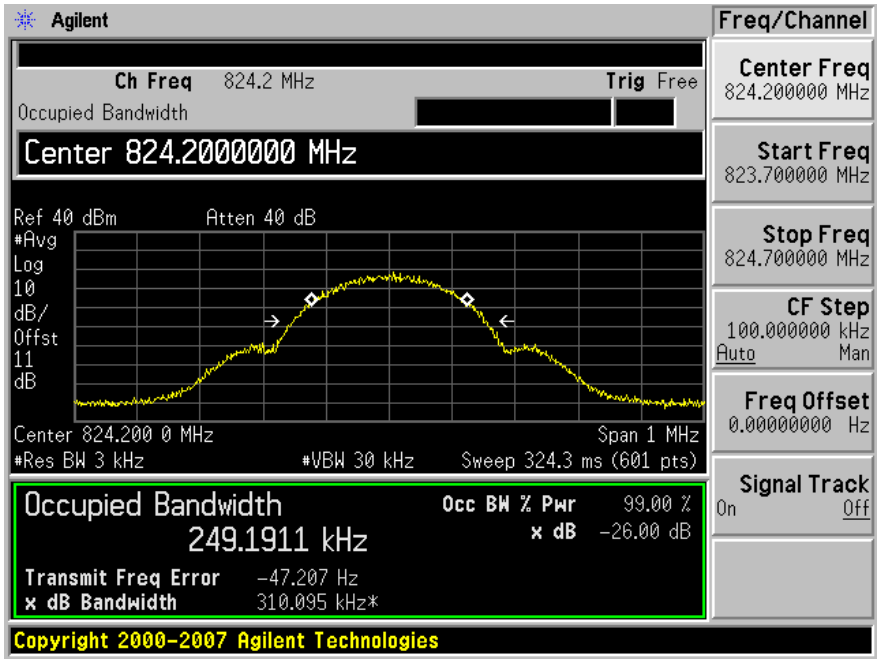


GSM Uplink, Low Channel: 824.2 MHz

Input

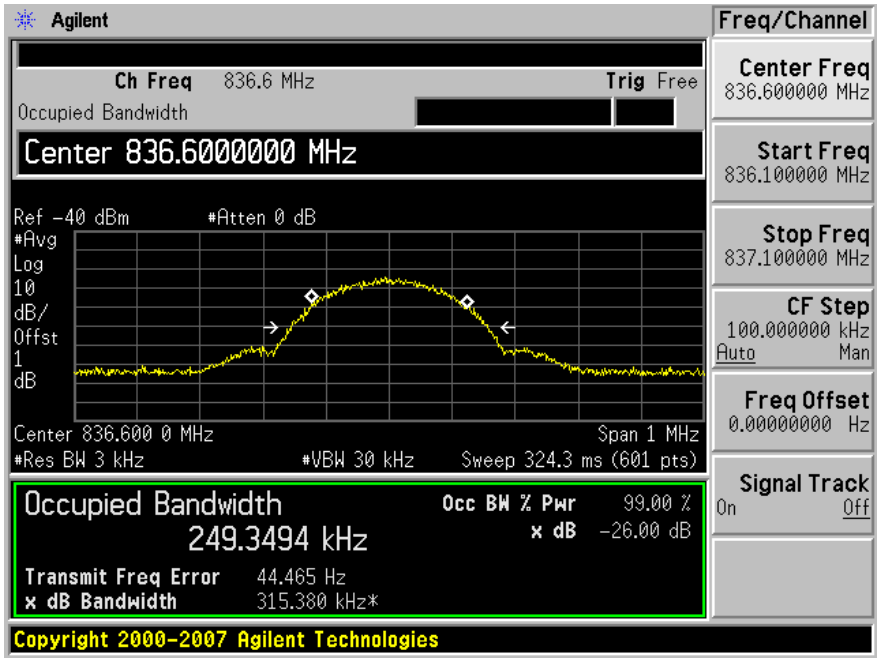


Output

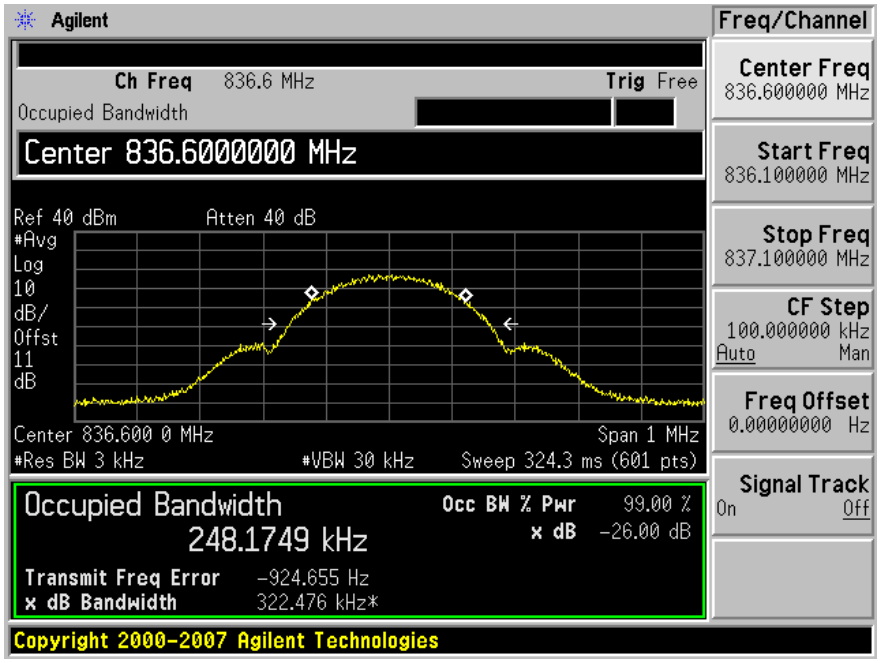


GSM Uplink, Middle Channel: 836.6 MHz

Input

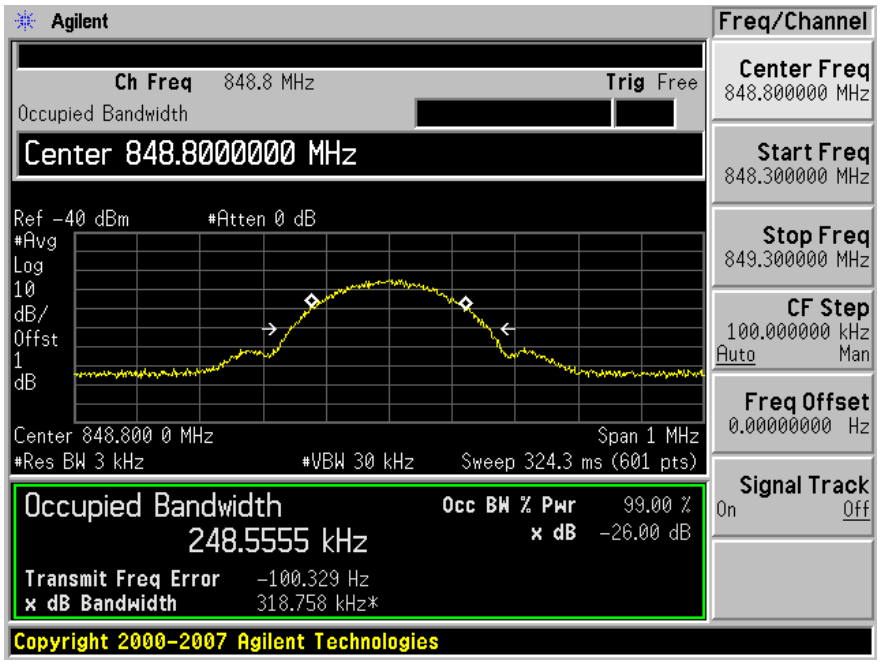


Output

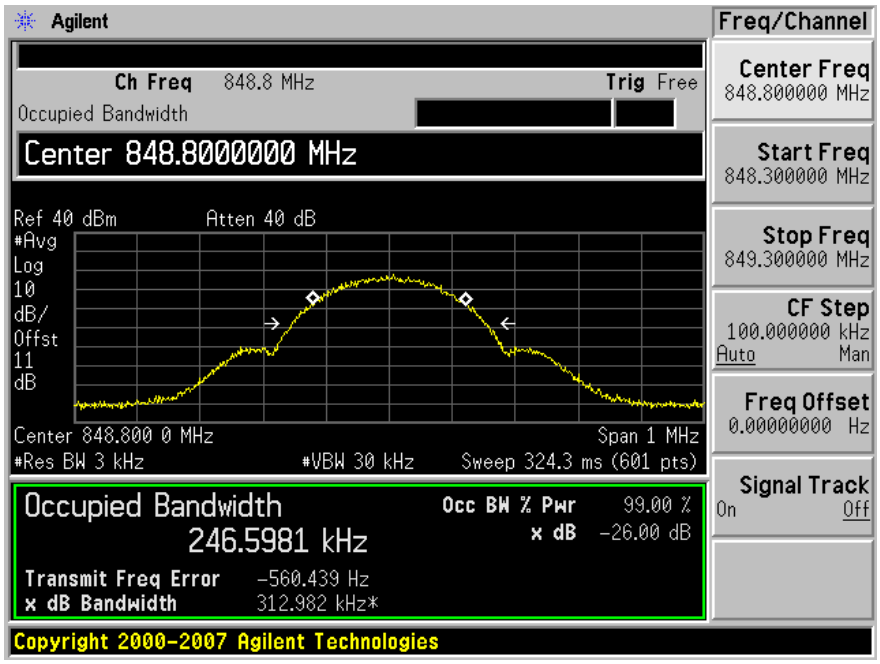


GSM Uplink, High Channel: 848.8 MHz

Input

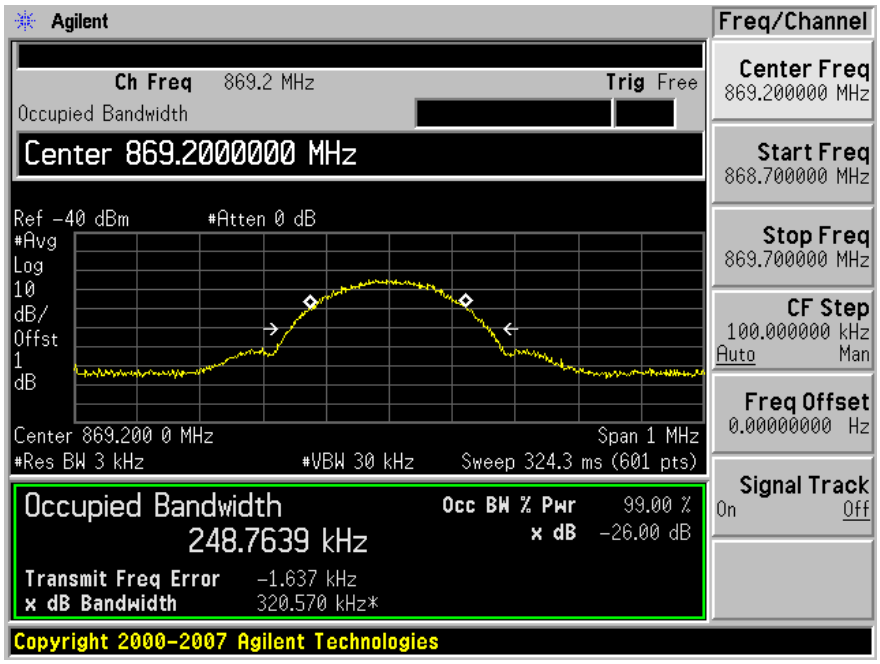


Output

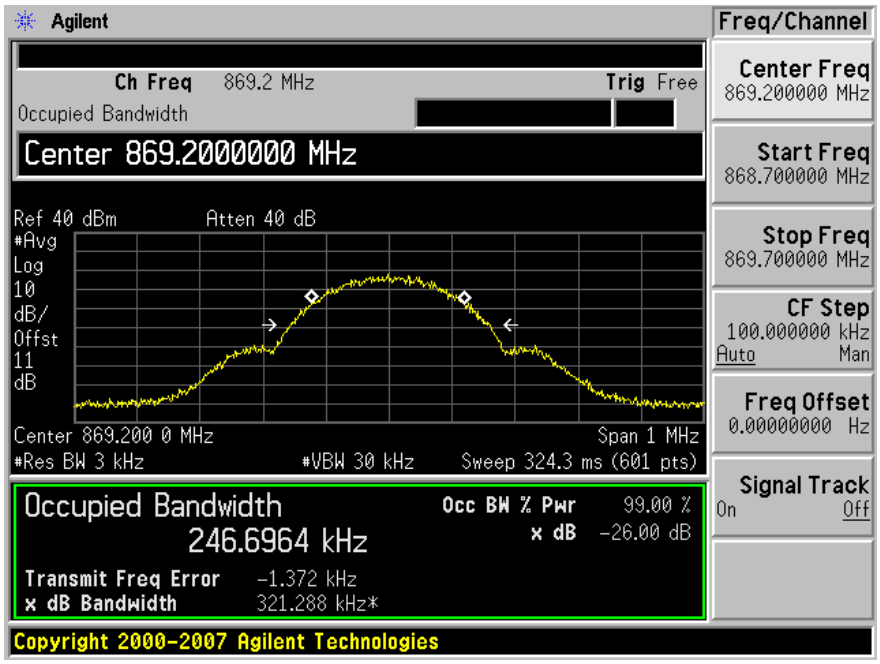


GSM Downlink, Low Channel: 869.2 MHz

Input

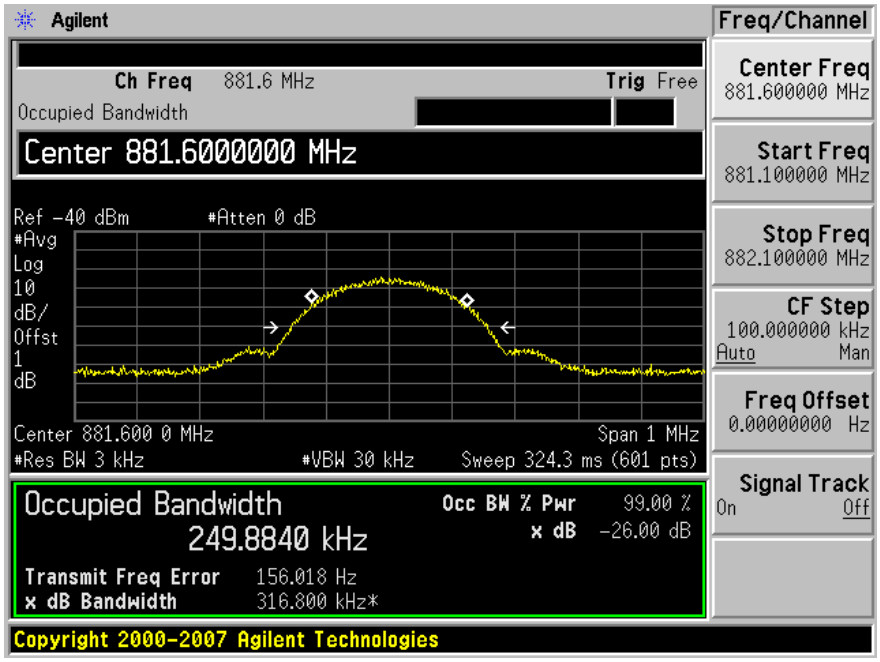


Output

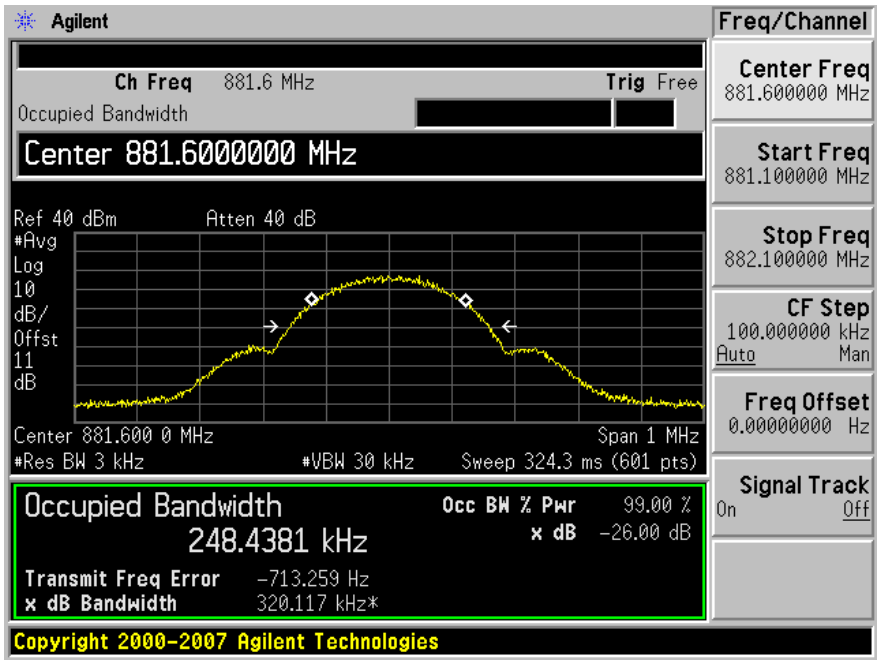


GSM Downlink, Middle Channel: 881.6 MHz

Input

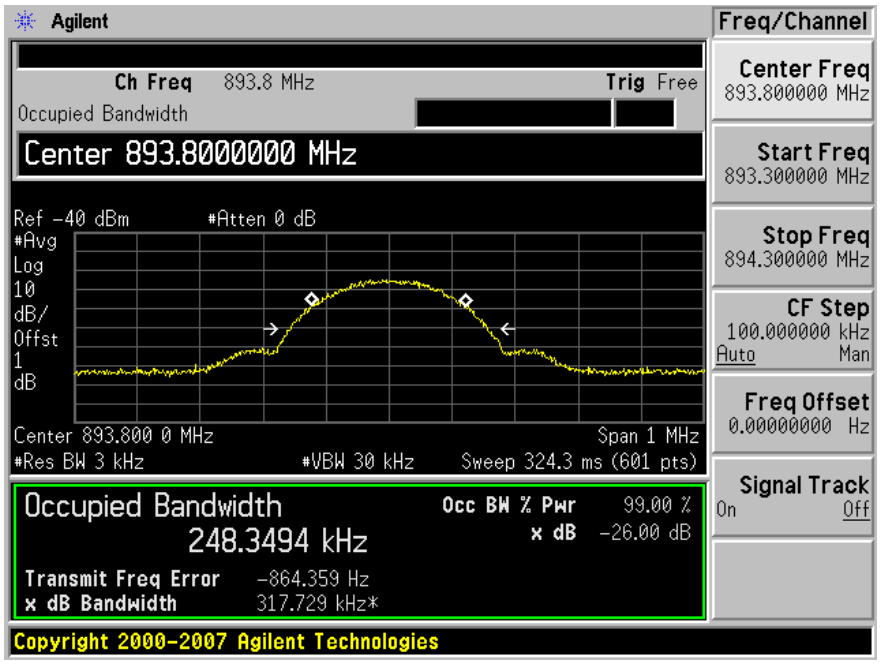


Output

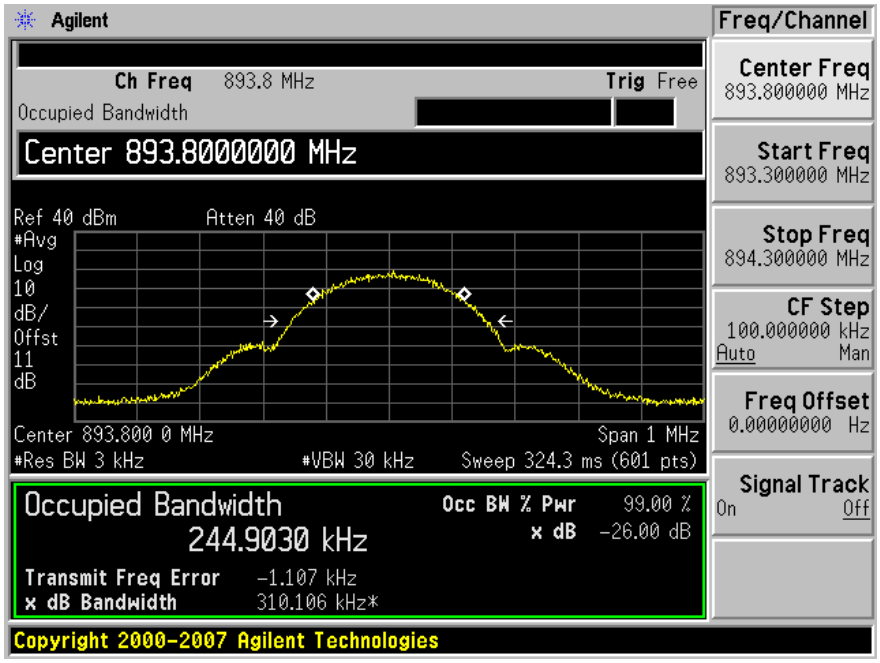


GSM Downlink, High Channel: 893.8 MHz

Input



Output



7 §2.1053, §22.917 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

Requirements: CFR 47, § 2.1053, § 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 (TX Power in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

7.3 Environmental Conditions

Temperature:	22.5 °C
Relative Humidity:	41 %
ATM Pressure:	101.1 kPa

** The testing was performed by Victor Zhang on 2009-03-21 in 5 Meter Chamber #3.*

7.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Analyzer, Spectrum	E4446A	US44300386	2008-05-19
HP	Generator, Signal	83650B	3614A00276	2008-05-28
Ducommun Technologies	Amplifier, Pre	1-18GHz	9909297-01	2007-08-27*
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2008-07-01
A.R.A.	Antenna, Horn	DRG-118/A	1132	2008-06-18
Agilent	ESG Vector Signal Generator	E44387C	MY45092922	2009-01-23

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

7.5 Summary of Test Results

The worst case reading as follows:

CDMA

Mode: Uplink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-11.93	1673.04	Vertical	881.52 MHz

Mode: Downlink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-17.92	1763.04	Vertical	836.52MHz

GSM

