



FCC PART 20.21, 22H, 24E

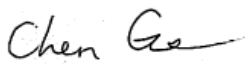
TEST AND MEASUREMENT REPORT

For

Wi-Ex, Inc.

One Meca Way,
Norcross, GA 30093, USA

FCC ID: SO4YX741-PCS-CEL

Report Type: Original Report	Product Type: Dual-Band Amplifier
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Report Number: <u>R1401271-2224</u>	
Report Date: <u>2014-03-17</u>	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government.

* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1401271-2224	Original Report	2014-03-03
Rev A	R1401271-2244	Revised Report	2014-03-17

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Wi-Ex, Inc.* and their product model: YX741, FCC ID: SO4YX741-PCS-CEL, which will henceforth be referred to as the EUT (Equipment Under Test). The EUT is a cellular band and PCS band amplifier for both downlink and uplink. The YX741 SOHO model is designed for small office and home office environment.

1.2 Mechanical Description

The EUT measures approximately 5 in. (L) x 7 in. (W) x 1.25 in. (H) and weighs 12oz.

The test data gathered are from typical production sample, serial number: 54SA-123456.

1.3 Objective

This type approval report is prepared on behalf of *Cellphone-Mate, Inc.* in accordance with Part 2, Subpart J, Part 20.21, Part 22 Subpart H, Part 24 Subpart E of the Federal Communication Commissions rules.

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

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

1.5 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 20.21 – Signal Boosters
Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E – PCS

Applicable Standards: TIA/EIA603-C, ANSI C63.4-2003, FCC KDB 935210.

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.

1.6 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 CISPR16-4-2:2011, 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.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:

1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminaires and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC (Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:

1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.

2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.

3. Radio Communication Equipment for Singapore.

4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.

5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).

6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s), Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

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 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

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.: A-0027. 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 an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at <http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b>

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

N/A, 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 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Wi-Ex, Inc.	PCB Board	YX741	-

2.5 Local Support Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers
Dell	Laptop	Latitude D600	CN-0X2034-48643-3A6-8307
Rohde & Schwarz	Signal Generator	SMIQ03	849192/0085/DE23746
Agilent	Signal Generator	E4438C	MY45091309
Agilent	Signal Studio for WCDMA/HSPA	N7600B	-

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
I.T.E	AC/DC Adapter	FY052000	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	<1	Signal Generator	Input/ EUT
RF cable	<1	Output/ EUT	Spectrum Analyzer

3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1046, §22.913, §24.232	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A*
§2.1049, §22.917, §24.238	Occupied Bandwidth	Compliant
§2.1053, §22.917, §24.238	Spurious Radiated Emissions	Compliant
§2.1051, §22.917, §24.238	Spurious Emissions at Antenna Terminals	Compliant
§22.917, §24.238	Band Edge	Compliant
§2.1055	Frequency Stability	N/A*
§2.1091	RF Exposure	Compliant

Note: N/A*: The unit is a signal booster.

4 FCC §2.1046, §22.913 & §24.232 – RF Output Power

4.1 Applicable Standards

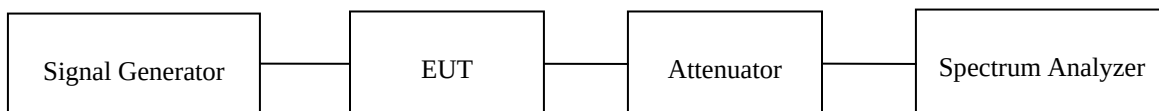
According to FCC §22.913 (a), the maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

According to FCC §24.232 , Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

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 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2013-05-03	1 year

Statement of Traceability: *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

4.4 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	42 %
ATM Pressure:	101.4 kPa

The testing was performed by Chen Ge on 2013-02-21 in the RF Site.

4.5 Test Results

Cellular Band

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
GSM/GPRS	850 MHz Downlink	Low	869.2	-49	9.99
		Middle	881.6	-49	9.85
		High	893.8	-47	9.94
	850 MHz Uplink	Low	824.2	-36	19.98
		Middle	836.6	-36	19.94
		High	848.8	-34	19.91

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
EDGE	850 MHz Downlink	Low	869.2	-50	9.87
		Middle	881.6	-49	9.96
		High	893.8	-45	9.86
	850 MHz Uplink	Low	824.2	-40	19.93
		Middle	836.6	-40	19.98
		High	848.8	-37	19.92

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
CDMA/EVDO	850 MHz Downlink	Low	869.80	-55	9.92
		Middle	881.52	-54	9.90
		High	893.20	-49	9.99
	850 MHz Uplink	Low	826.80	-40	19.99
		Middle	836.52	-40	19.94
		High	848.20	-37	20.00

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA	850 MHz Downlink	Low	871.4	-52	9.87
		Middle	881.4	-51	9.98
		High	891.6	-51	9.85
	850 MHz Uplink	Low	826.4	-41	19.99
		Middle	836.4	-40	19.84
		High	846.6	-37	20.00

PCS Band

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
GSM/GPRS	1900 MHz Downlink	Low	1930.2	-43	10.02
		Middle	1960.0	-49	9.97
		High	1989.8	-51	9.91
	1900 MHz Uplink	Low	1850.2	-37	19.96
		Middle	1880.0	-40	20.00
		High	1909.8	-39	20.00

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
EDGE	1900 MHz Downlink	Low	1930.2	-42	9.88
		Middle	1960.0	-49	9.99
		High	1989.8	-46	9.96
	1900 MHz Uplink	Low	1850.2	-40	19.97
		Middle	1880.0	-40	19.87
		High	1930.2	-40	19.90

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
CDMA	1900 MHz Downlink	Low	1930.8	-48	9.89
		Middle	1960.0	-55	9.80
		High	1989.2	-50	9.87
	1900 MHz Uplink	Low	1850.8	-40	19.87
		Middle	1880.0	-40	19.94
		High	1909.2	-40	19.98

Mode		Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
WCDMA	1900 MHz Downlink	Low	1932.4	-50	9.88
		Middle	1960.0	-54	9.72
		High	1987.6	-52	9.85
	1900 MHz Uplink	Low	1852.4	-43	19.88
		Middle	1880.0	-43	19.82
		High	1907.6	-37	19.84

5 FCC §2.1049, §22.917& §24.238 - Occupied Bandwidth

5.1 Applicable Standards

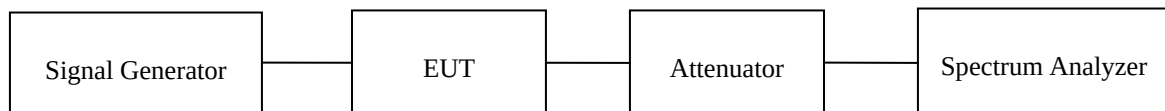
Requirements: FCC §2.1049, §22.917, §24.238.

5.2 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 to at least 1% of the BW and the 26 dB & 99% bandwidth was recorded.

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



5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2013-05-03	1 year

Statement of Traceability: *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

5.4 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	42 %
ATM Pressure:	101.4 kPa

The testing was performed by Chen Ge on 2013-02-20 in the RF Site.

5.5 Test Results

Please refer to the following tables and plots.

Occupied Bandwidth

Mode/Band		Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	
				Input	Output
GSM/GPRS	Cellular Uplink	Middle	836.6	249.9331	245.8907
	Cellular Downlink	Middle	881.6	246.2935	246.3154
	PCS Uplink	Middle	1880	246.3744	245.3152
	PCS Downlink	Middle	1960	244.0952	241.3842

Mode/Band		Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	
				Input	Output
EDGE	Cellular Uplink	Middle	836.6	241.0459	245.4651
	Cellular Downlink	Middle	881.6	245.1467	244.5714
	PCS Uplink	Middle	1880	244.8429	243.2965
	PCS Downlink	Middle	1960	246.3756	243.4326

Mode/Band		Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	
				Input	Output
CDMA	Cellular Uplink	Middle	836.52	1.2651	1.2615
	Cellular Downlink	Middle	881.52	1.2667	1.2569
	PCS Uplink	Middle	1880	1.2555	1.2587
	PCS Downlink	Middle	1960	1.2653	1.2667

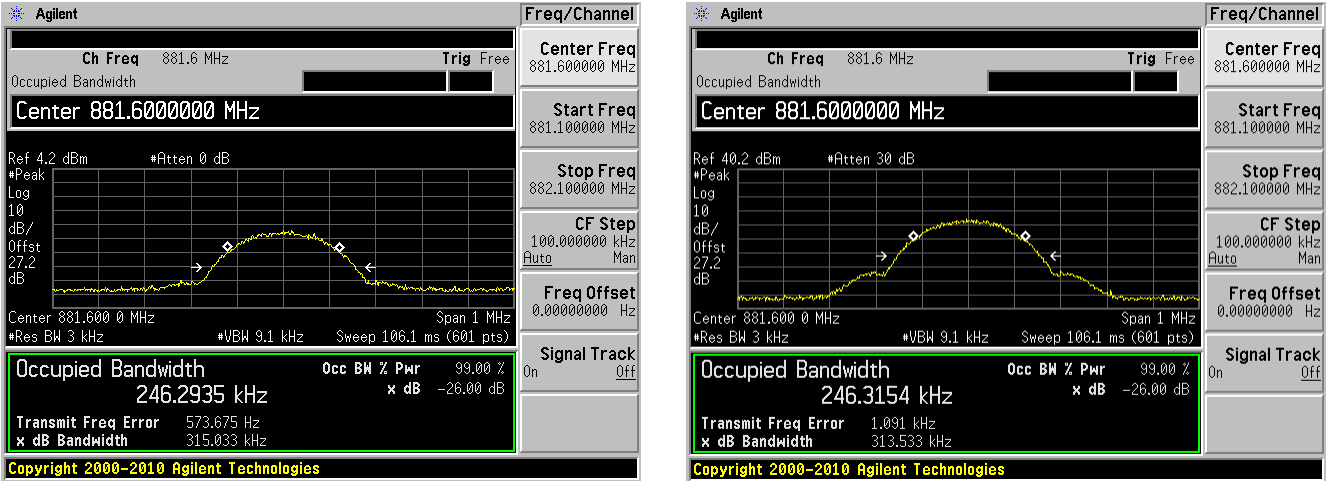
Mode/Band		Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	
				Input	Output
WCDMA	Cellular Uplink	Middle	836.4	4.1833	4.1876
	Cellular Downlink	Middle	881.4	4.2010	4.1681
	PCS Uplink	Middle	1880	4.2081	4.1656
	PCS Downlink	Middle	1960	4.2149	4.1853

Cellular Band, Downlink

GSM/GPRS (Middle Channel)

Input

Output

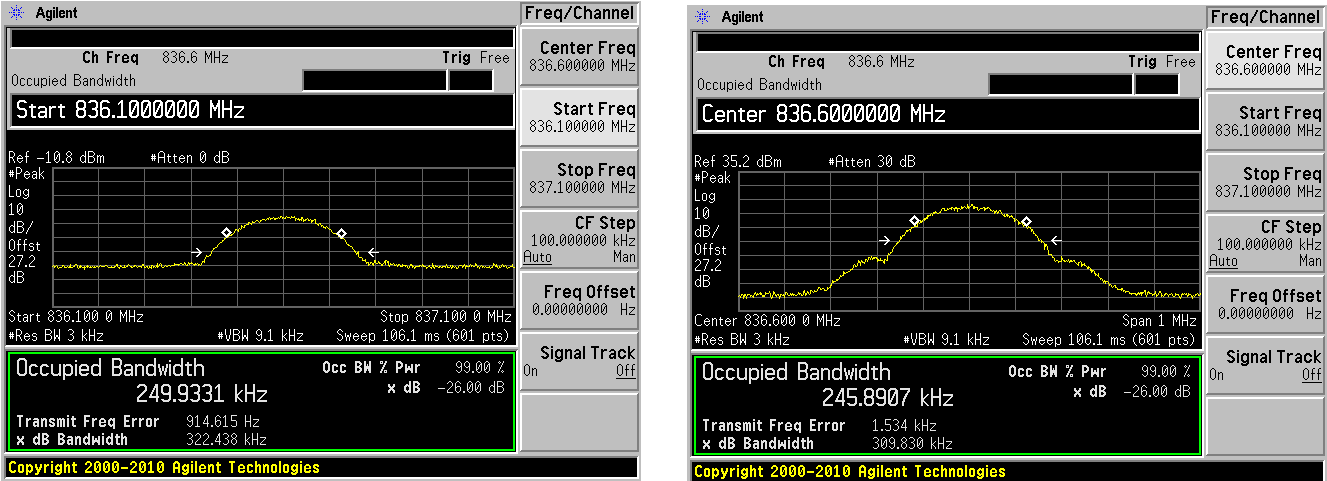


Cellular Band, Uplink

GSM/GPRS (Middle Channel)

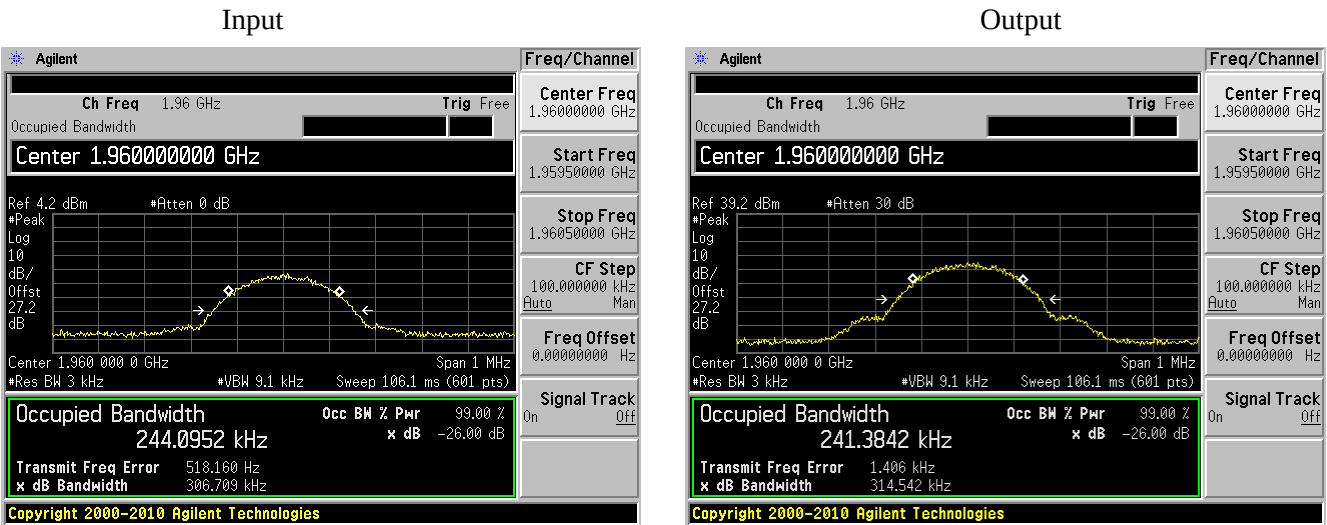
Input

Output



PCS Band, Downlink

GSM/GPRS (Middle Channel)