Mode: Uplink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-11.73	1673.2	Vertical	881.6 MHz

Mode: Downlink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-18.67	1763.2	Vertical	836.6 MHz

7.6 Test Results

CDMA

Uplink (Input frequency = 836.52 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1673.04	79.27	157	2.00	V	1875.00	-33.33	9.30	0.36	-24.39	-13	-11.39
1673.04	67.19	228	1.95	H	1875.00	-45.85	9.30	0.36	-36.91	-13	-23.91
2509.56	47.84	187	1.77	V	2812.50	-58.24	9.40	0.44	-49.28	-13	-36.28
2509.56	45.08	61	1.56	H	2812.50	-61.24	9.40	0.44	-52.28	-13	-39.28

Downlink (Input frequency = 881.52 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1763.04	69.72	178	1.72	V	1763.04	-40.05	9.50	0.37	-30.92	-13	-17.92
1763.04	62.35	115	1.53	H	1763.04	-47.68	9.50	0.37	-38.55	-13	-25.55
2644.56	51.38	153	1.10	V	2644.56	-53.34	9.30	0.46	-44.50	-13	-31.50
2644.56	46.23	220	1.15	H	2644.56	-59.10	9.30	0.46	-50.26	-13	-37.26

GSM

Uplink (Input frequency = 836.6 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1673.20	78.93	158	2.00	V	1673.20	-33.67	9.30	0.36	-24.73	-13	-11.73
1673.20	67.23	230	1.99	H	1673.20	-45.81	9.30	0.36	-36.87	-13	-23.87
2509.80	53.17	225	1.78	H	2509.80	-53.15	9.40	0.44	-44.19	-13	-31.19
2509.80	47.32	192	1.57	V	2509.80	-58.76	9.40	0.44	-49.80	-13	-36.80

Downlink (Input frequency = 881.6 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1763.20	68.97	181	1.72	V	1763.20	-40.80	9.50	0.37	-31.67	-13	-18.67
1763.20	62.77	110	1.53	H	1763.20	-47.26	9.50	0.37	-38.13	-13	-25.13
2644.80	53.35	176	1.00	V	2644.80	-51.37	9.30	0.46	-42.53	-13	-29.53
2644.80	48.23	235	1.00	H	2644.80	-57.10	9.30	0.46	-48.26	-13	-35.26

§2.1051, §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

7.7 Applicable Standard

Requirements: CFR 47, § 2.1051. § 22.917.

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

§ 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

7.8 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 10^{th} harmonic.

7.9 Environmental Conditions

Temperature:	23.2 °C
Relative Humidity:	43 %
ATM Pressure:	101.7kPa

** The testing was performed by Victor Zhang on 2009-03-25 in RF Site.*

7.10 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Signal Generator	8648C	3426A00417	2008-05-28
R & S	Signal Generator	SMIQ03	849192/0085	2007-12-03*

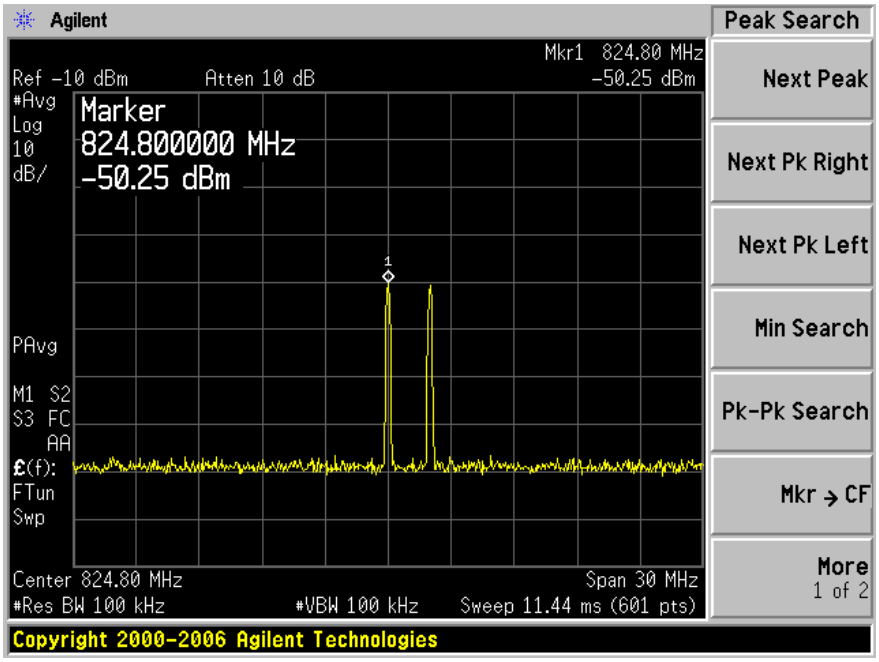
* Two years calibration Cycle.
*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.11 Test Results

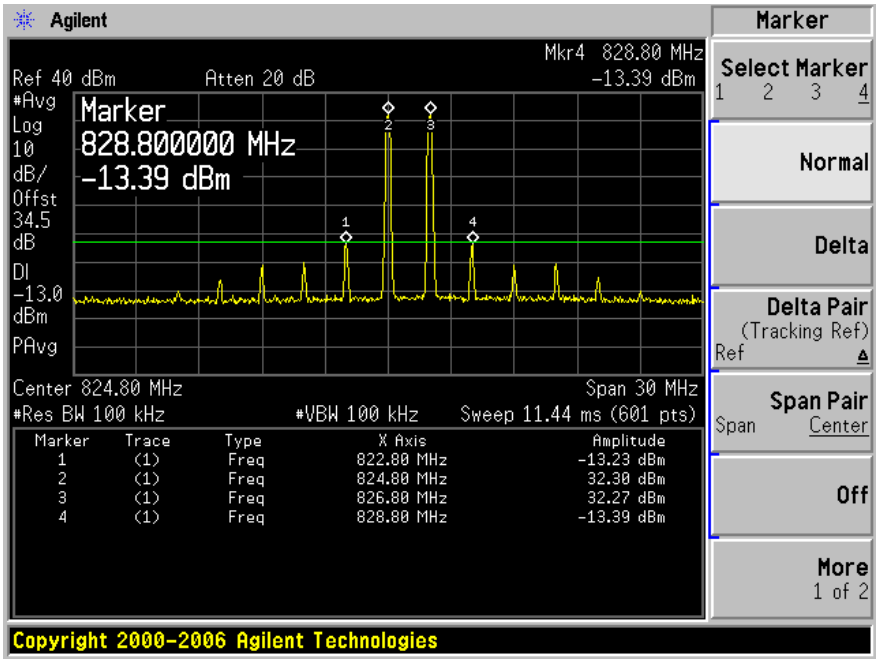
Please refer to the hereinafter plots.

CDMA Uplink: Low Channel (824.8 MHz)

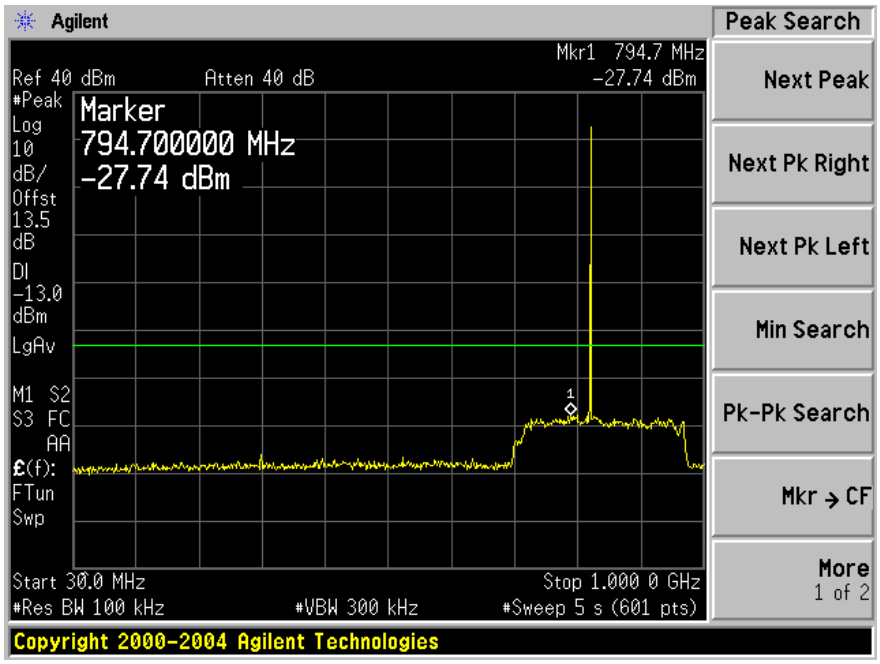
Plot 1: Intermodulation - Input



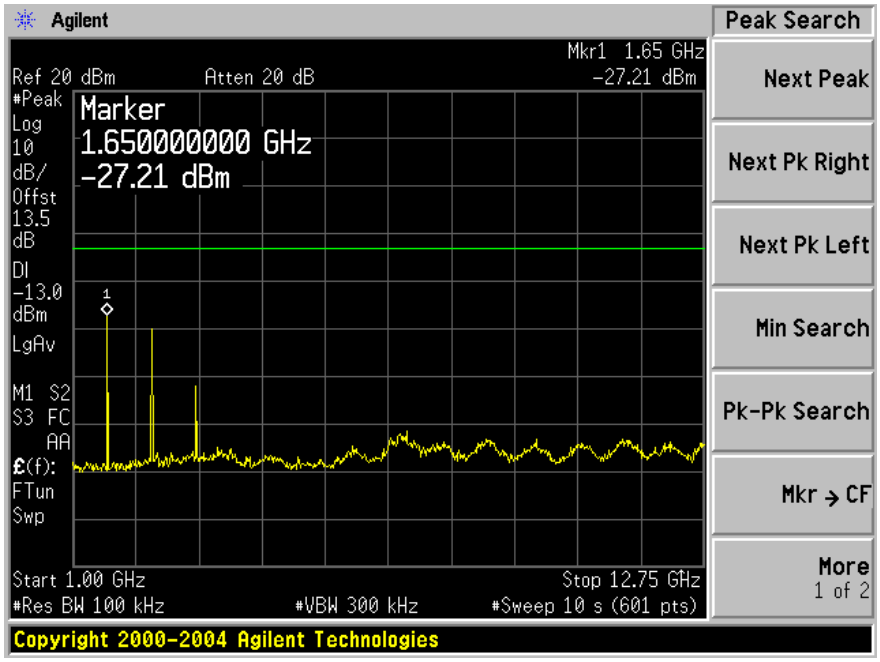
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

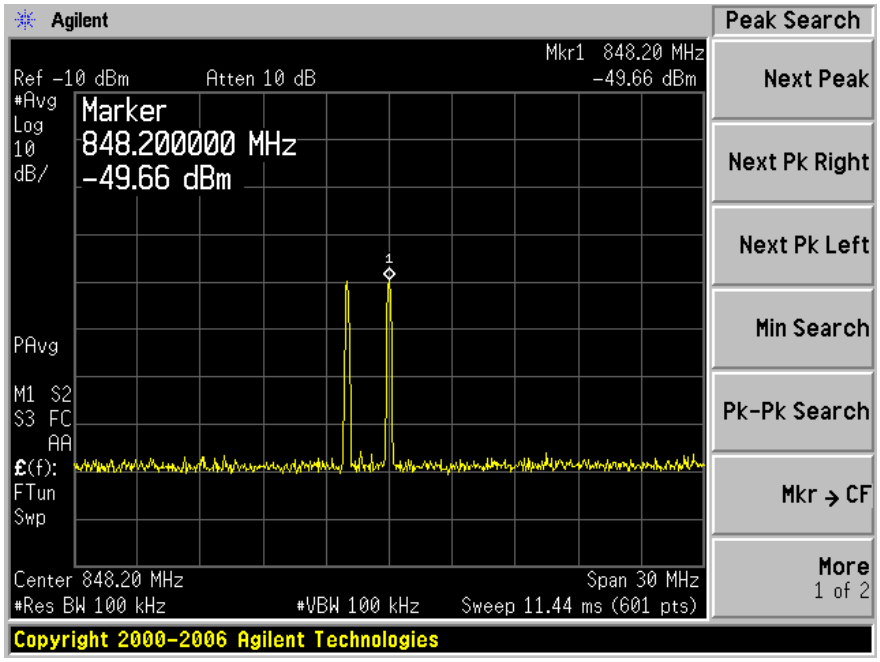


Plot 4: 1 GHz to 12.75 GHz

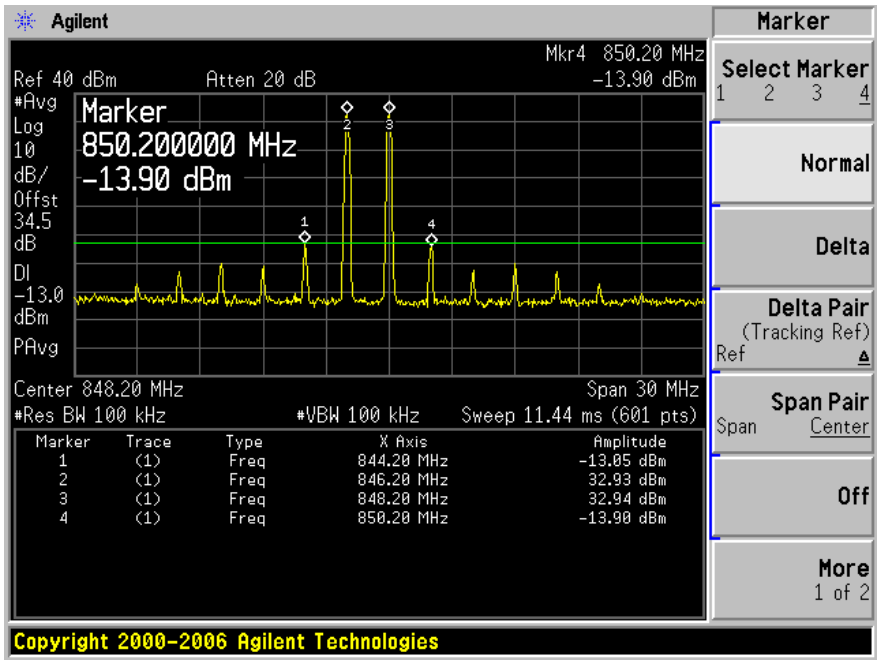


CDMA Uplink: High Channel (848.2 MHz)

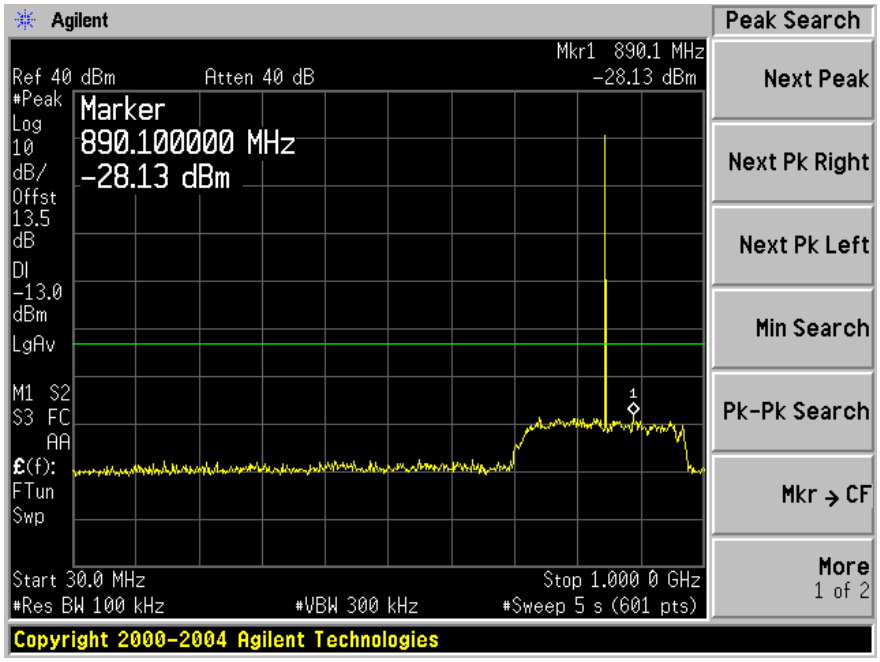
Plot 1: Intermodulation - Input



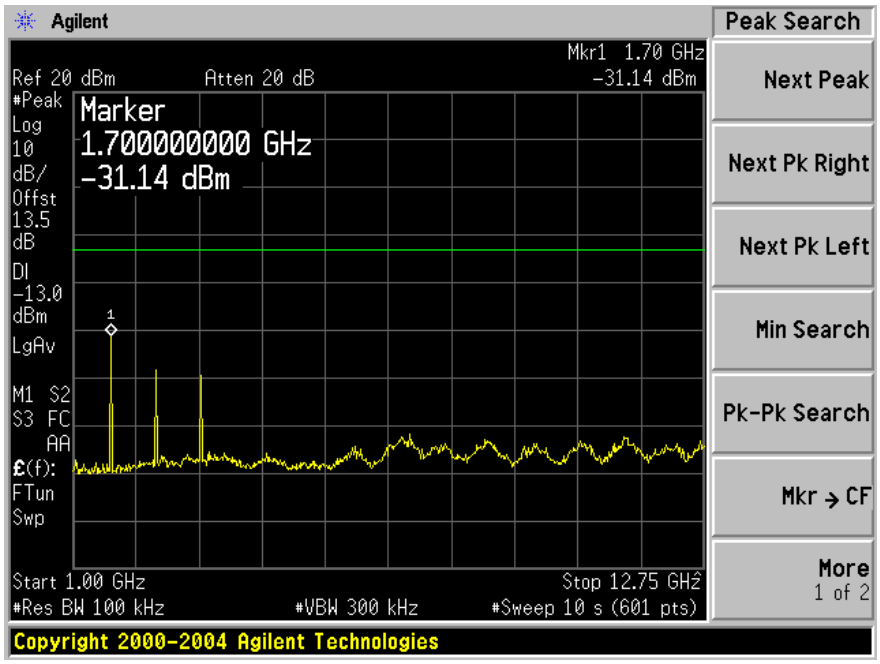
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