PCS Band, Uplink

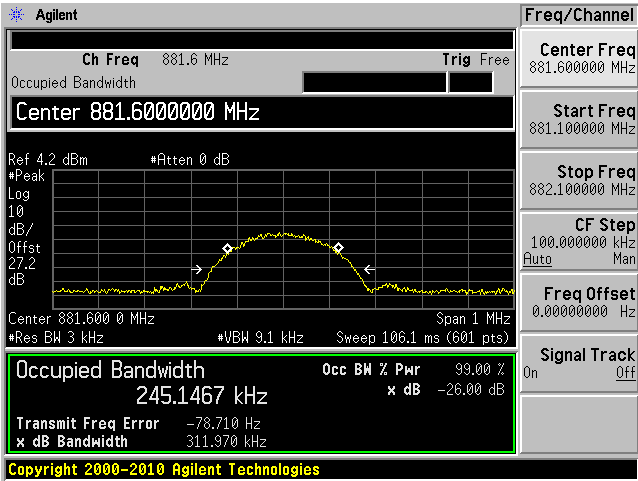
GSM/GPRS (Middle Channel)



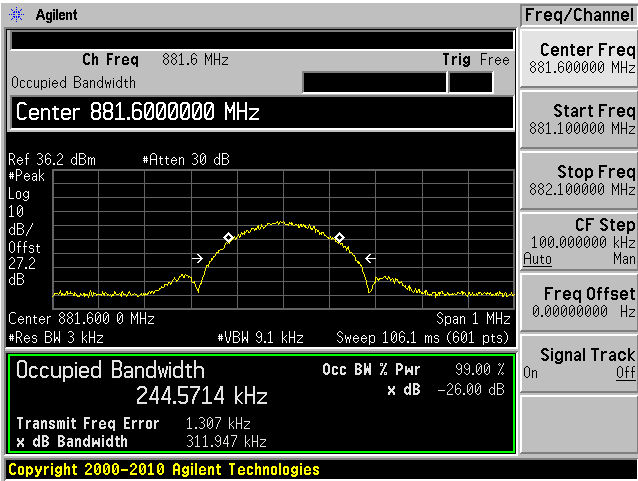
Cellular Band, Downlink

EDGE (Middle Channel)

Input



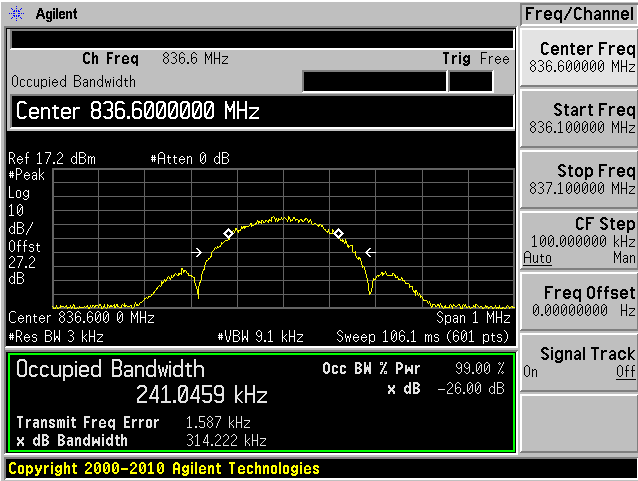
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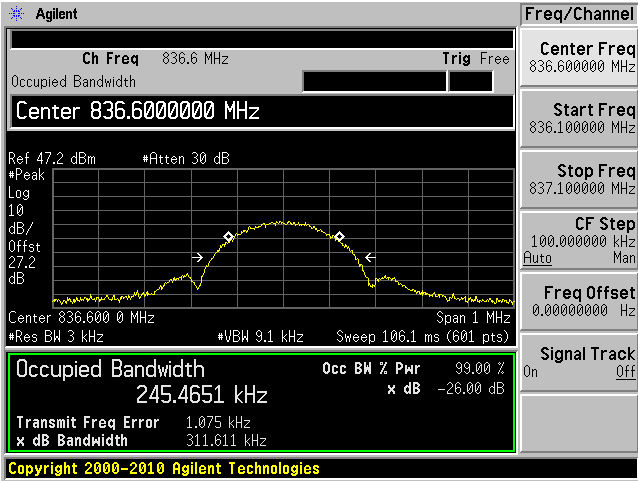
Cellular Band, Uplink

EDGE (Middle Channel)

Input



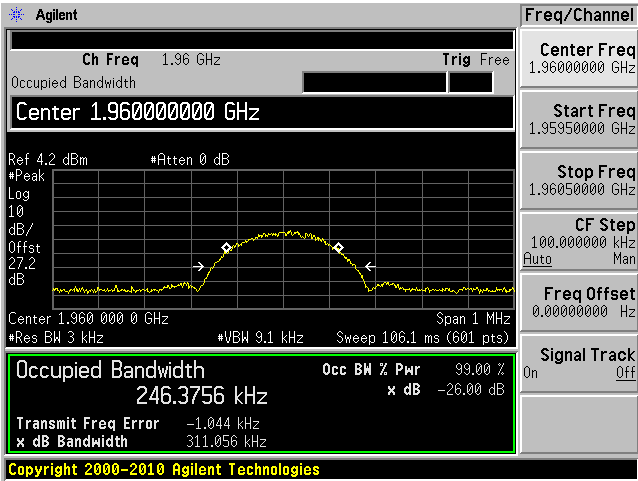
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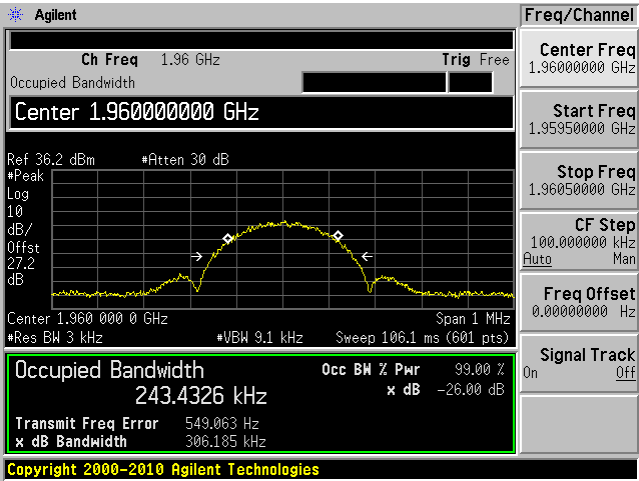
PCS Band, Downlink

EDGE (Middle Channel)

Input



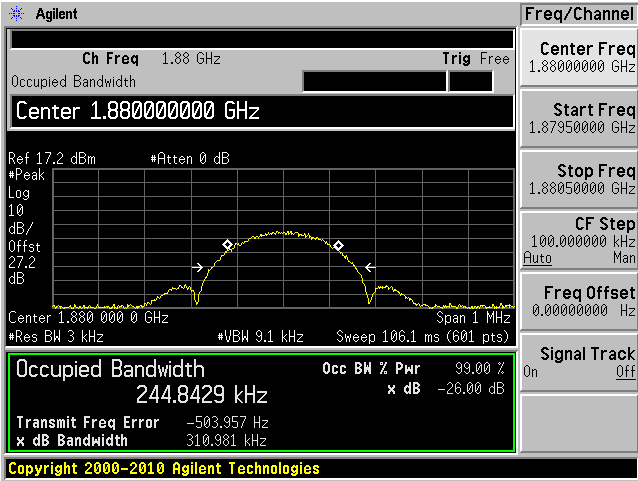
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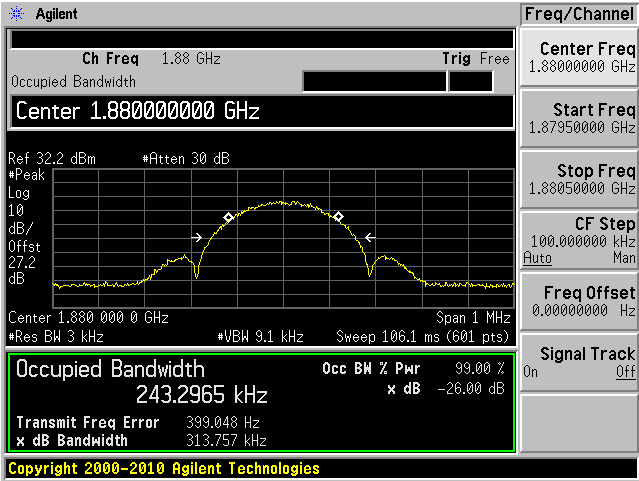
PCS Band, Uplink

EDGE (Middle Channel)

Input

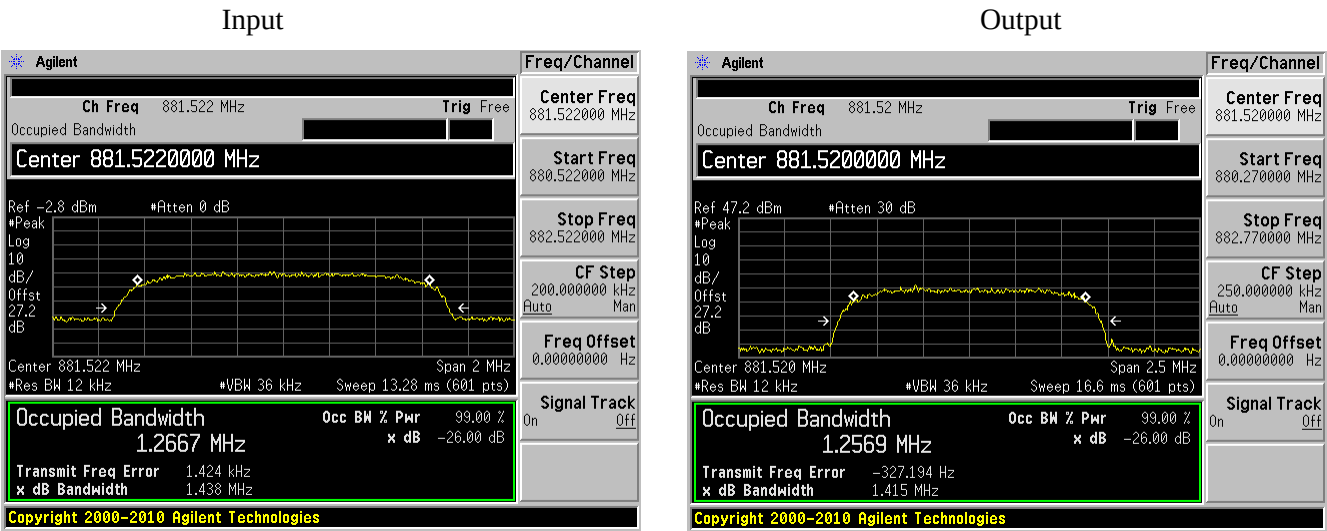


Output



Cellular Band, Downlink

CDMA/EVDO (Middle Channel)



Cellular Band, Uplink

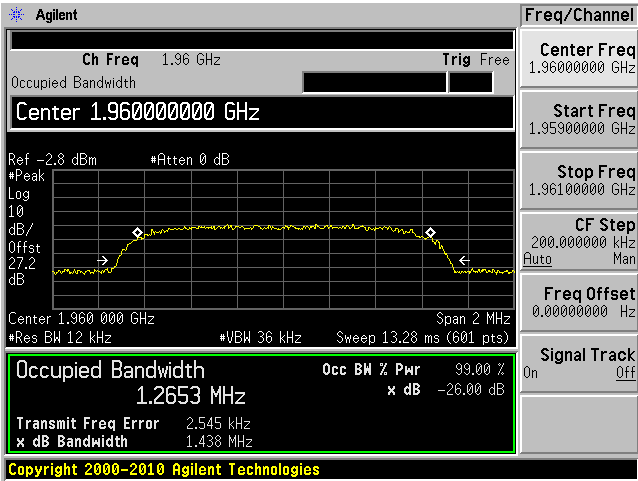
CDMA/EVDO (Middle Channel)



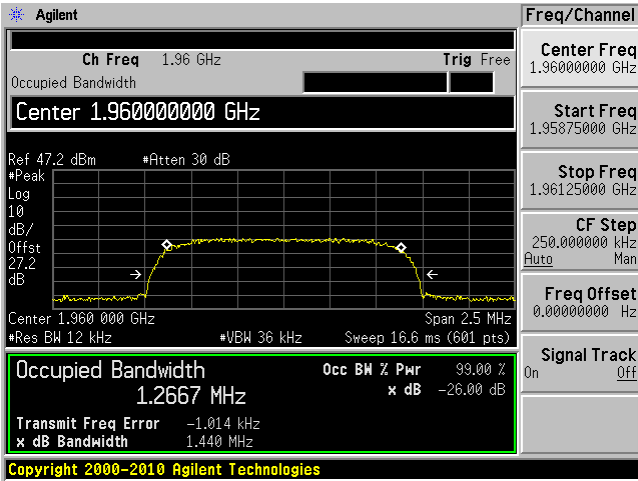
PCS Band, Downlink

CDMA/EVDO (Middle Channel)

Input



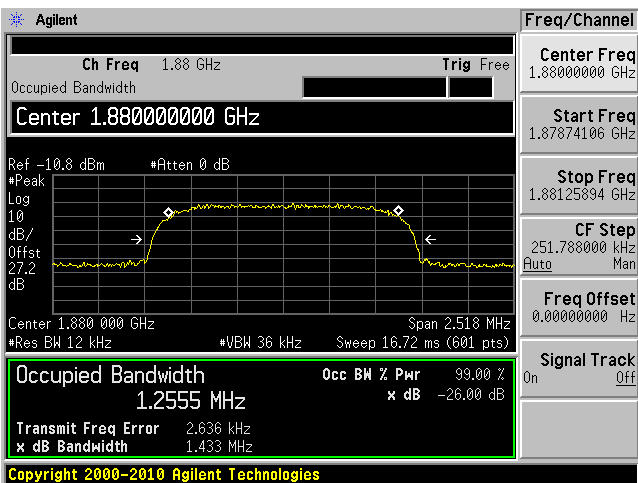
Output



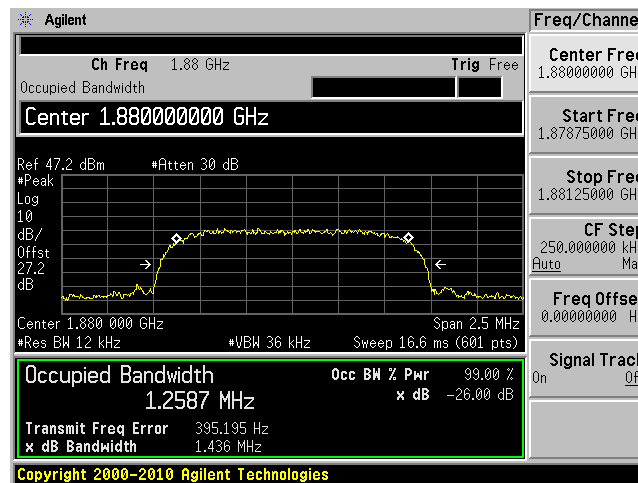
PCS Band, Uplink

CDMA/EVDO (Middle Channel)