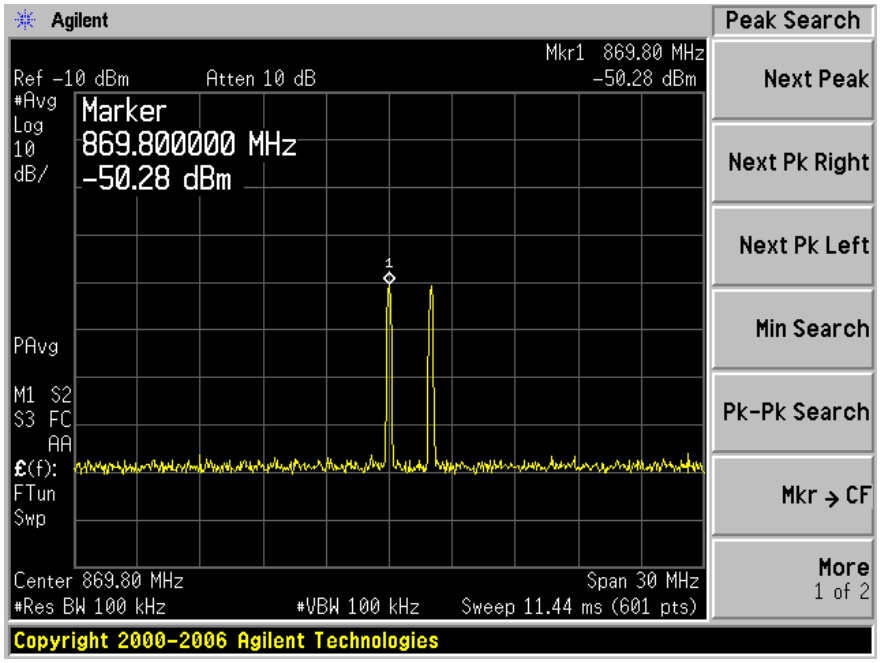


Plot 4: 1 GHz to 12.75 GHz

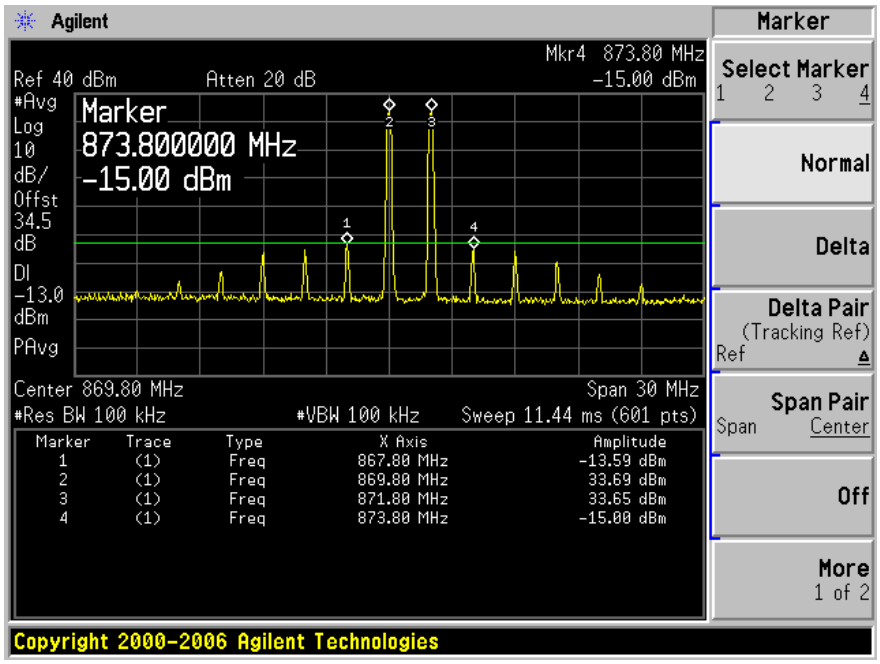


CDMA Downlink: Low Channel (869.8 MHz)

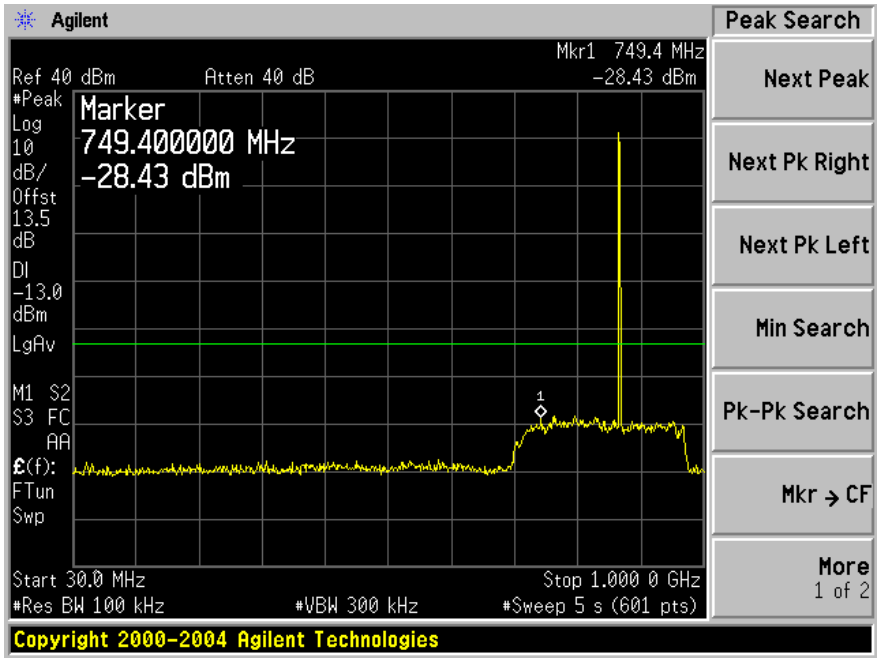
Plot 1: Intermodulation - Input



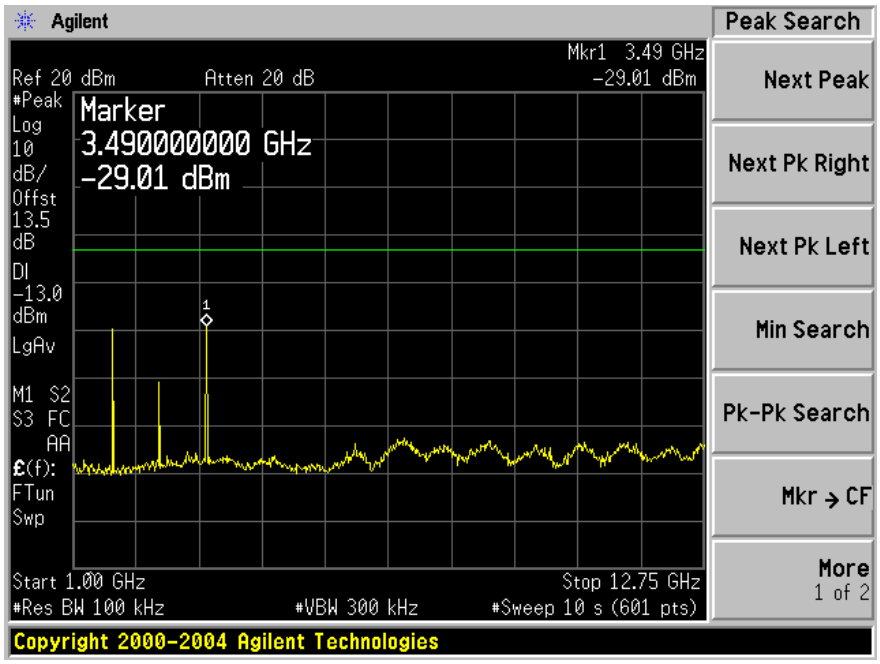
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

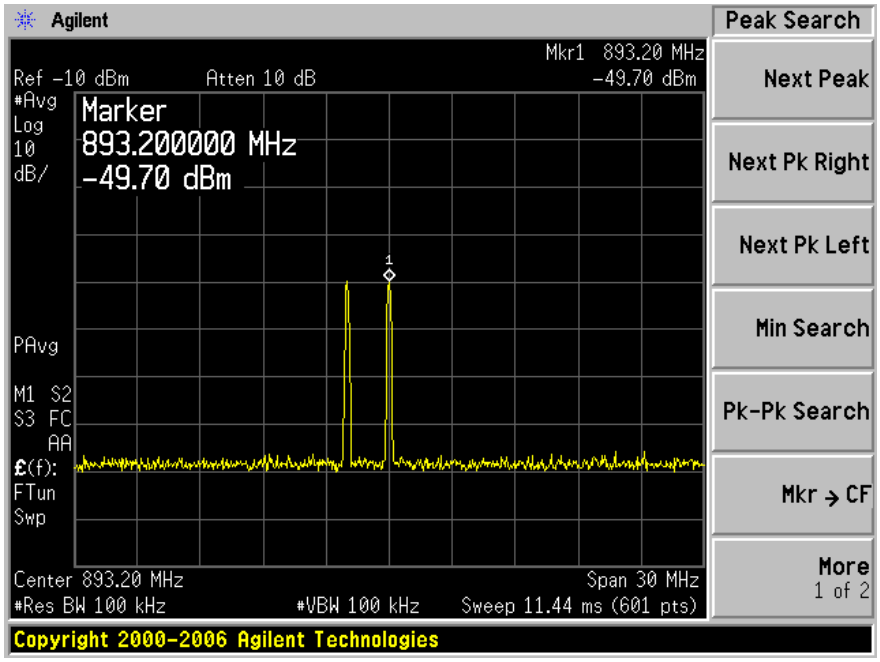


Plot 4: 1 GHz to 12.75 GHz

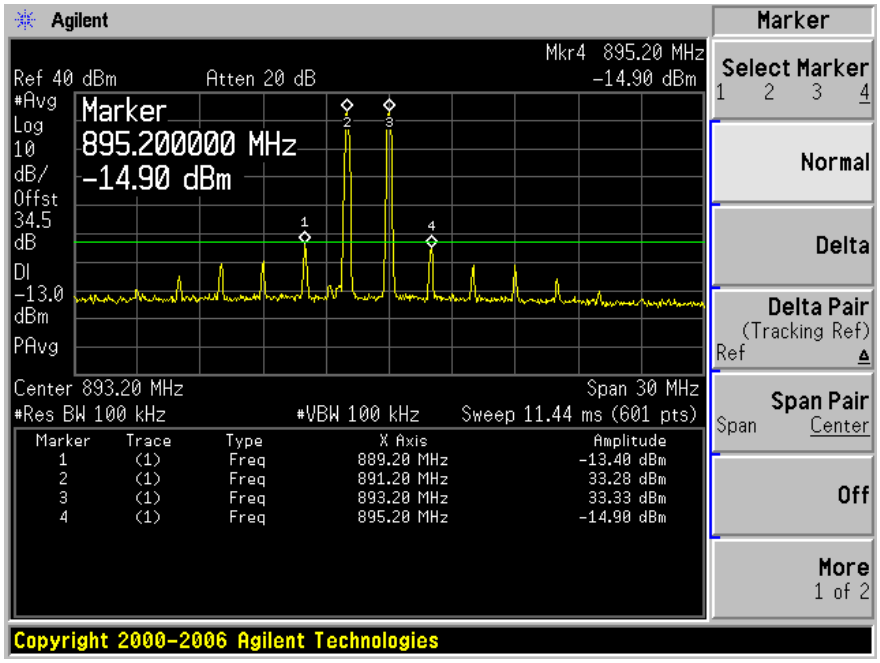


CDMA Downlink: High Channel (893.2 MHz)

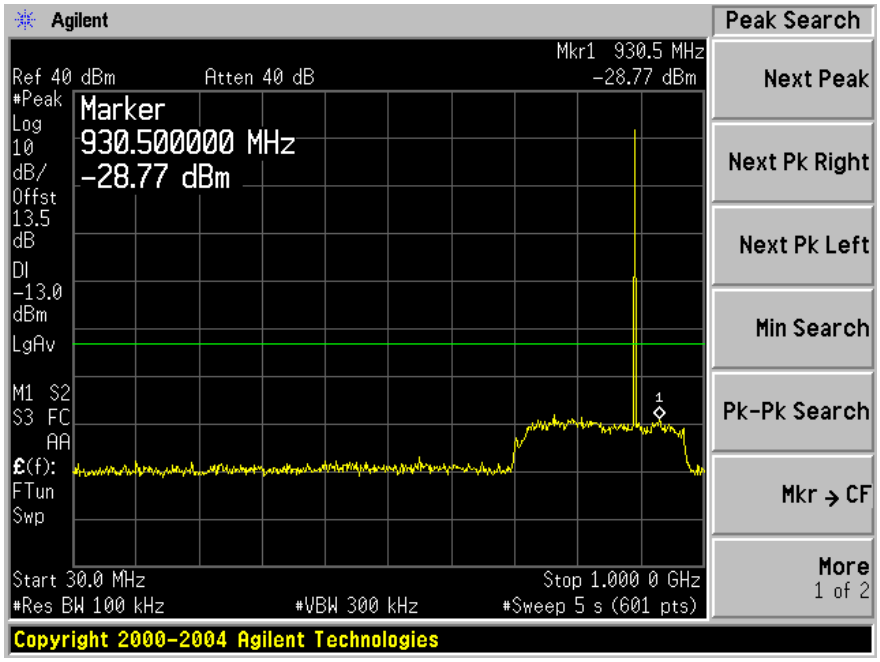
Plot 1: Intermodulation - Input



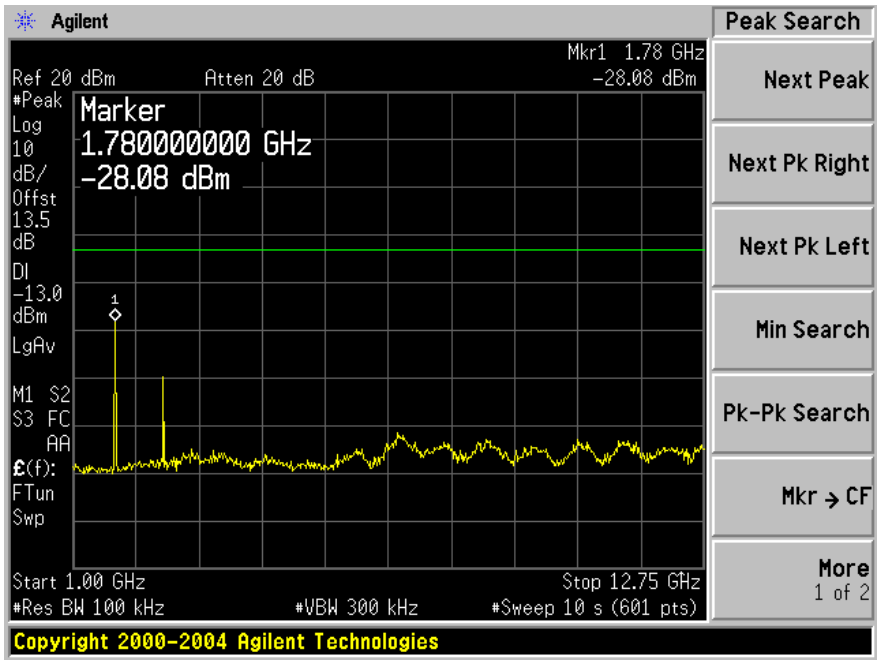
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

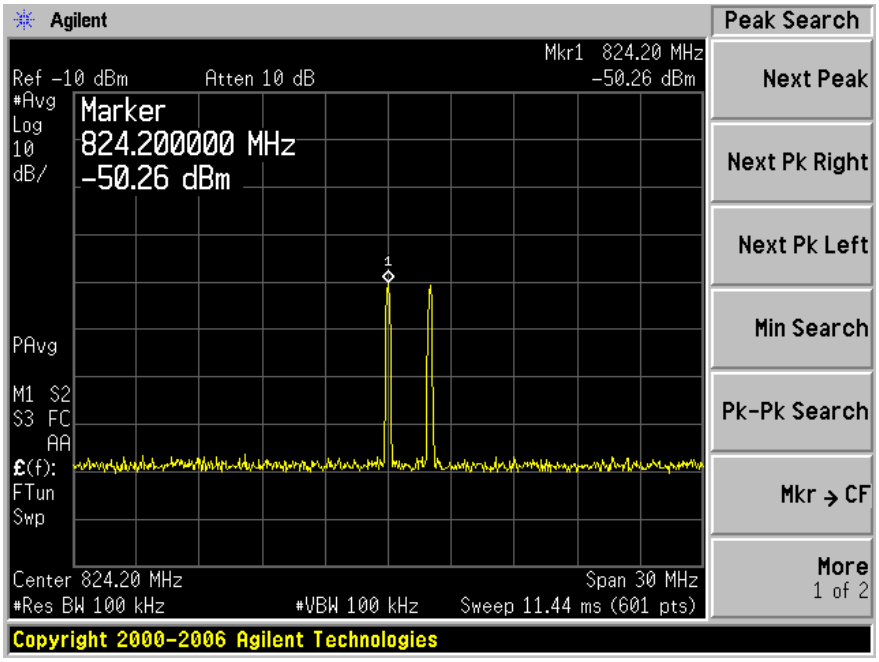


Plot 4: 1 GHz to 12.75 GHz

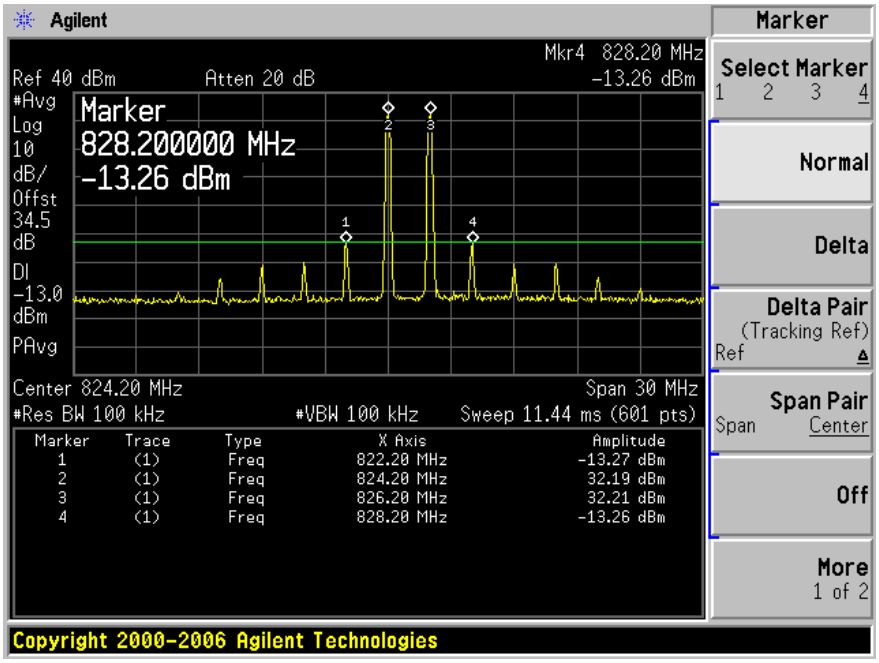


GSM Uplink: Low Channel (824.2 MHz)

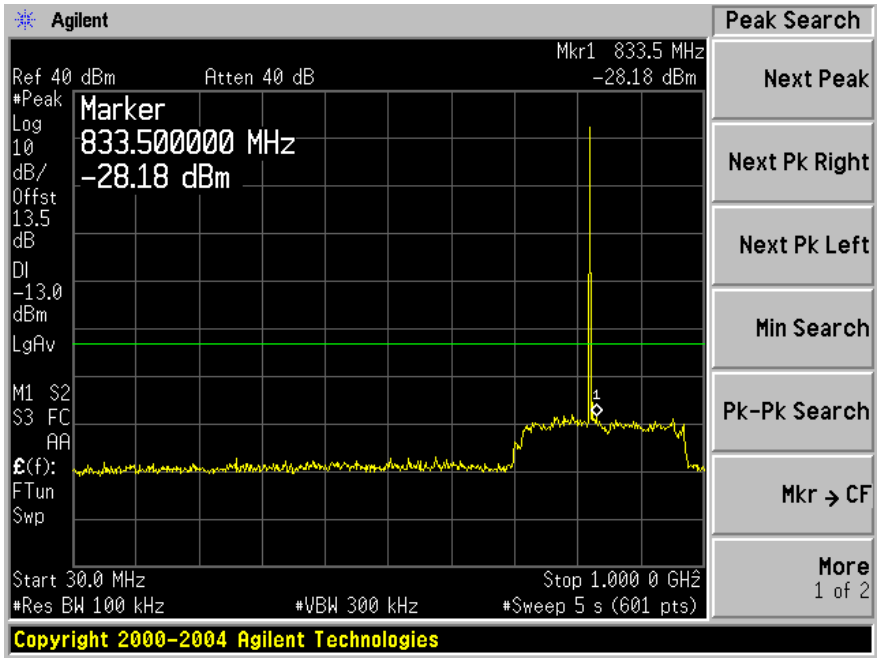
Plot 1: Intermodulation - Input



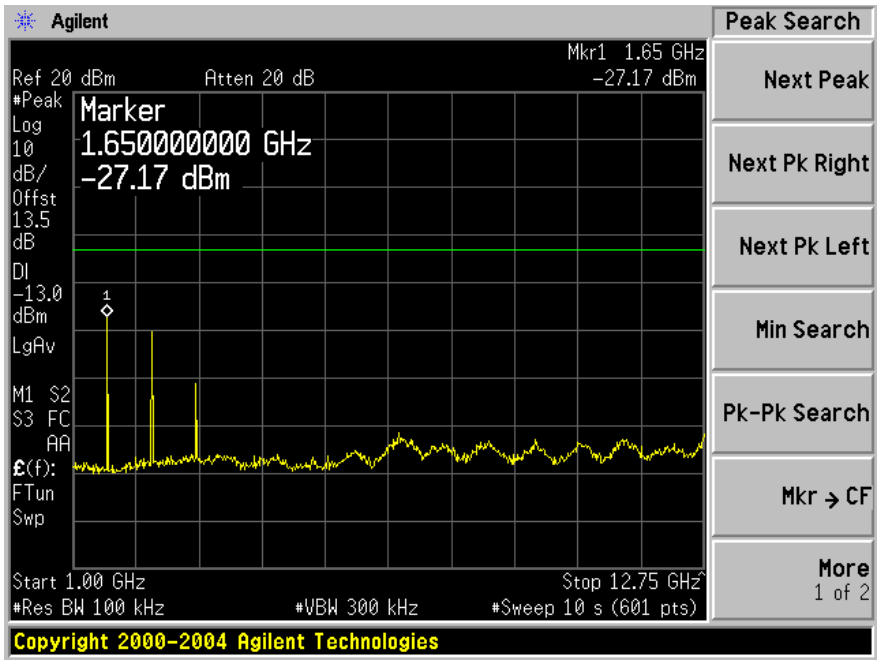
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