Input



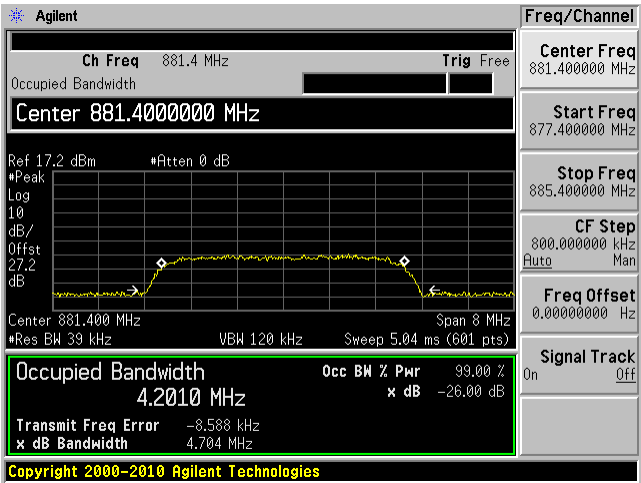
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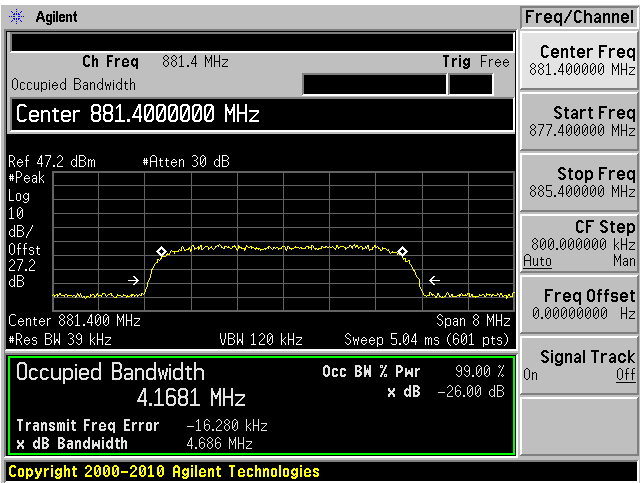
Cellular Band, Downlink

WCDMA (Middle Channel)

Input



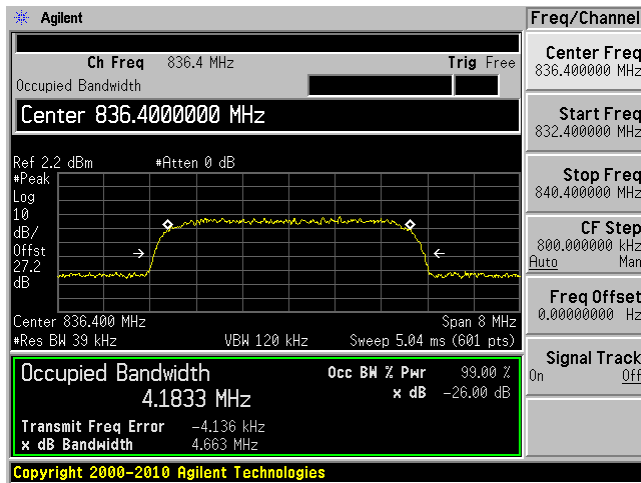
Output



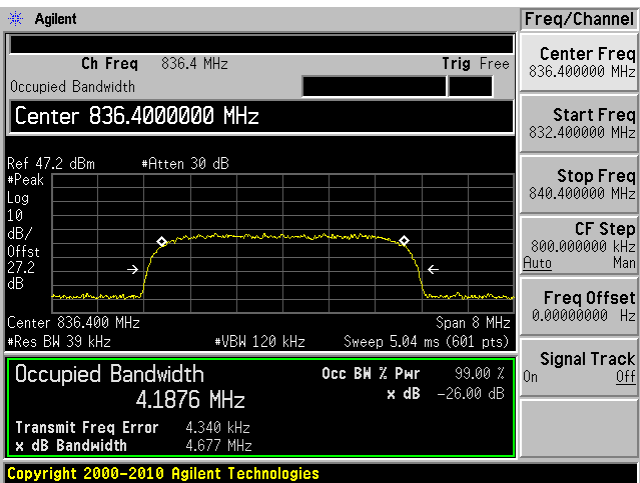
Cellular Band, Uplink

WCDMA (Middle Channel)

Input



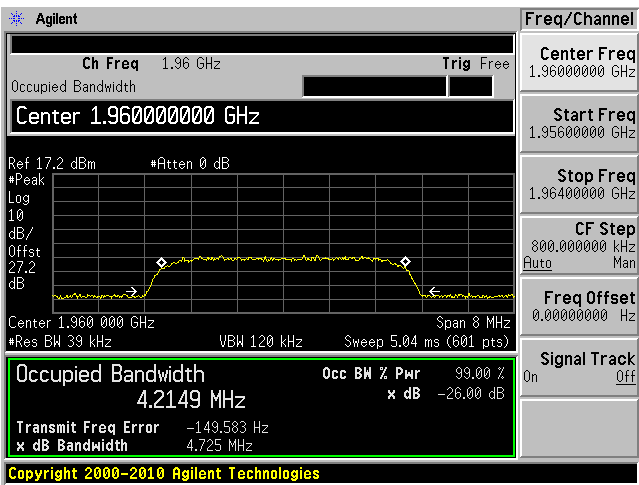
Output



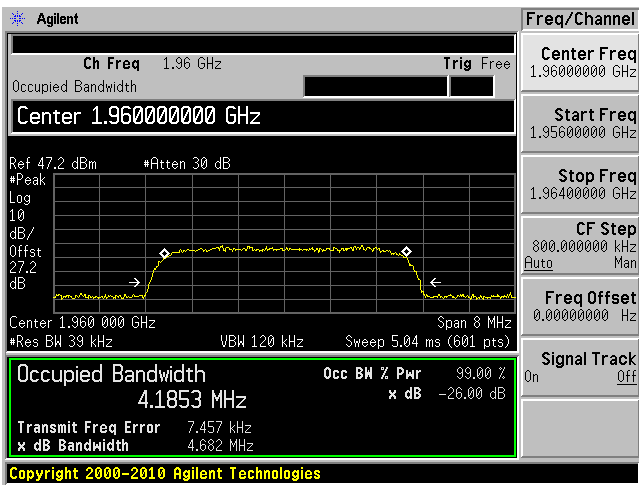
PCS Band, Downlink

WCDMA (Middle Channel)

Input



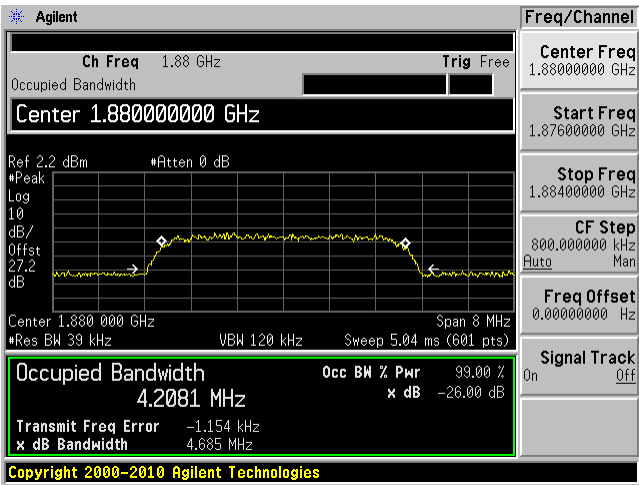
Output



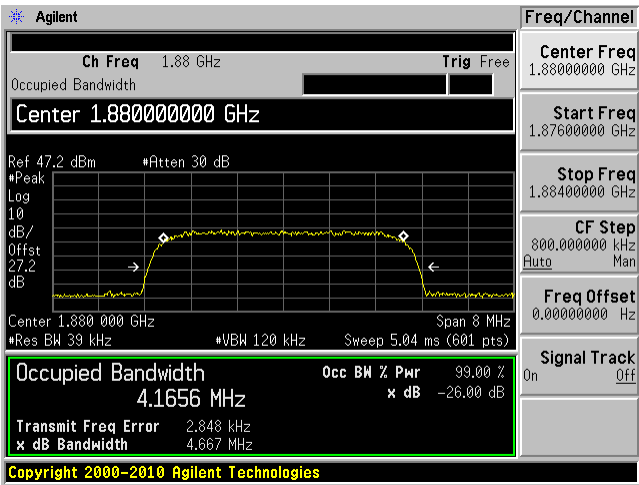
PCS Band, Uplink

WCDMA (Middle Channel)

Input



Output



6 FCC §2.1053, §22.917& §24.238 - Spurious Radiated Emissions

6.1 Applicable Standards

According to FCC §22.917, §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.

6.2 Test Procedure

The transmitter was placed on the 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 = $43 + 10 \log_{10}(\text{power out in Watts})$

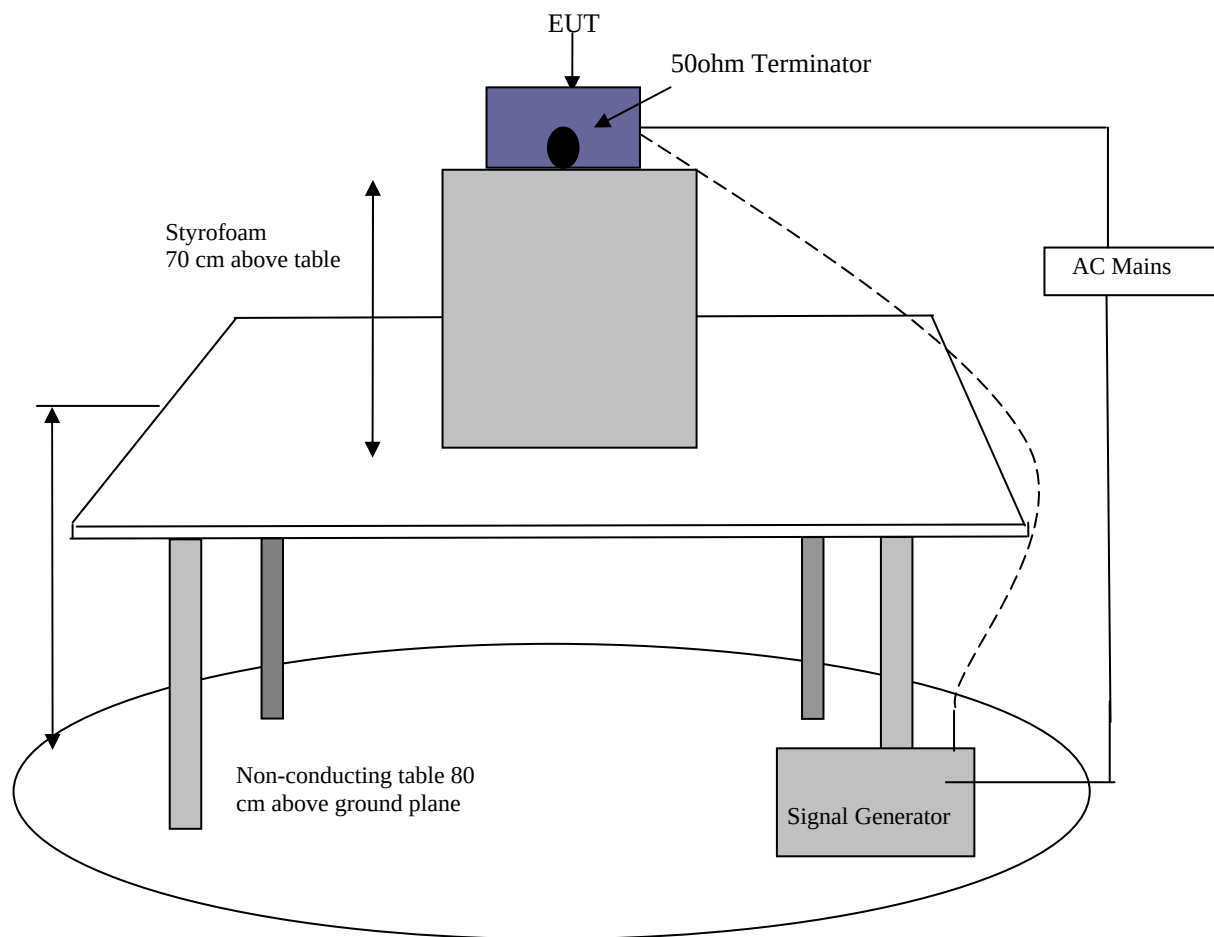
6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/A	N/A
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2013-06-18	1 year
Hewlett Packard	Pre amplifier	AD-100	2229	2013-07-23	2 years
Com-Power	Dipole Antenna	DRG-118/A	1132	2013-09-29	1 year
EMCO	Horn Antenna	3115	9511-4627	2013-07-17	1 year
Sunol Science Corp	Horn Antenna	DHR-118	A052704	2013-07-24	1 year
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2013-05-09	1 year
HP	Signal Generator	8648C	3426A00417	2013-09-17	1 year

Statement of Traceability: *BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.4 Test Setup Block Diagram

Radiated Emissions Testing



6.5 Test Environmental Conditions

Temperature:	20-21°C
Relative Humidity:	47-49 %
ATM Pressure:	101.4-101.6 kPa

The testing was performed by Chen Ge on 2014-02-18 in 5 Meter Chamber 3.

6.6 Test Results

Cellular Band: Worst Case

Uplink (Input frequency = 836.4 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. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
500.4	33.63	89	150	H	500.4	-49.62	0	1.78	-51.4	-13	-38.4
500.4	30.35	89	150	V	500.4	-54.57	0	1.78	-56.35	-13	-43.35
712.2	34.08	142	150	H	712.2	-53.24	0	2.14	-55.38	-13	-42.38
712.2	32.74	142	150	V	712.2	-53.74	0	2.14	-55.88	-13	-42.88
2455	45.7	32	150	H	2455	-53.42	9.747	3.53	-47.203	-13	-34.203
2455	46.85	32	150	V	2455	-51.14	9.436	3.53	-45.234	-13	-32.234

Downlink (Input frequency = 881.52 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. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
499.9	38.63	0	150	H	499.9	-44.01	0	1.78	-45.79	-13	-32.79
449.9	38.19	0	150	V	449.9	-43.36	0	1.78	-45.14	-13	-32.14
2458	48.23	18	150	H	2458	-50.48	9.747	3.53	-44.263	-13	-31.263
2458	47.91	18	150	V	2458	-51.58	9.436	3.53	-45.674	-13	-32.674

PCS Band: Worst Case

Uplink (Input frequency = 1880 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. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
500.4	32.94	13	150	H	500.4	-50.27	0	1.78	-52.05	-13	-39.05
500.4	29.5	13	150	V	500.4	-52.25	0	1.78	-54.03	-13	-41.03
2456	47.62	57	150	H	2456	-51	9.747	1	-42.253	-13	-29.253
2456	46.94	57	150	V	2456	-52.41	9.436	1	-43.974	-13	-30.974

Downlink (Input frequency = 1989.2 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. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
713.2	38.47	0	150	H	713.2	-48.89	0	1.78	-50.67	-13	-37.67
713.2	38.76	0	150	V	713.2	-48.21	0	1.78	-49.99	-13	-36.99
2461	46.12	53	150	H	2461	-52.3	9.747	3.53	-46.083	-13	-33.083
2461	47.28	53	150	V	2461	-51.48	9.436	3.53	-45.574	-13	-32.574

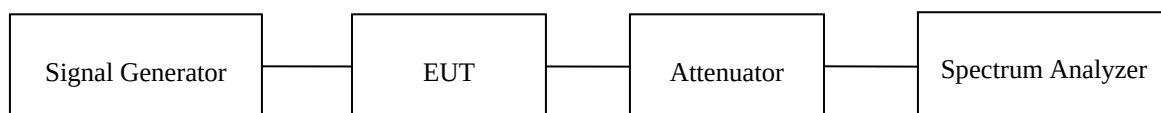
7 FCC §2.1051, §22.917& §24.238 - Spurious Emissions at Antenna Terminals

7.1 Applicable Standards

According to FCC §22.917, §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.

7.2 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.



7.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year
Rohde & Schwarz	Signal Generator	SMIQ03	849192/0085/ DE23746	2012-04-23	2 year
Agilent	Signal Generator	E4438C	MY45091309	2013-05-03	1 year

Statement of Traceability: *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	20-22° C
Relative Humidity:	40-42 %
ATM Pressure:	101.1-101.3 kPa

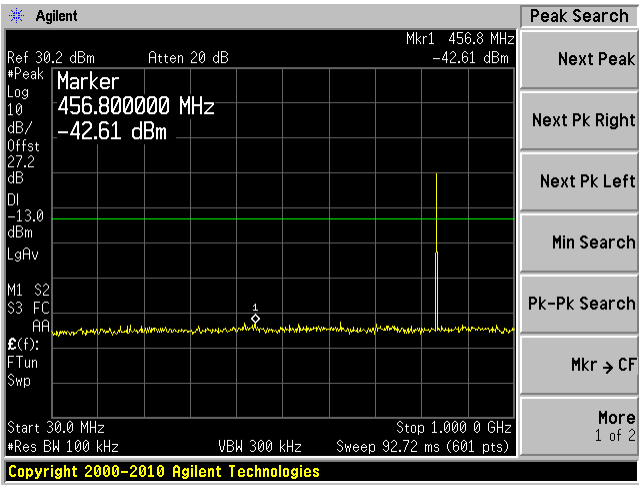
The testing was performed by Chen Ge on 2013-02-25 in the RF Site.

7.5 Test Results

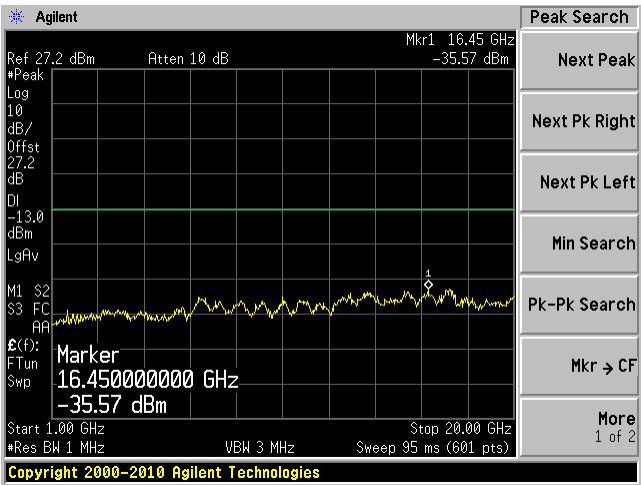
Please refer to the following plots.