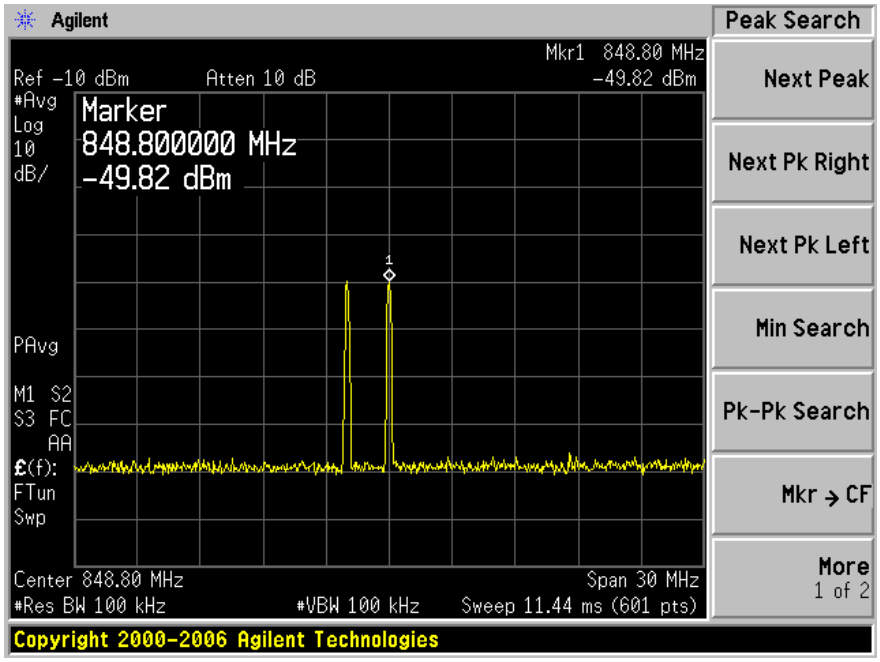


Plot 4: 1 GHz to 12.75 GHz

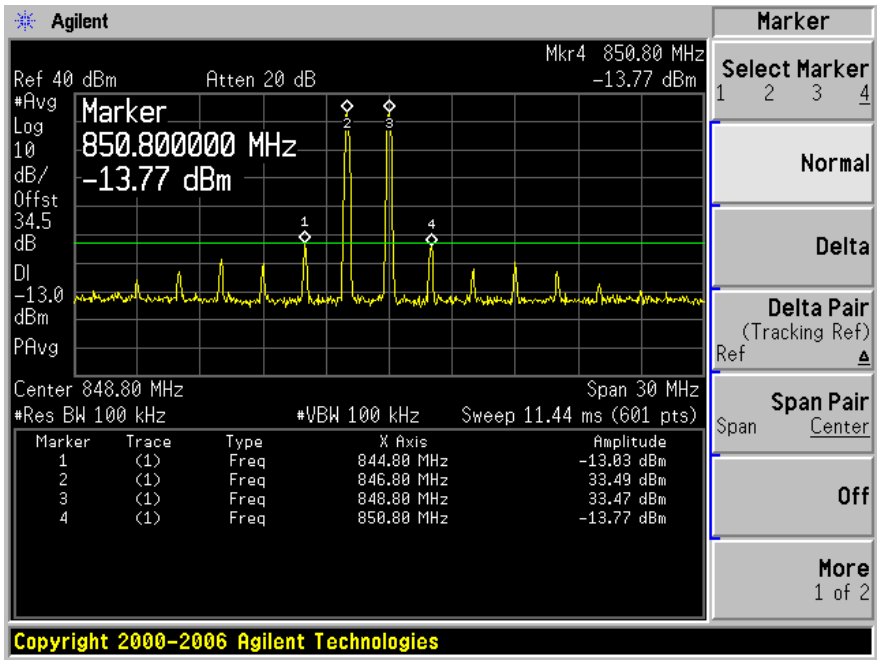


GSM Uplink: High Channel (848.8 MHz)

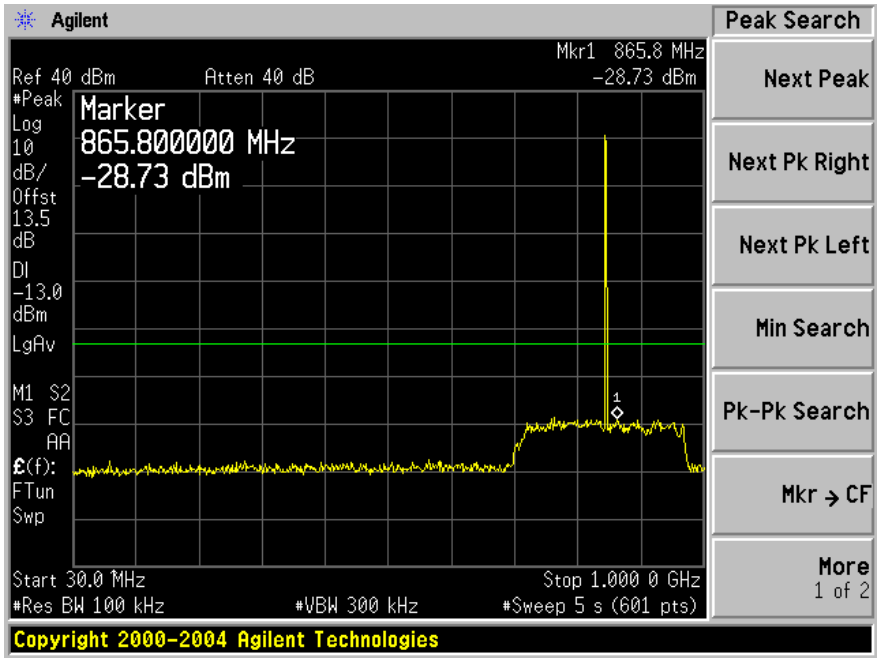
Plot 1: Intermodulation - Input



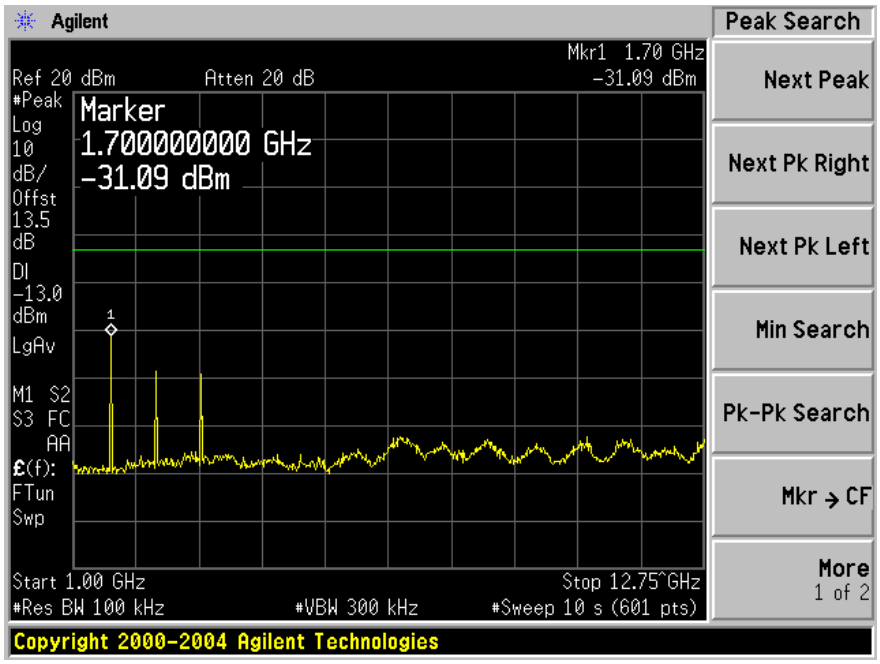
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

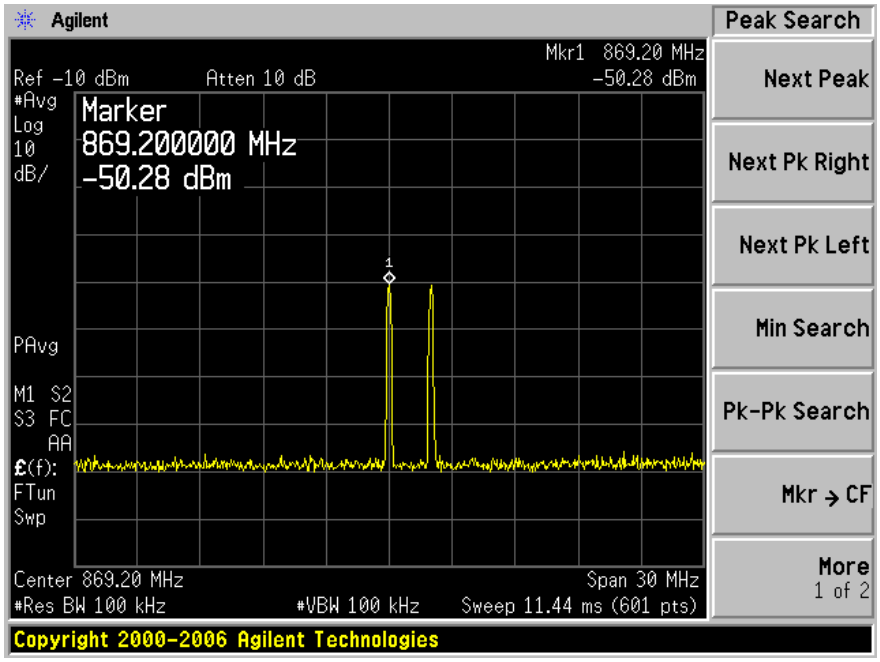


Plot 4: 1 GHz to 12.75 GHz

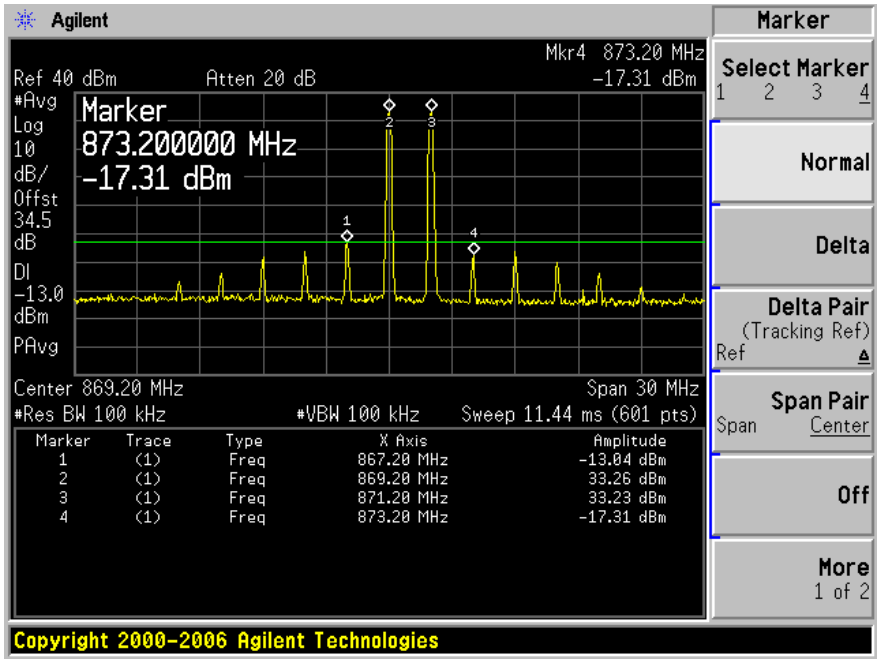


GSM Downlink: Low Channel (869.2 MHz)

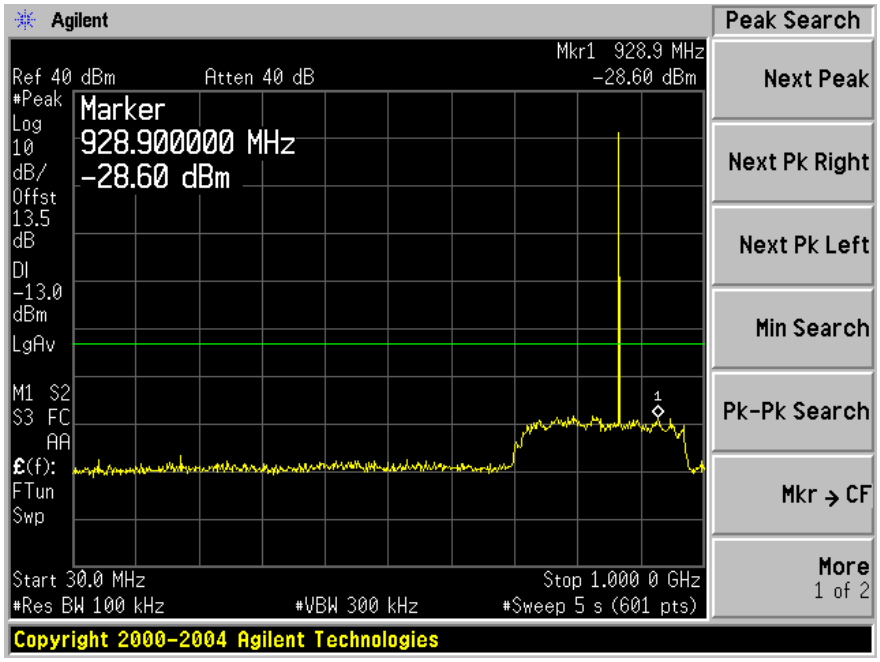
Plot 1: Intermodulation - Input



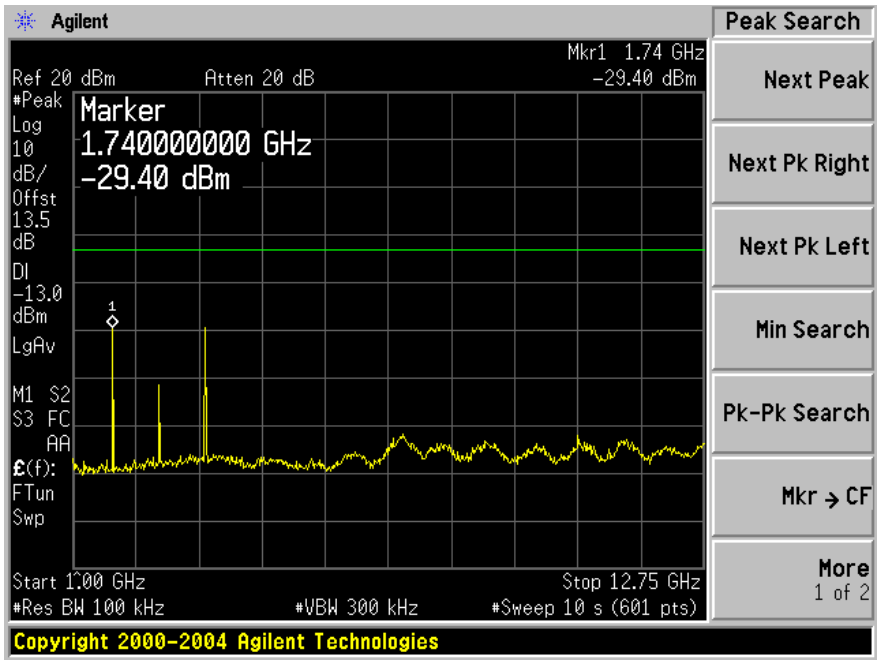
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz

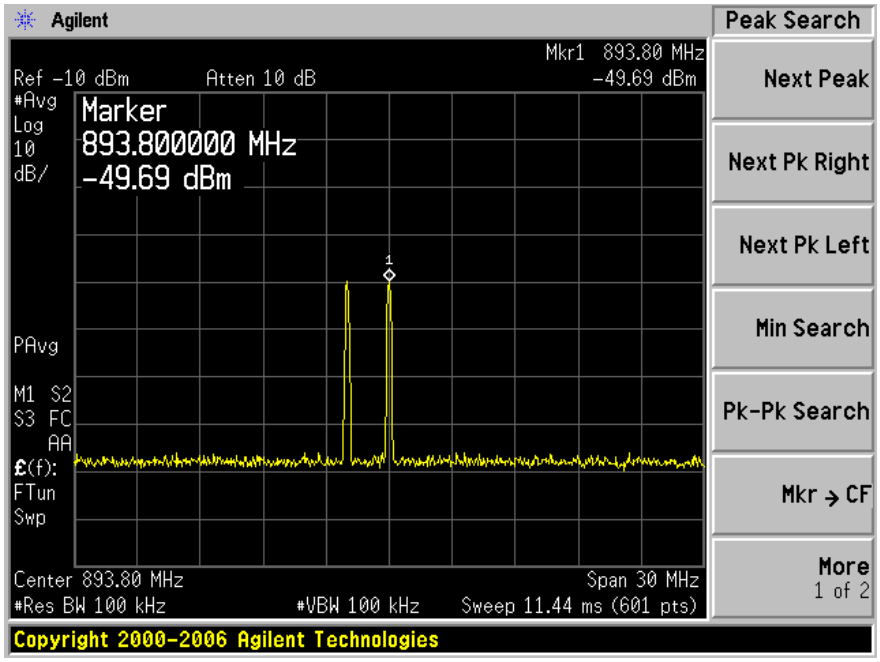


Plot 4: 1 GHz to 12.75 GHz

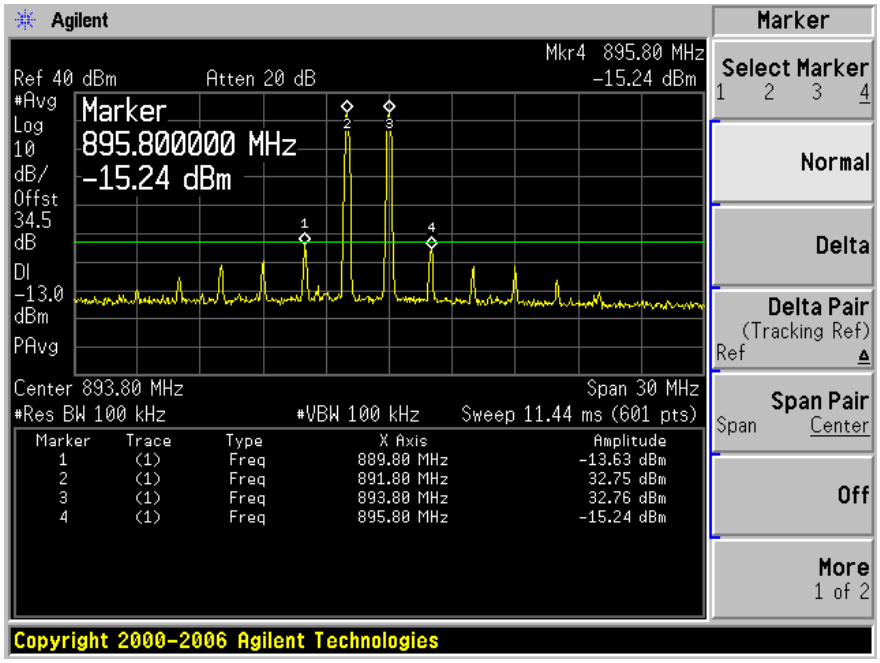


GSM Downlink: High Channel (893.8 MHz)

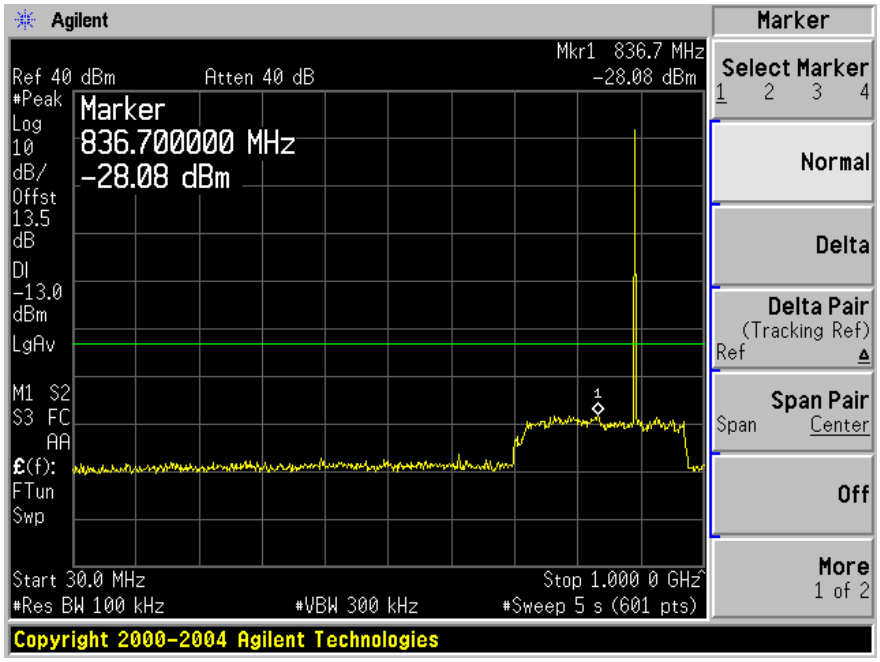
Plot 1: Intermodulation - Input



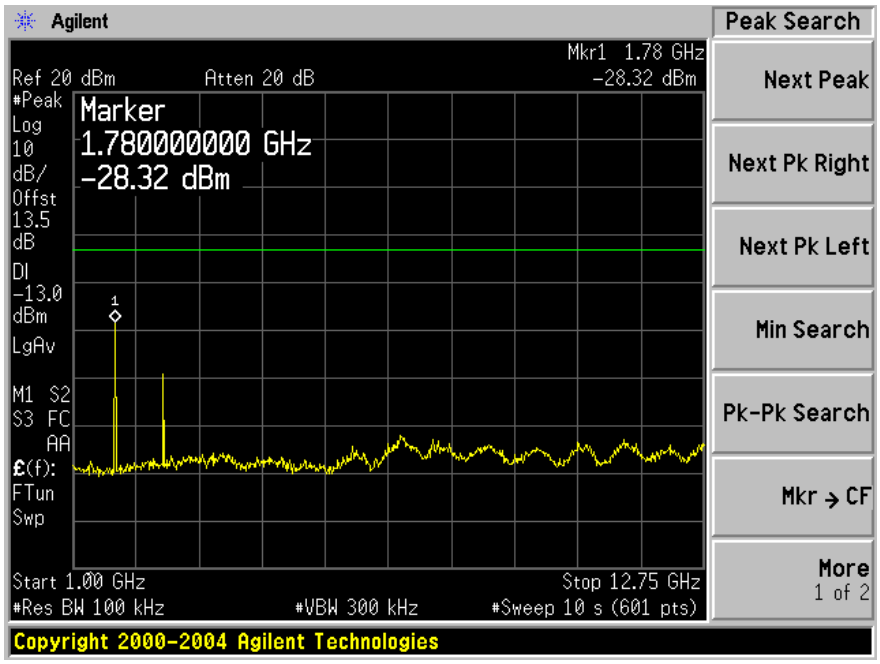
Plot 2: Intermodulation - Output



Plot 3: 30 MHz to 1 GHz



Plot 4: 1 GHz to 12.75 GHz



8 §22.917 – BAND EDGE

8.1 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.

8.2 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.

8.3 Environmental Conditions

Temperature:	23.1 °C
Relative Humidity:	42 %
ATM Pressure:	101.5kPa

** The testing was performed by Victor Zhang on 2009-03-26 in RF Site.*

8.4 Test Equipment List and Details

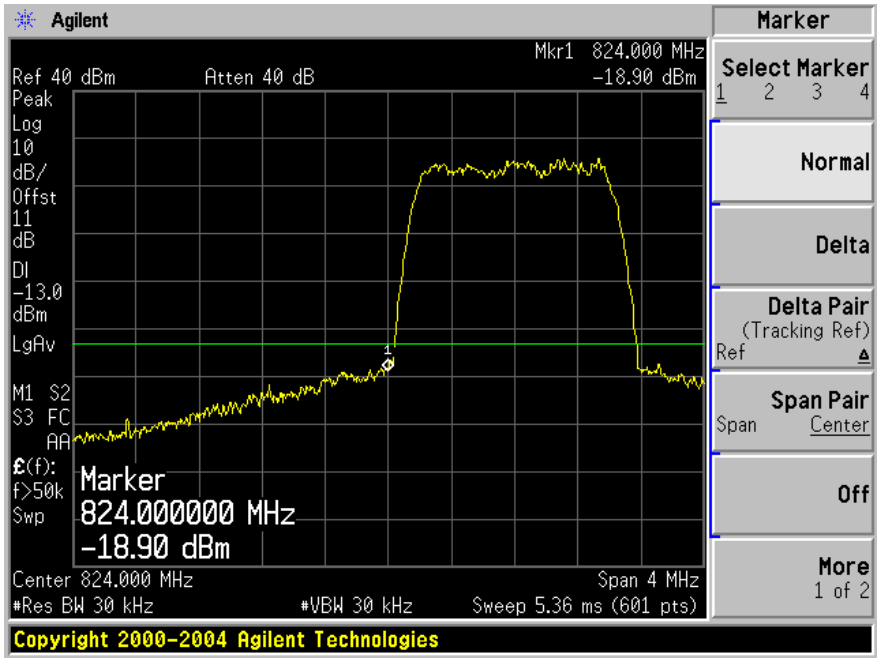
Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
HP	Signal Generator	8648C	3426A00417	2008-05-28
R & S	Signal Generator	SMIQ03	849192/0085	2007-12-03*

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

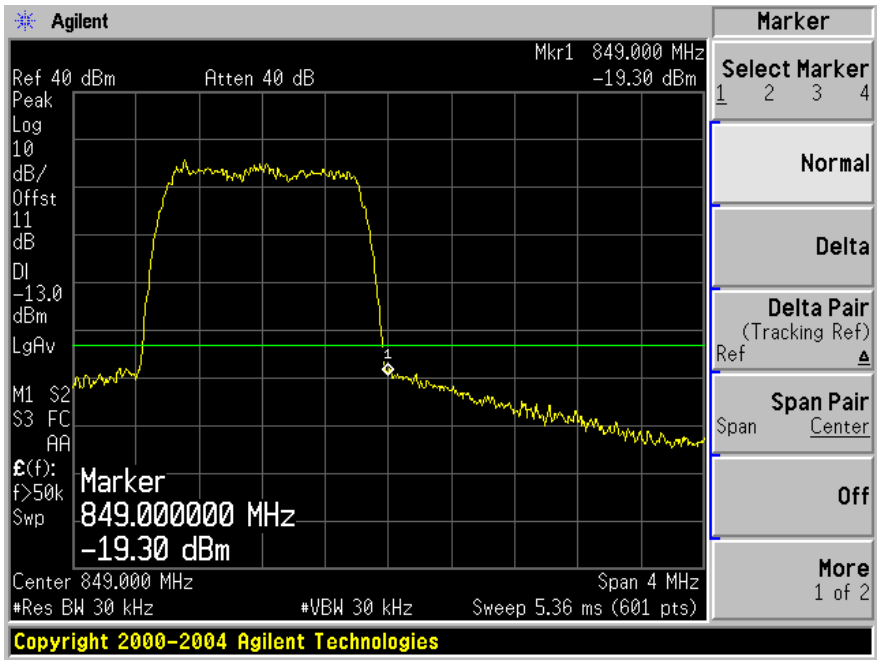
8.5 Test Results

Please refer to the following plots.