Cellular Band Uplink, Worst Case: Middle Channel, 836.4 MHz

Plot 1: 30 MHz to 1 GHz

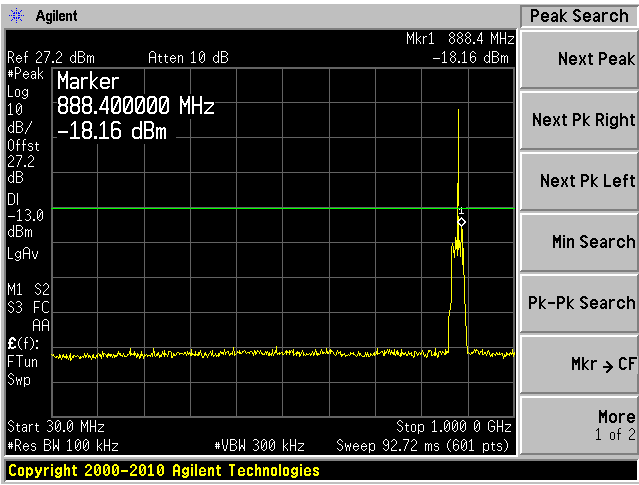


Plot 2: Above 1 GHz

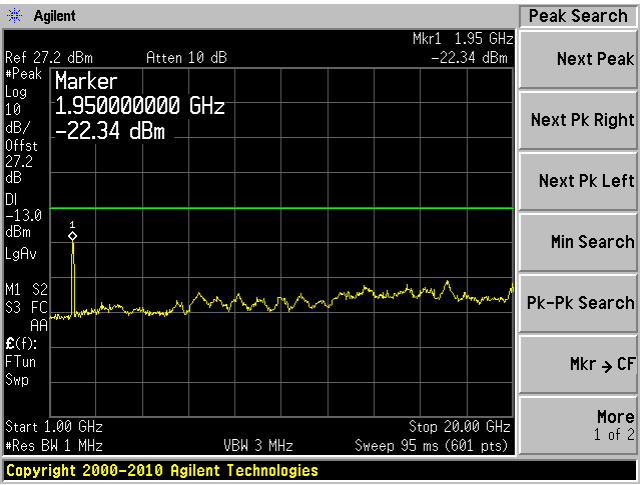


Cellular Band Downlink, Worst Case: Middle Channel, 881.52 MHz

Plot 1: 30 MHz to 1 GHz

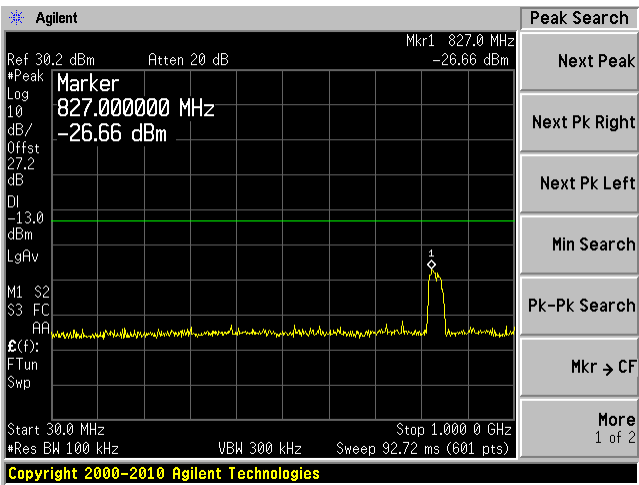


Plot 2: Above 1 GHz

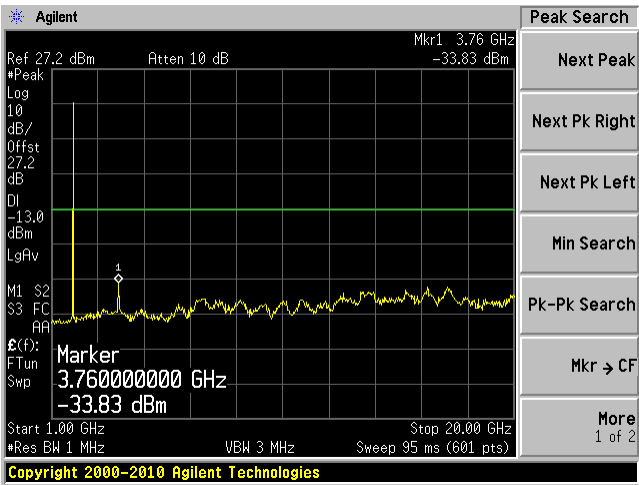


PCS Band Uplink, Worst Case: Middle Channel, 1880 MHz

Plot 1: 30 MHz to 1 GHz

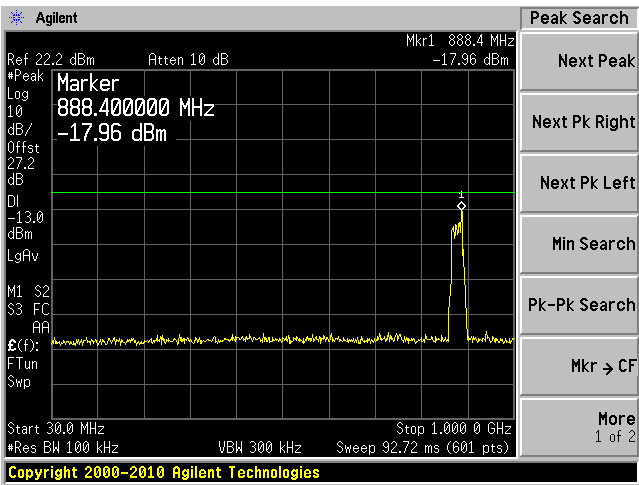


Plot 2: Above 1 GHz

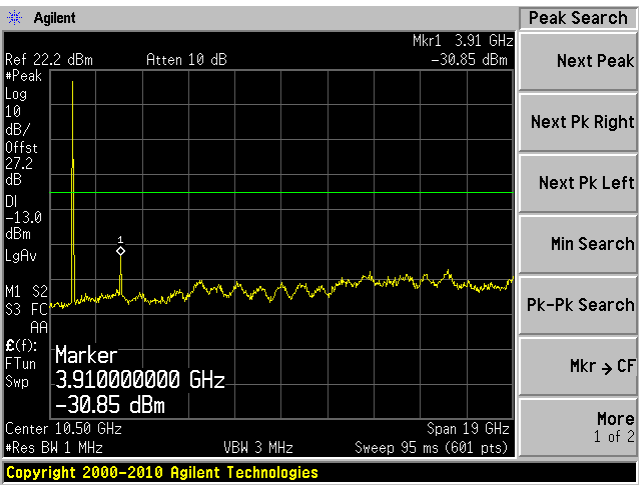


PCS Band Downlink, Worst Case: High Channel, 1989.2 MHz

Plot 1: 30 MHz to 1 GHz



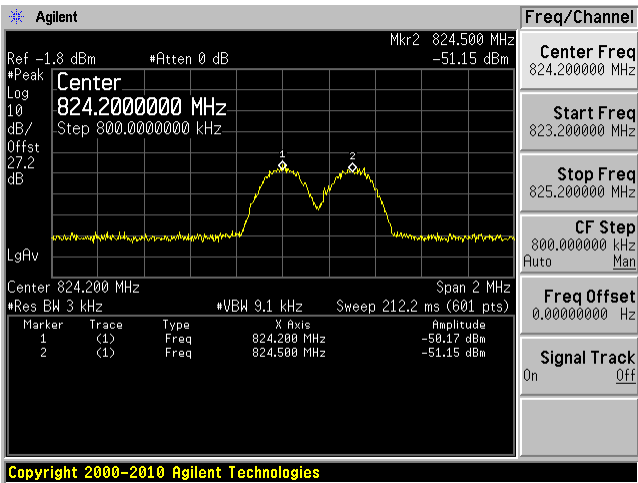
Plot 2: Above 1 GHz



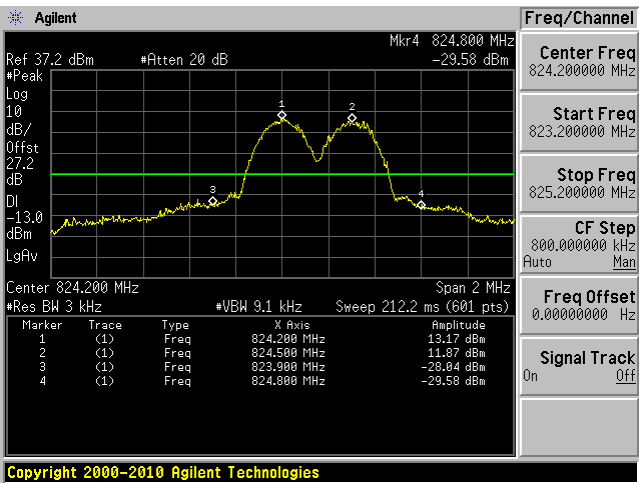
Inter-Modulation

Cellular Band Uplink, Modulation: GSM

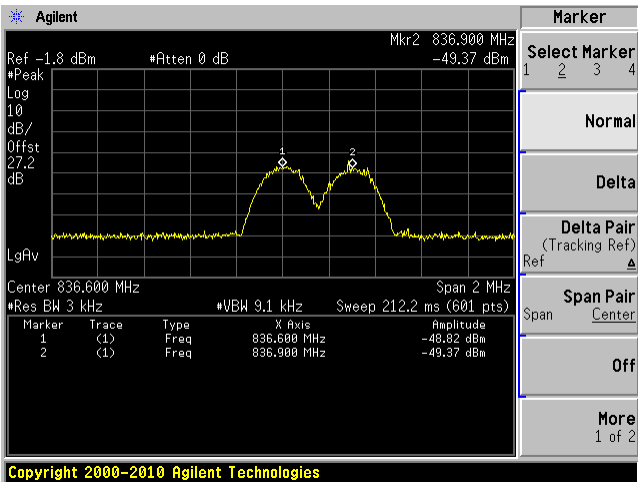
Low Channel, Input



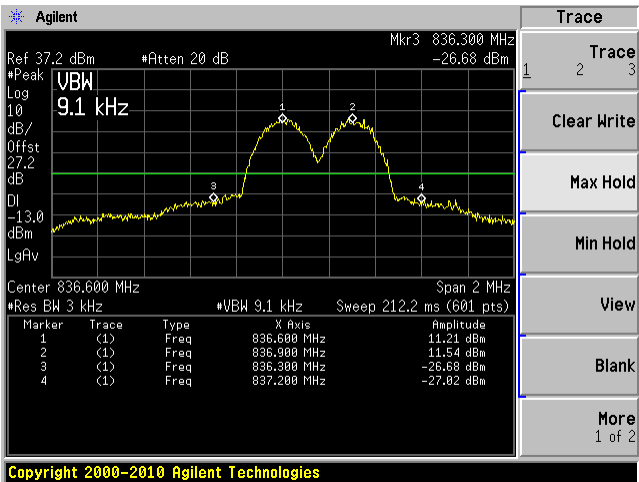
Low Channel, Output



Middle Channel, Input

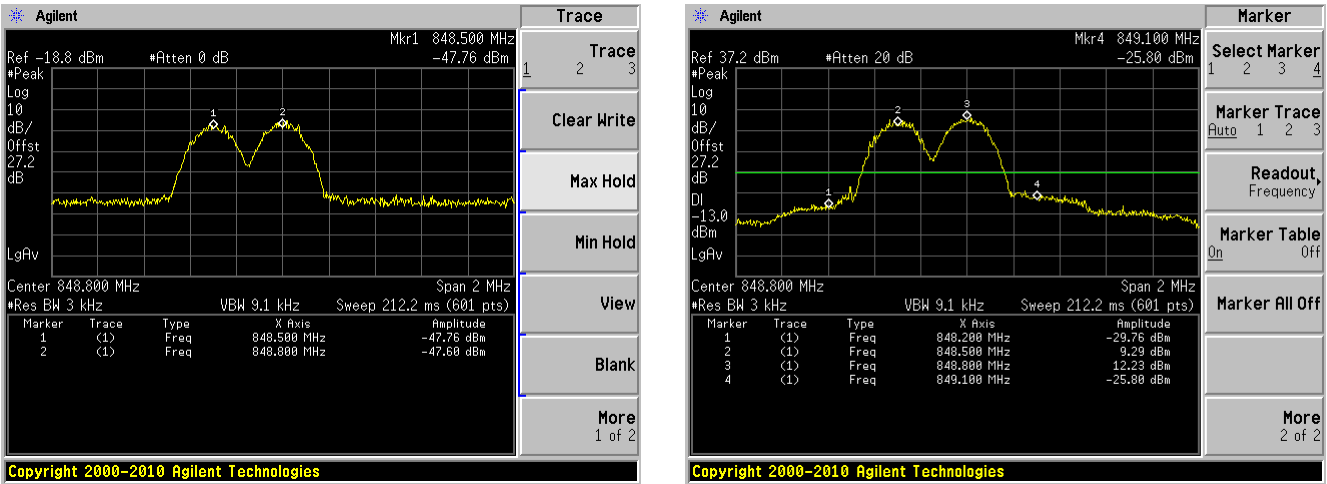


Middle Channel, Output

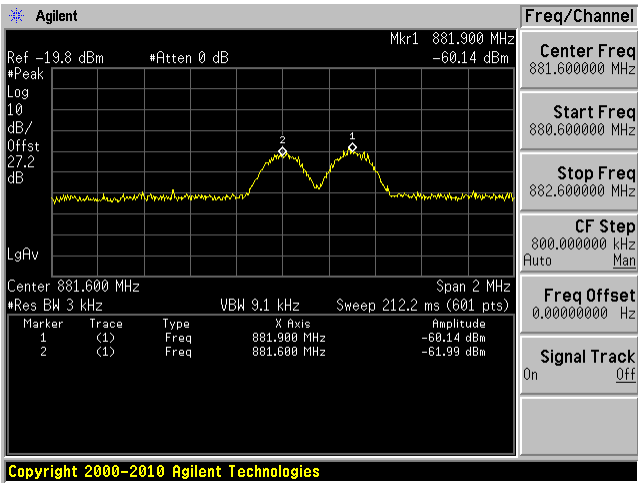


High Channel, Input

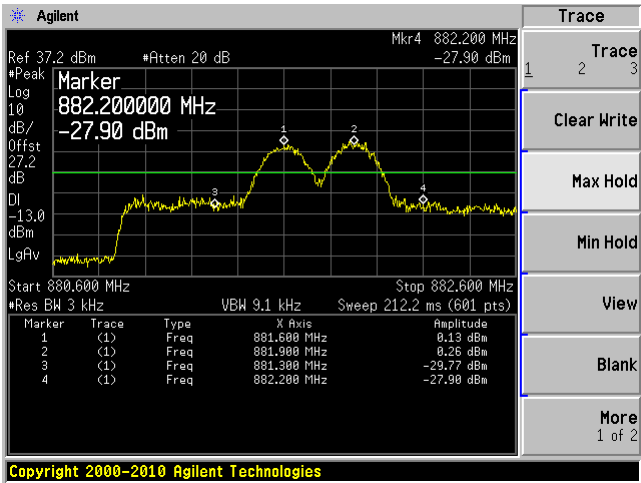
High Channel, Output



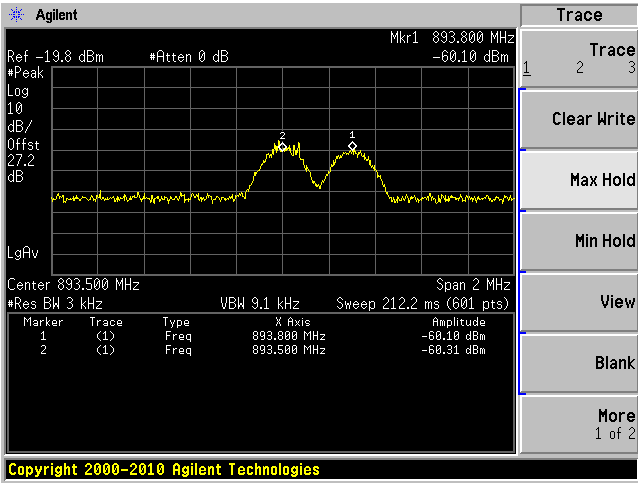