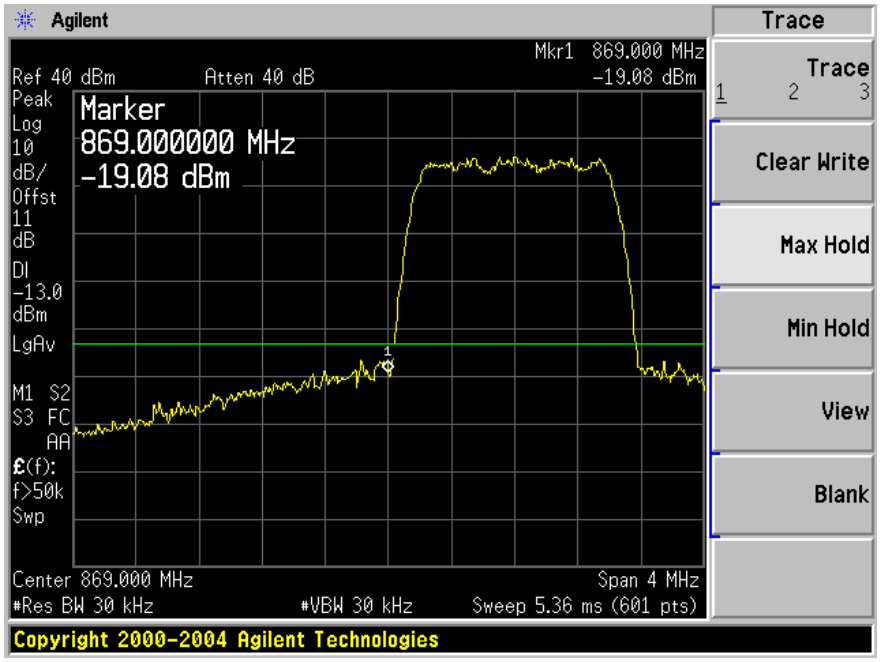
CDMA Uplink: Lowest Channel



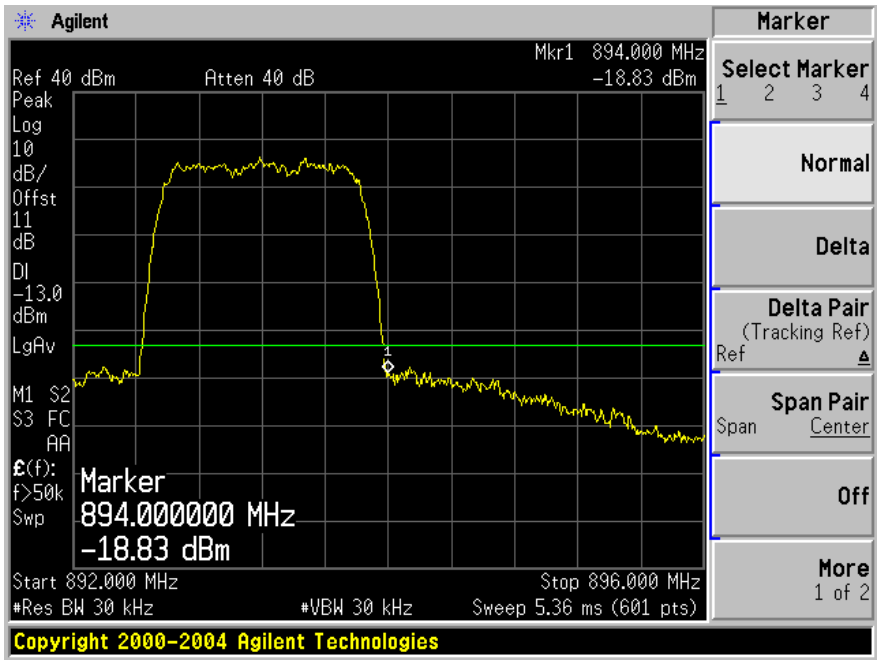
CDMA Uplink: Highest Channel



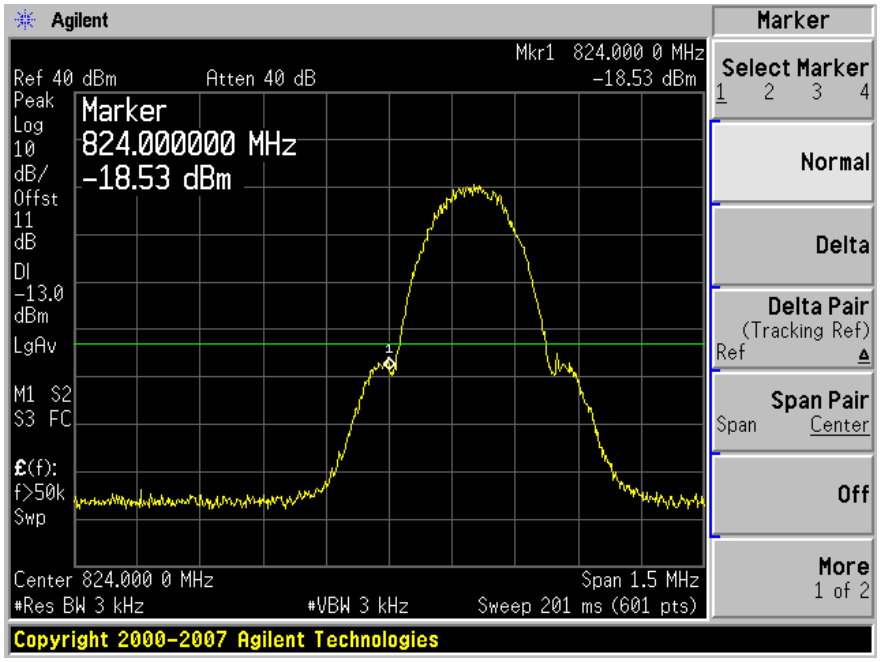
CDMA Downlink: Lowest Channel



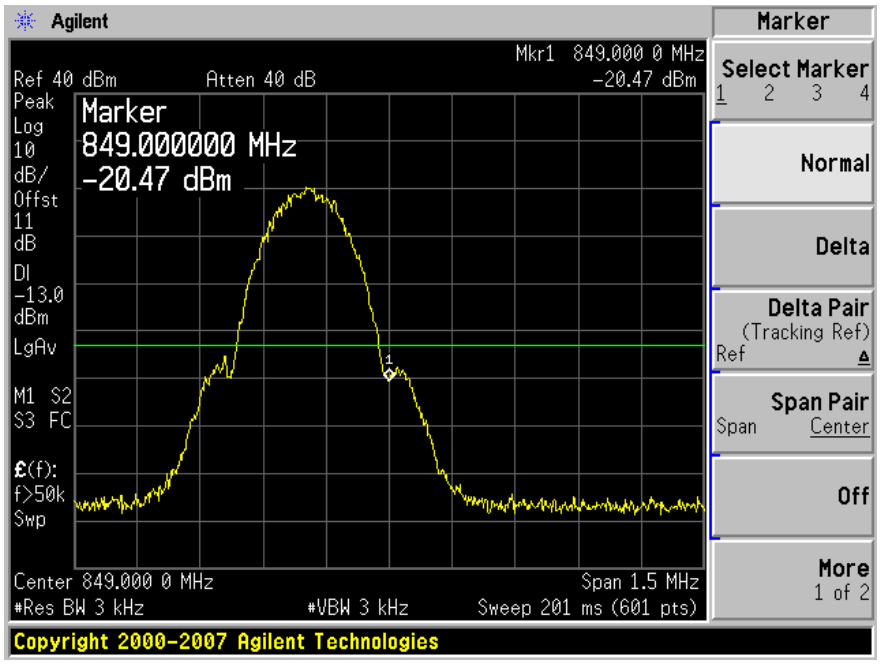
CDMA Downlink: Highest Channel



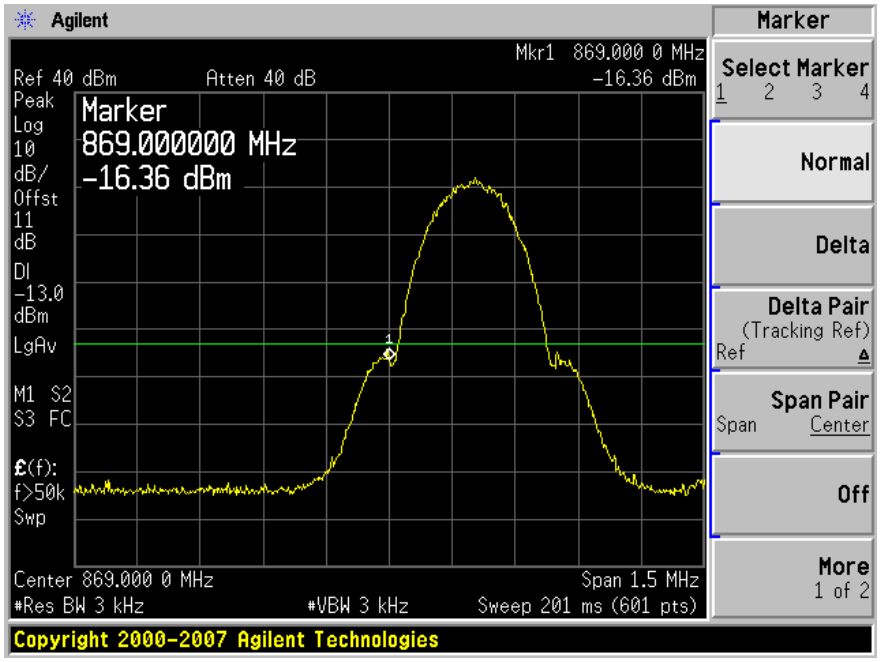
GSM Uplink: Lowest Channel



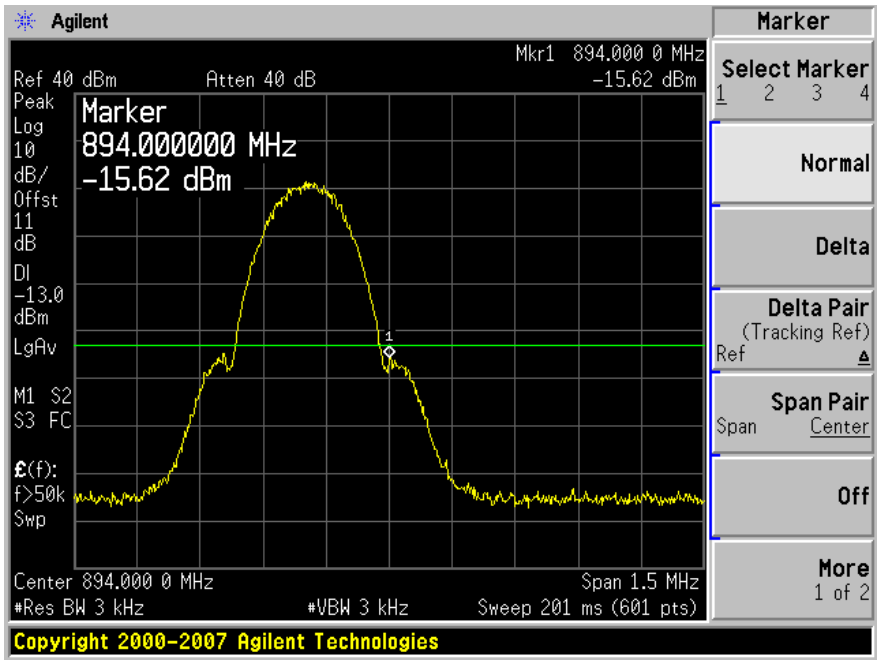
GSM Uplink: Highest Channel



GSM Downlink: Lowest Channel



GSM Downlink: Highest Channel



9 §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.

9.1 Test Result

N/A

10 §1.1307(b) (1) & §2.1091 - RF EXPOSURE

10.1 Applicable Standard

According to §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

f = frequency in MHz
* = Plane-wave equivalent power density

10.2 MPE Prediction

Predication of MPE limit at a given distance
Equation from page 18 of 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

Uplink:

CDMA:

Maximum peak output power at antenna input terminal (dBm):	37.10
Maximum peak output power at antenna input terminal (mW):	51.29
Prediction distance (cm):	100
Prediction frequency (MHz):	836.52
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.4082
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.57

GSM:

Maximum peak output power at antenna input terminal (dBm):	37.06
Maximum peak output power at antenna input terminal (mW):	5082
Prediction distance (cm):	100
Prediction frequency (MHz):	836.6
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.40443
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.57

Downlink:

CDMA:

Maximum peak output power at antenna input terminal (dBm):	37.54
Maximum peak output power at antenna input terminal (mW):	5675
Prediction distance (cm):	40
Prediction frequency (MHz):	881.52
Antenna Gain, typical (dBi):	2
Maximum Antenna Gain (numeric):	1.585
Power density at predication frequency and distance (mW/cm^2):	0.4474
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.587

GSM:

Maximum peak output power at antenna input terminal (dBm):	37.41
Maximum peak output power at antenna input terminal (mW):	5508
Prediction distance (cm):	40
Prediction frequency (MHz):	881.6
Antenna Gain, typical (dBi):	2
Maximum Antenna Gain (numeric):	1.585
Power density at predication frequency and distance (mW/cm^2):	0.4342
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.587

Test Result

For Uplink, the highest power density level at 100 cm is 0.4082mW/cm², which is below the uncontrolled exposure limit of 0.57 mW/cm² at 836.52 MHz.
For Downlink, the highest power density level at 40 cm is 0.4474mW/cm², which is below the uncontrolled exposure limit of 0.587 mW/cm² at 881.52 MHz.
So the indoor antenna prediction distance should be greater then 40 cm, and outdoor antenna prediction distance should be greater then 100 cm.