Middle Channel, Input



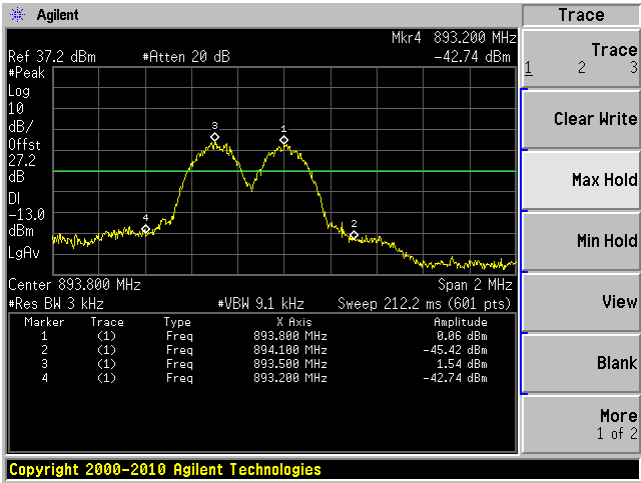
Middle Channel, Output



High Channel, Input

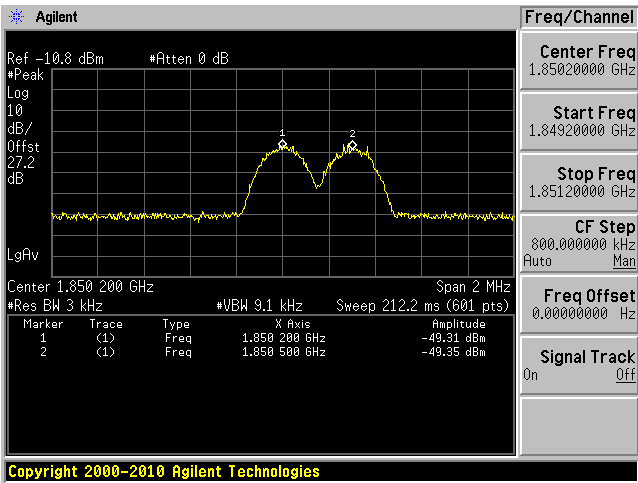


High Channel, Output

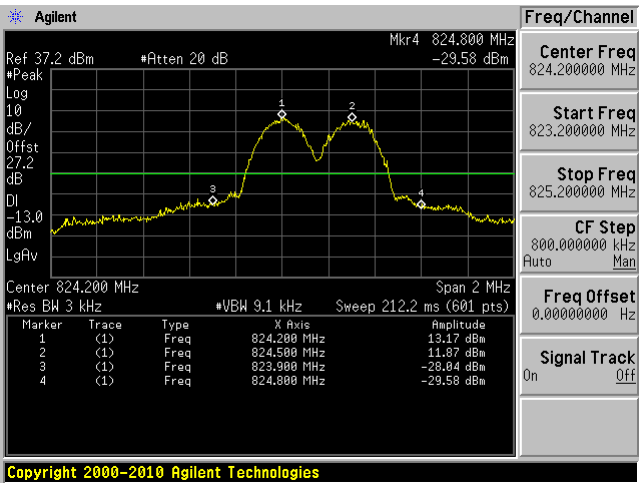


PCS Band Uplink, Modulation: GSM

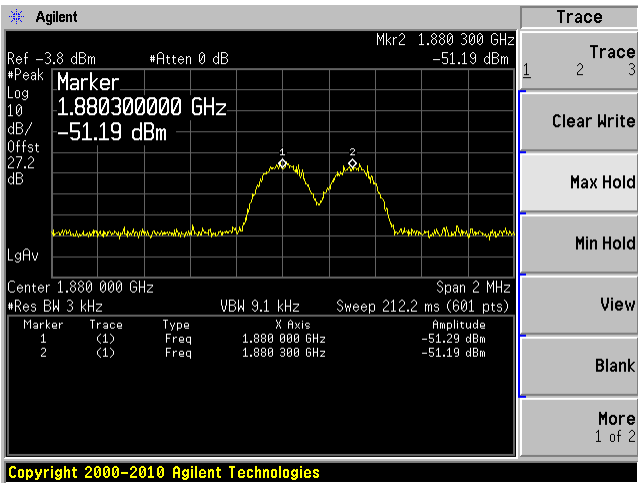
Low Channel, Input



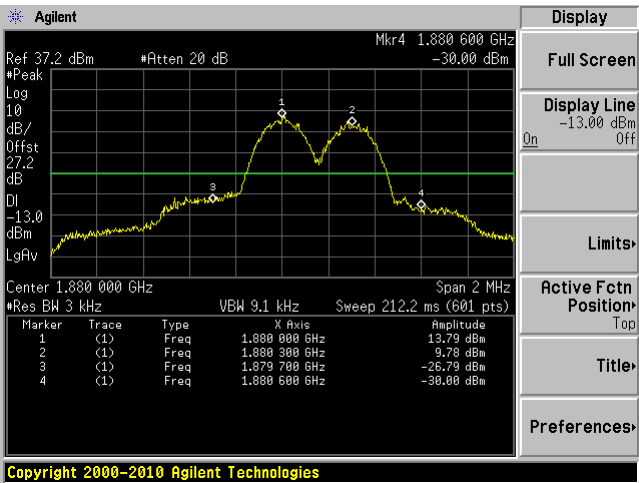
Low Channel, Output



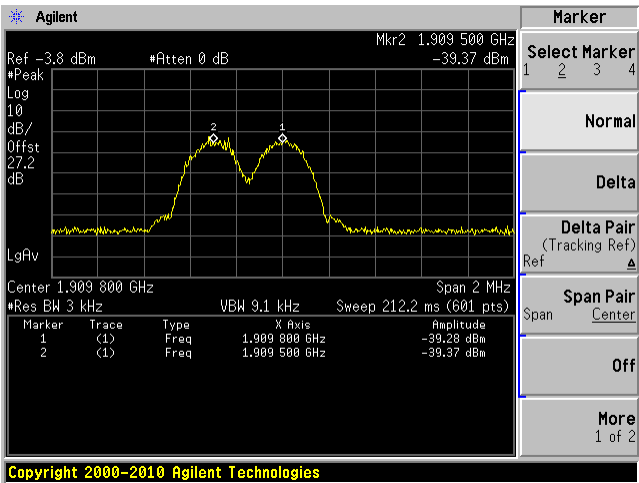
Middle Channel, Input



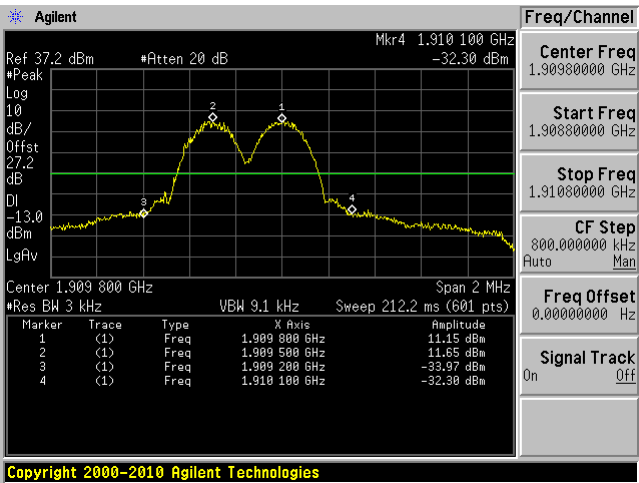
Middle Channel, Output



High Channel, Input

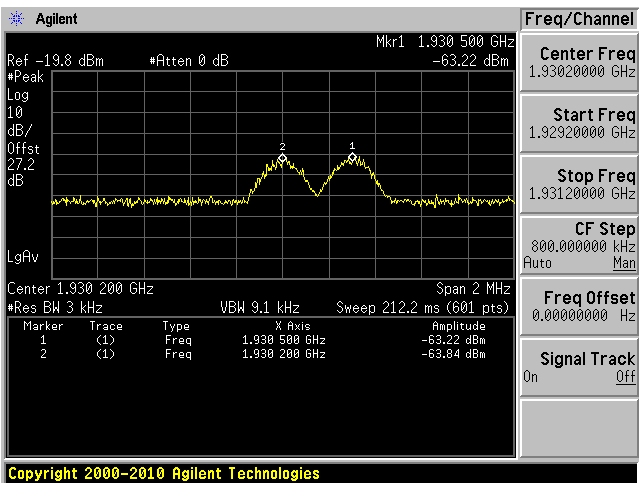


High Channel, Output

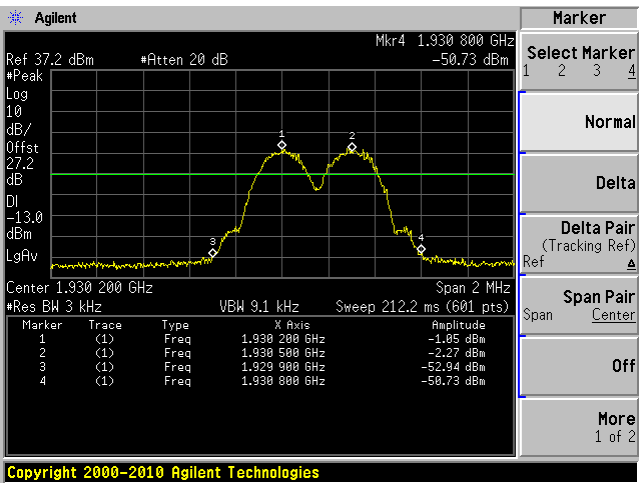


PCS Band Downlink, Modulation: GSM

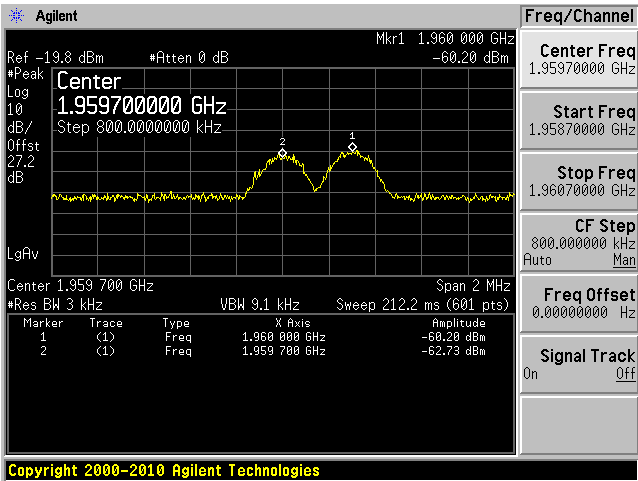
Low Channel, Input



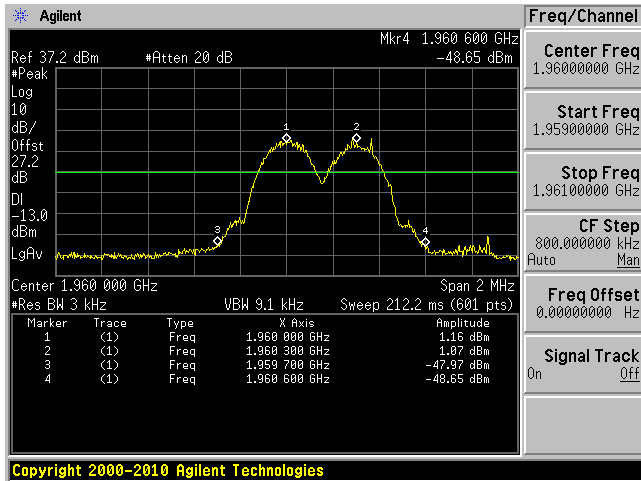
Low Channel, Output



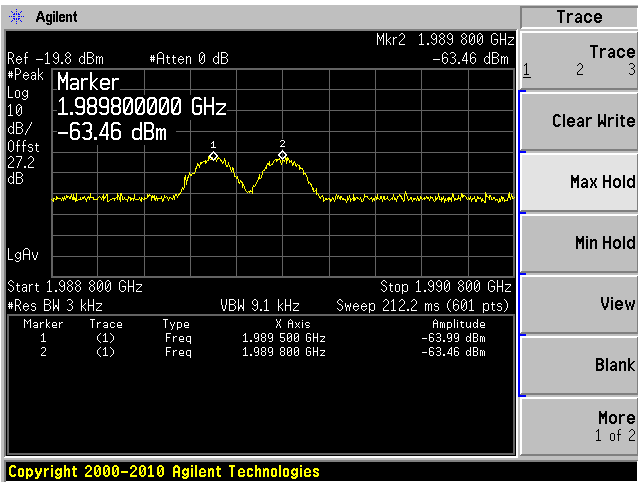
Middle Channel, Input



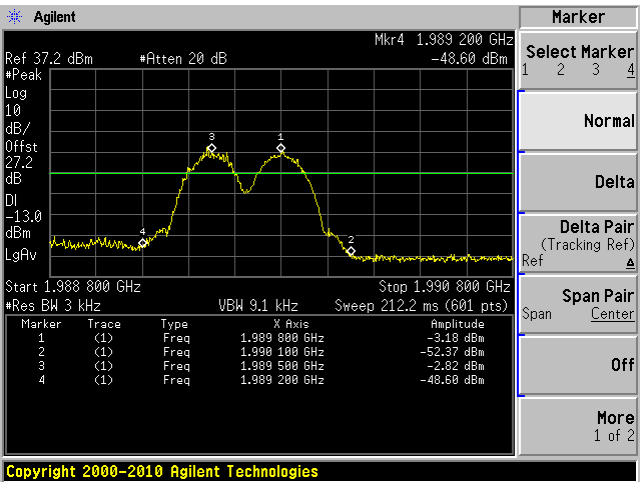
Middle Channel, Output



High Channel, Input

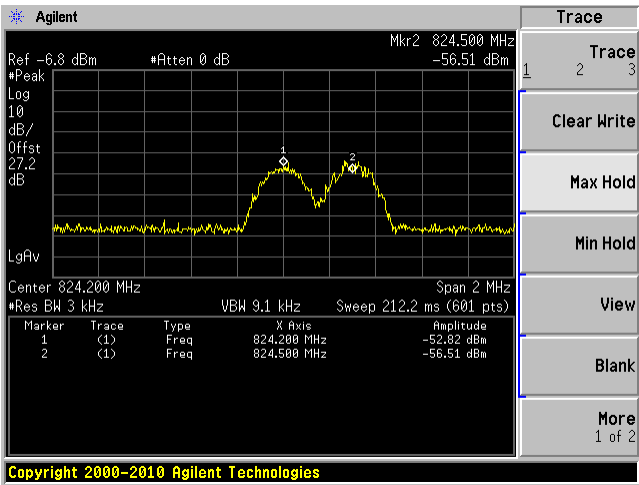


High Channel, Output

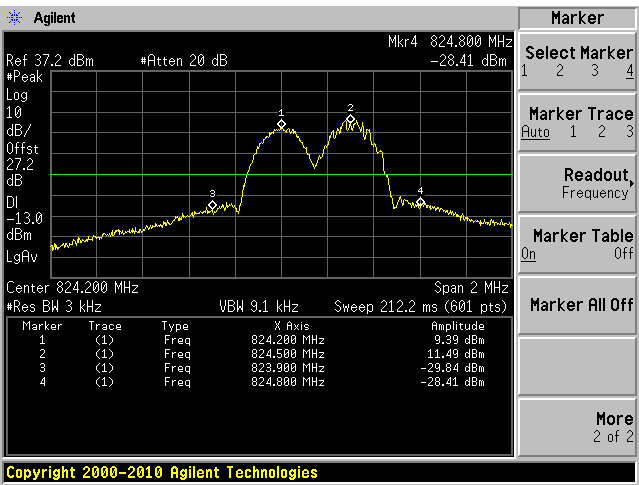


Cellular Band Uplink, Modulation: EDGE

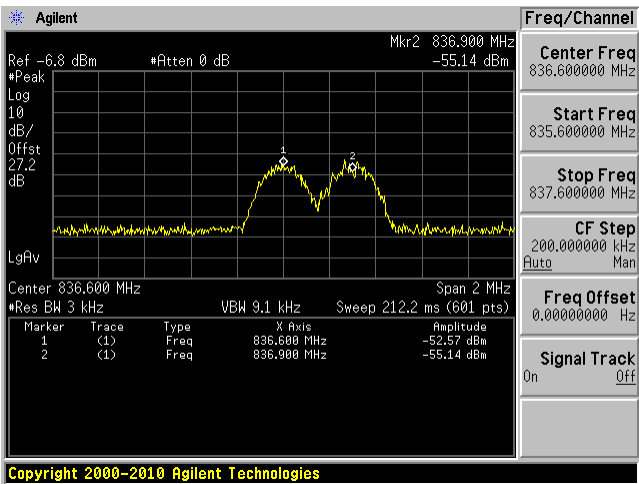
Low Channel, Input



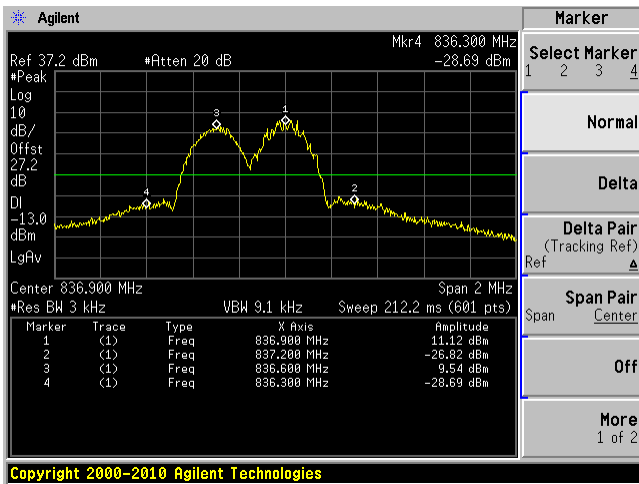
Low Channel, Output



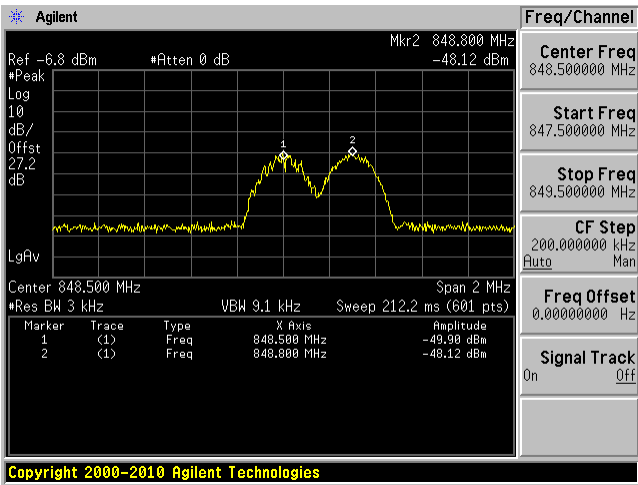
Middle Channel, Input



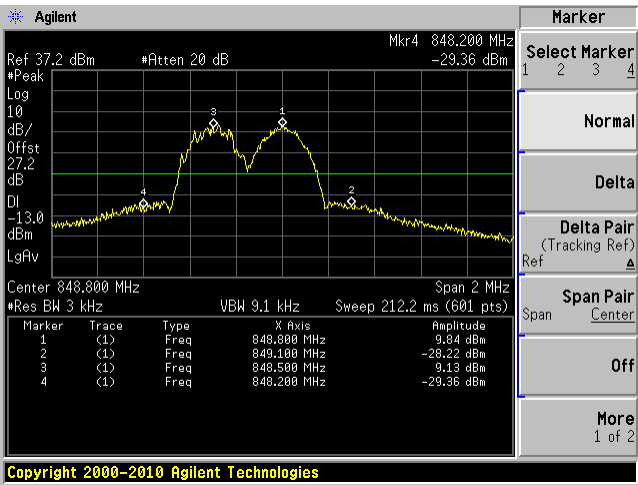
Middle Channel, Output



High Channel, Input

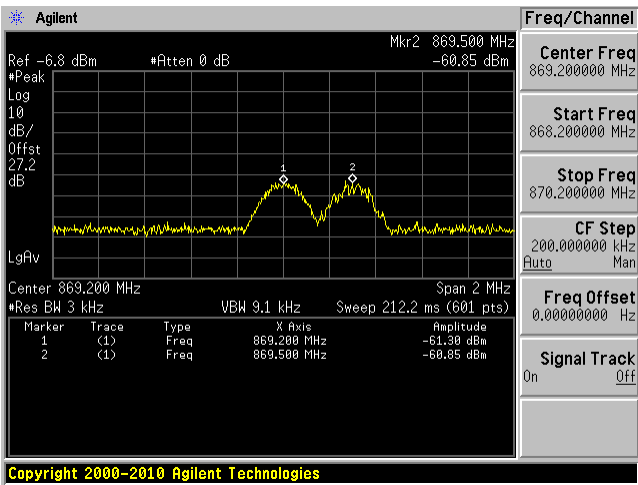


High Channel, Output

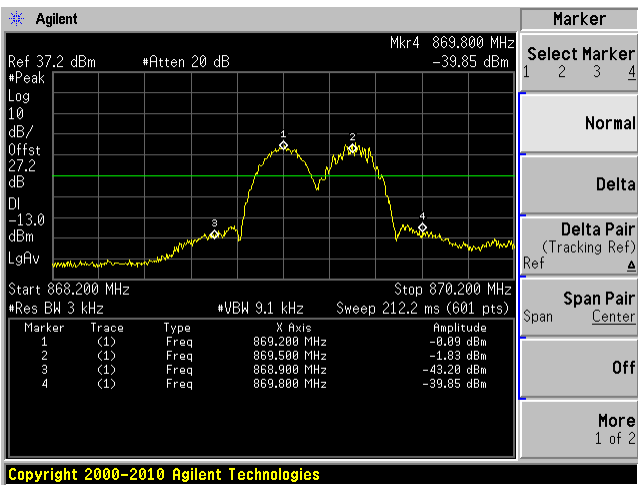


Cellular Band Downlink, Modulation: EDGE

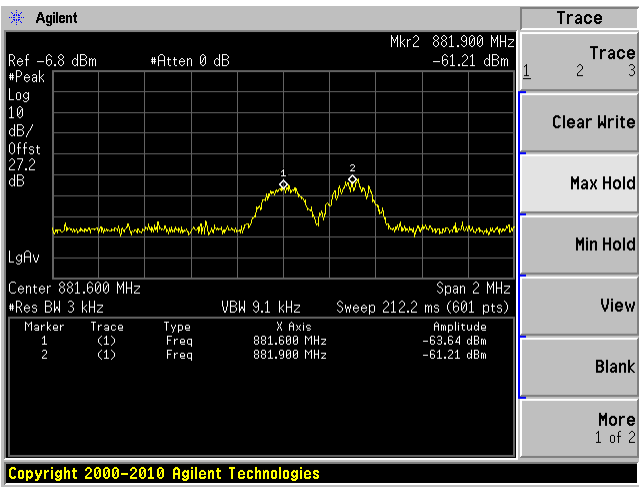
Low Channel, Input



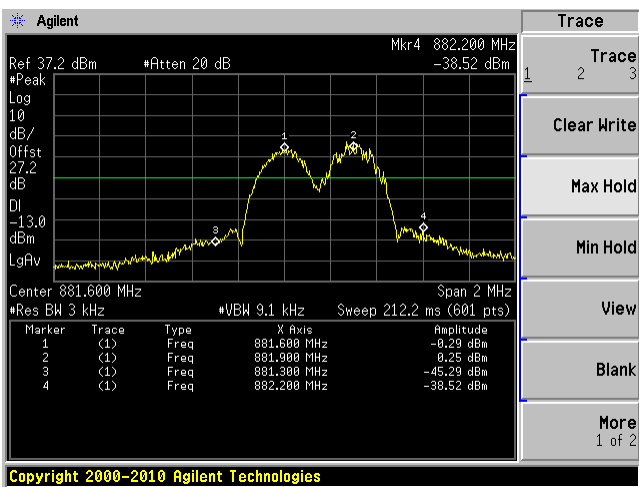
Low Channel, Output



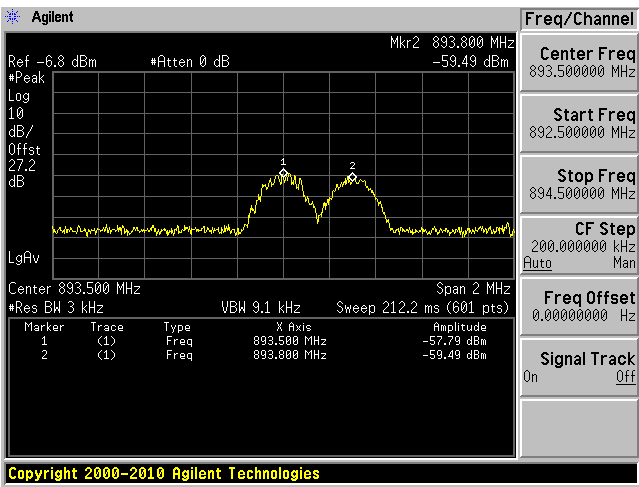
Middle Channel, Input



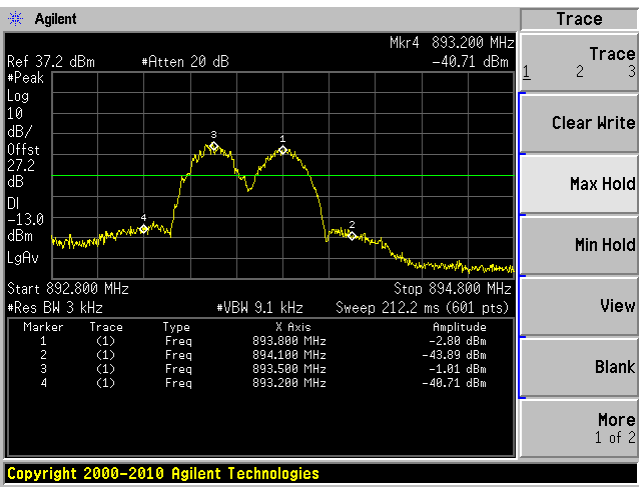
Middle Channel, Output



High Channel, Input

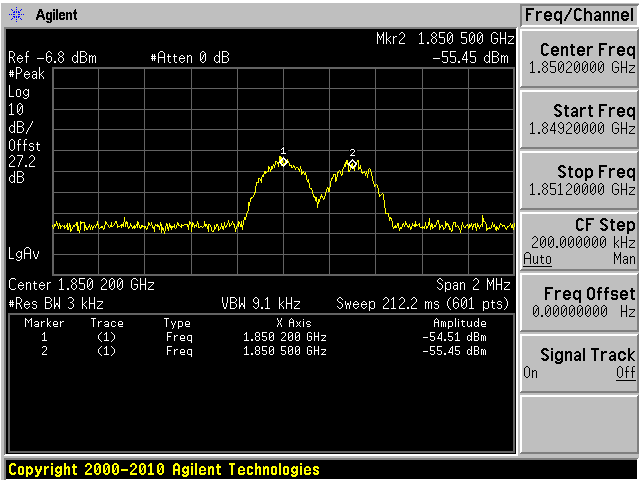


High Channel, Output

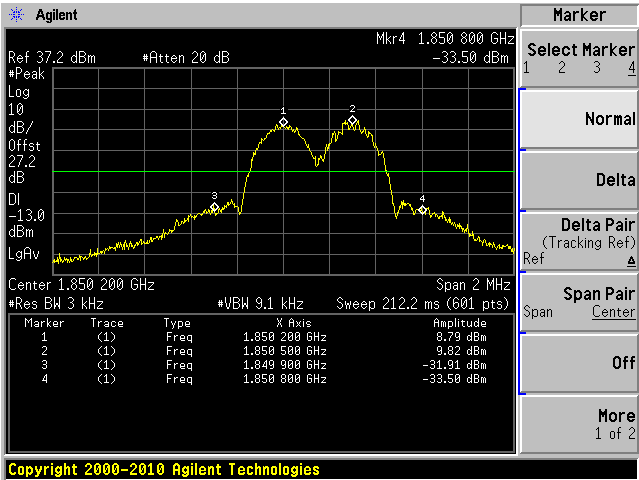


PCS Band Uplink, Modulation: EDGE

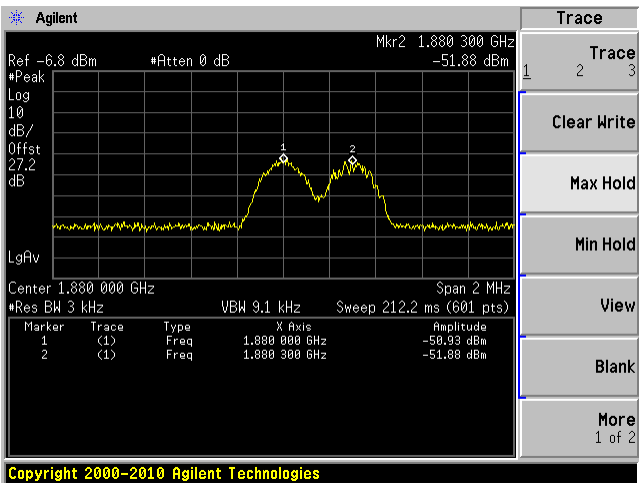
Low Channel, Input



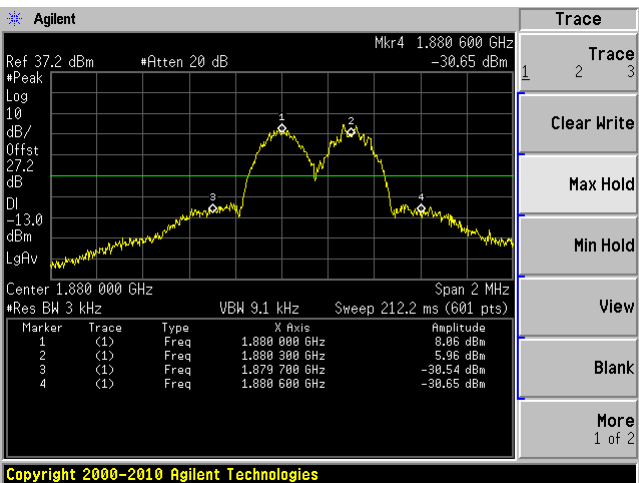
Low Channel, Output



Middle Channel, Input

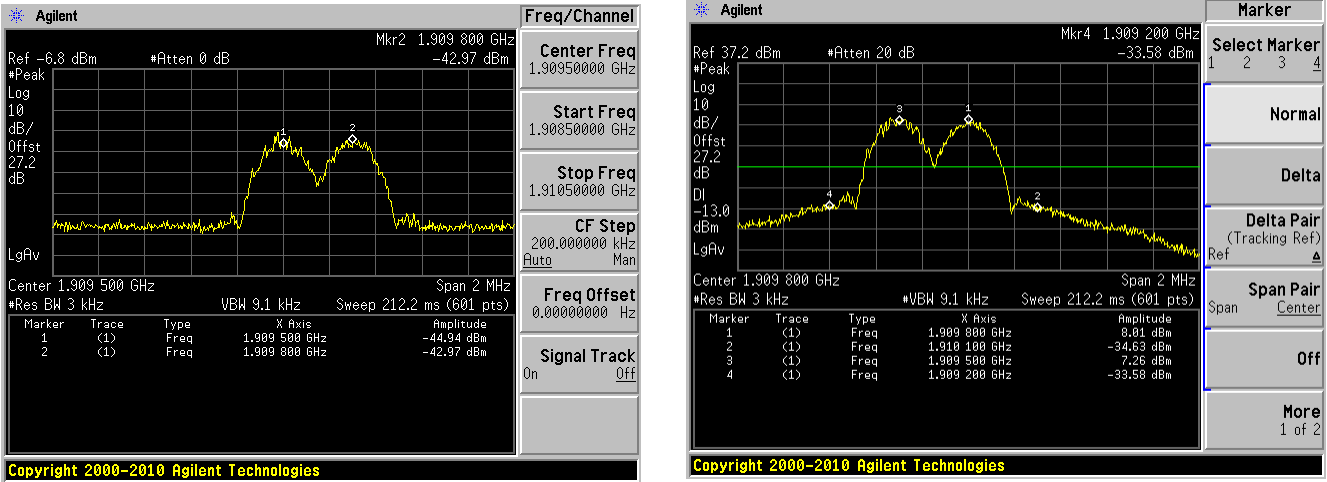


Middle Channel, Output



High Channel, Input

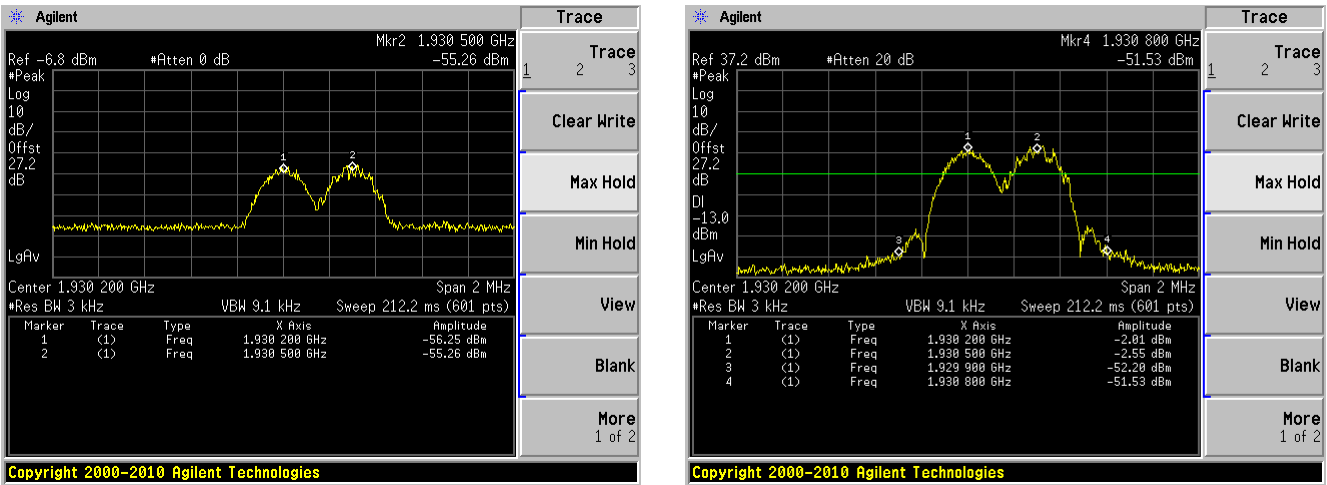
High Channel, Output



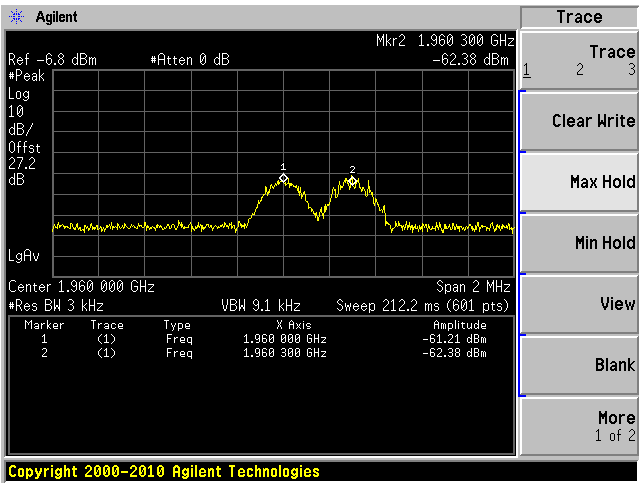
PCS Band Downlink, Modulation: EDGE

Low Channel, Input

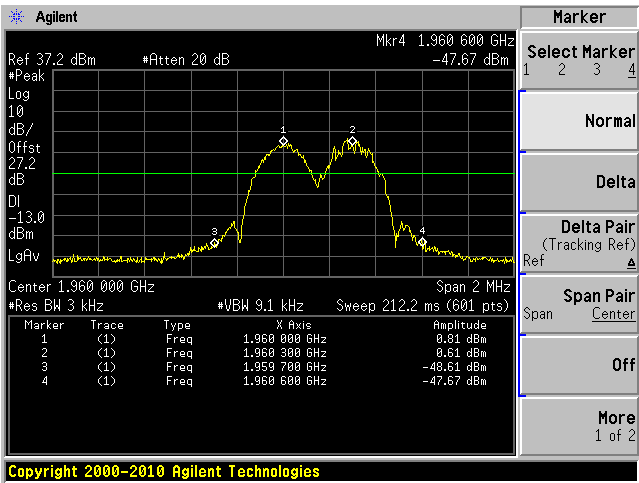
Low Channel, Output



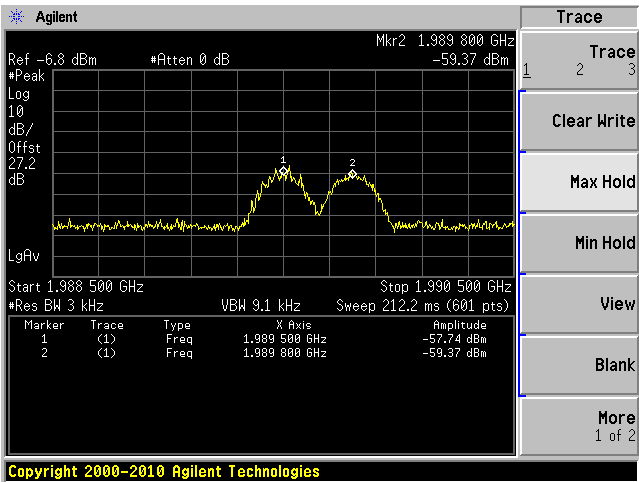
Middle Channel, Input



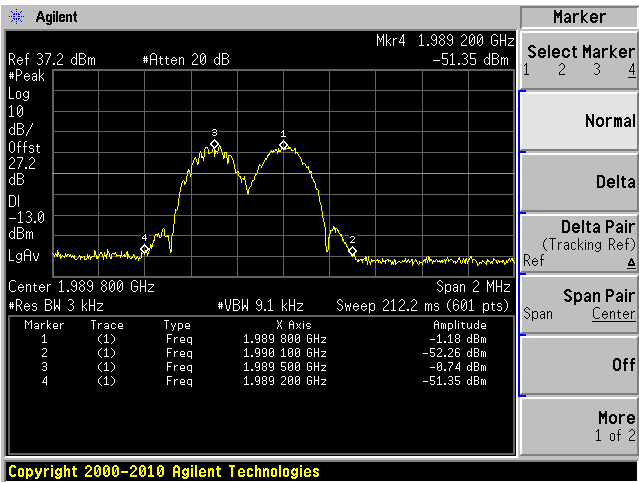
Middle Channel, Output



High Channel, Input

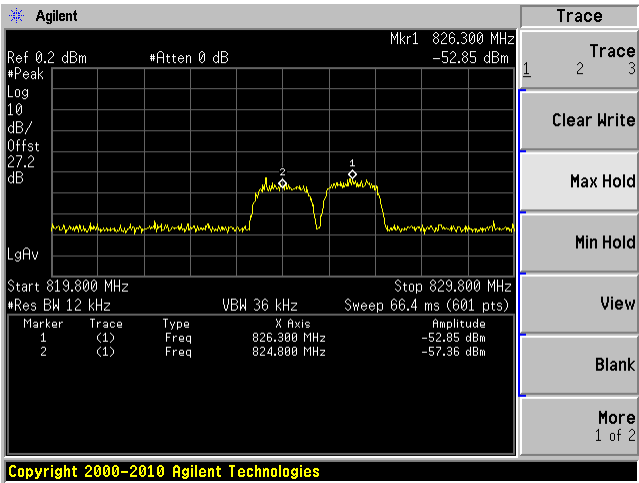


High Channel, Output

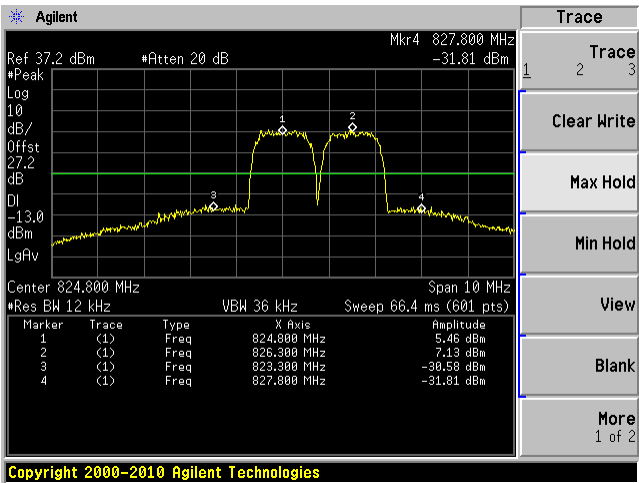


Cellular Band Uplink, Modulation: CDMA

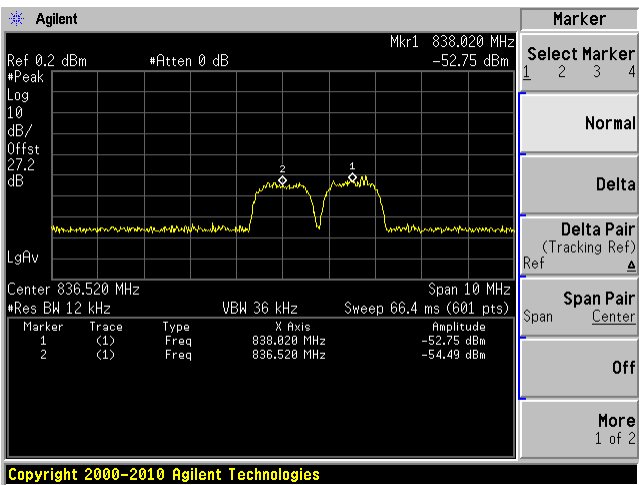
Low Channel, Input



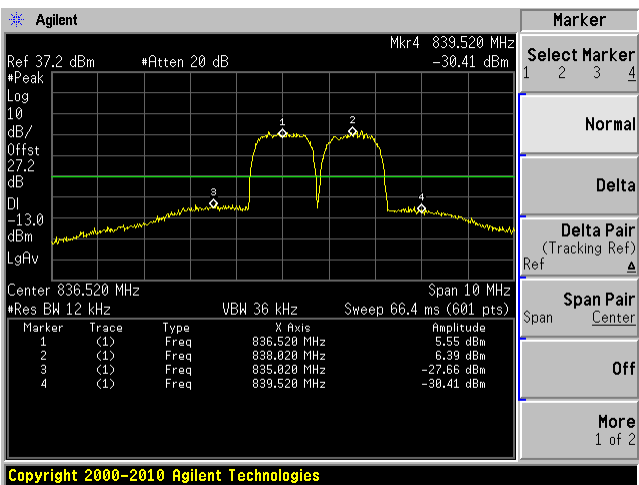
Low Channel, Output



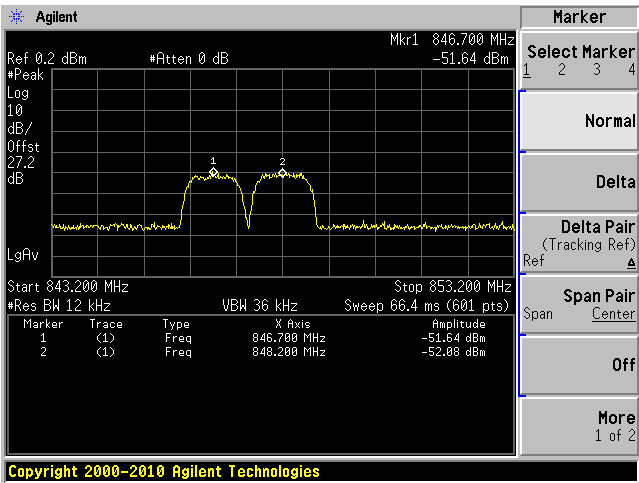
Middle Channel, Input



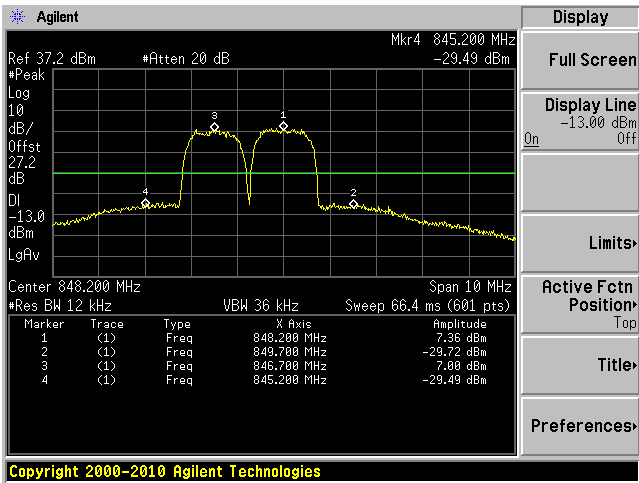
Middle Channel, Output



High Channel, Input

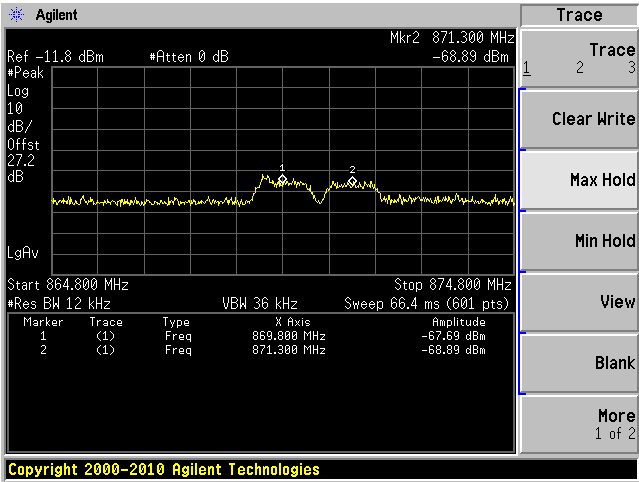


High Channel, Output

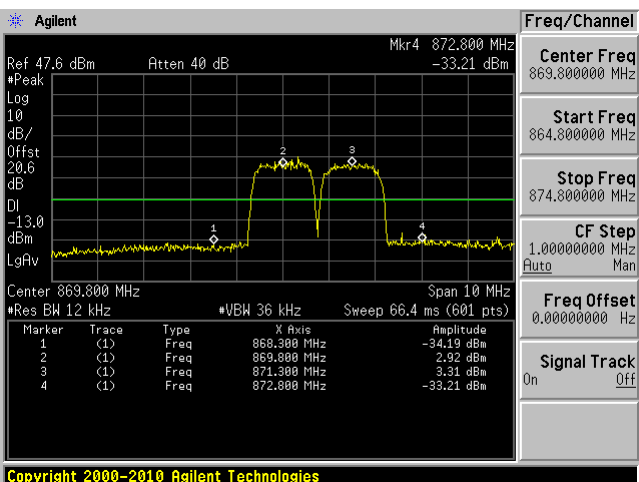


Cellular Band Downlink, Modulation: CDMA

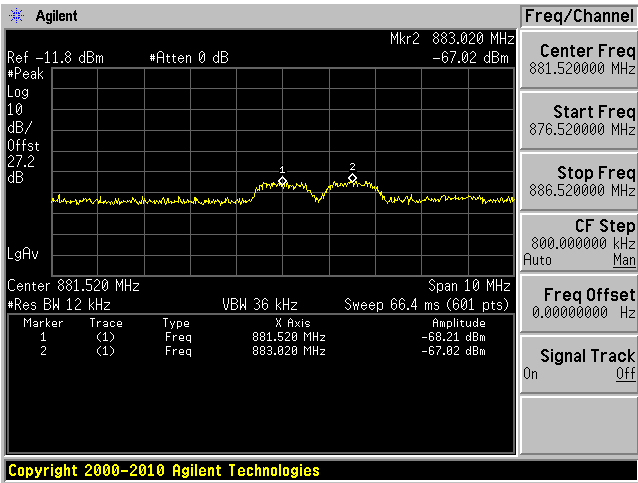
Low Channel, Input



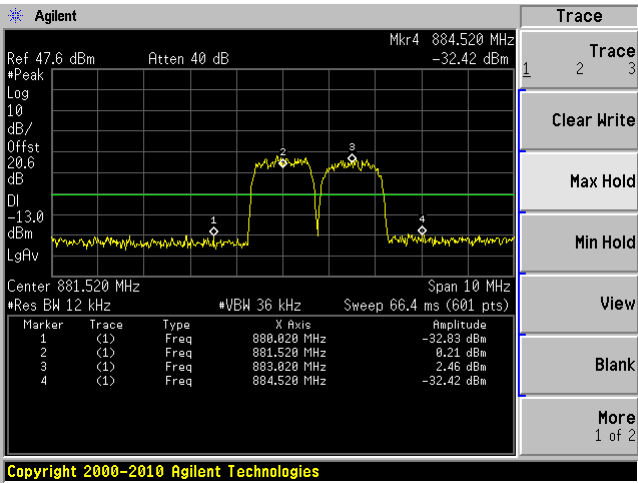
Low Channel, Output



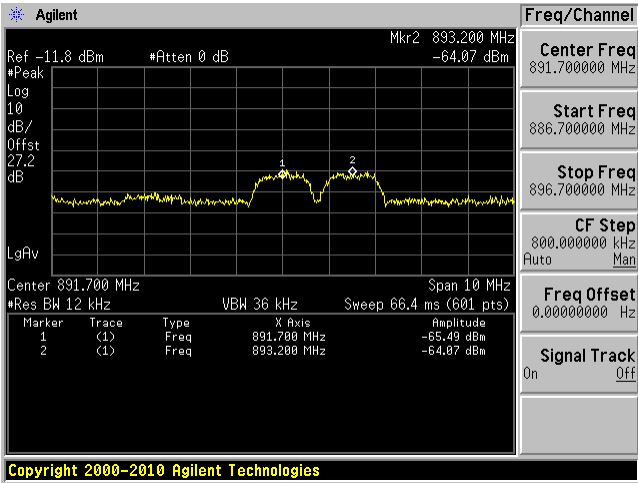
Middle Channel, Input



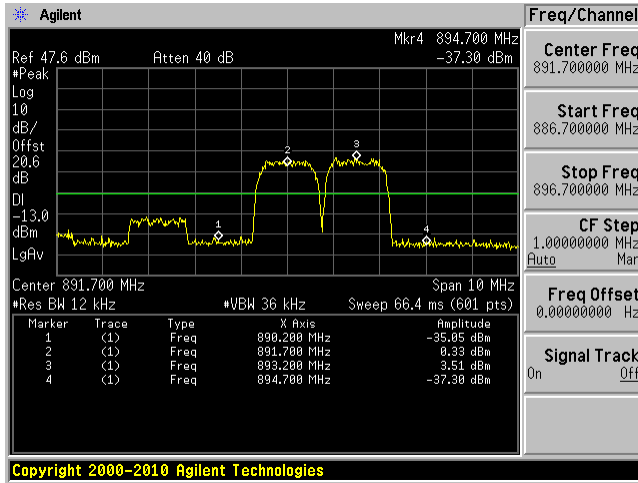
Middle Channel, Output



High Channel, Input

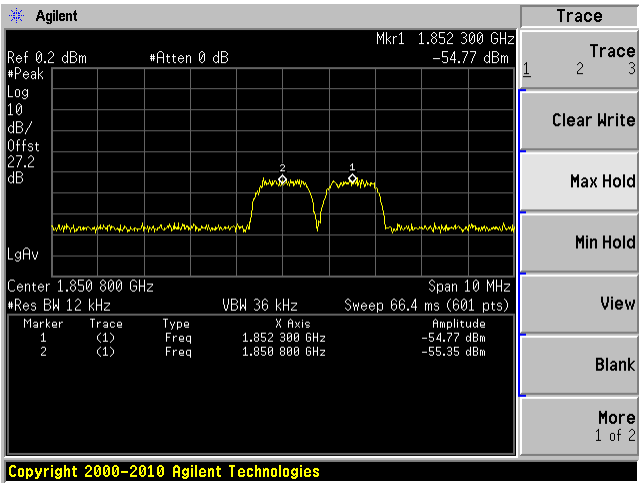


High Channel, Output

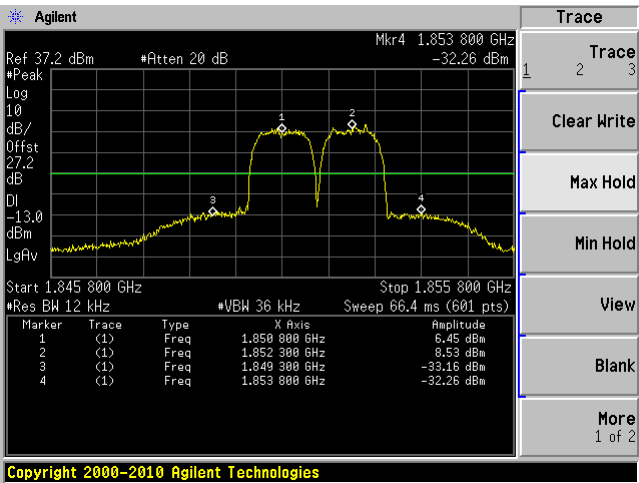


PCS Band Uplink, Modulation: CDMA

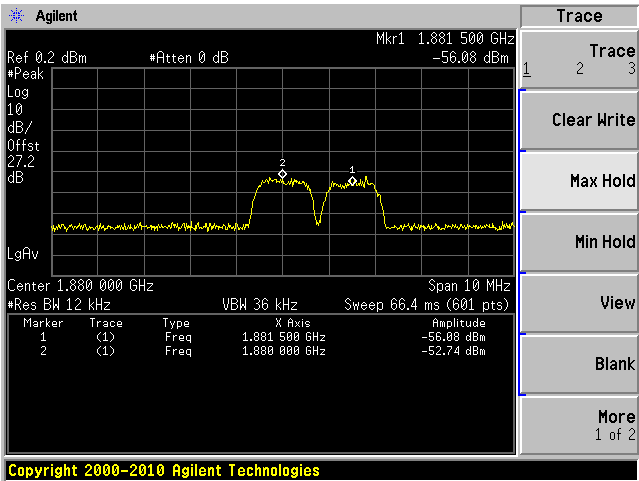
Low Channel, Input



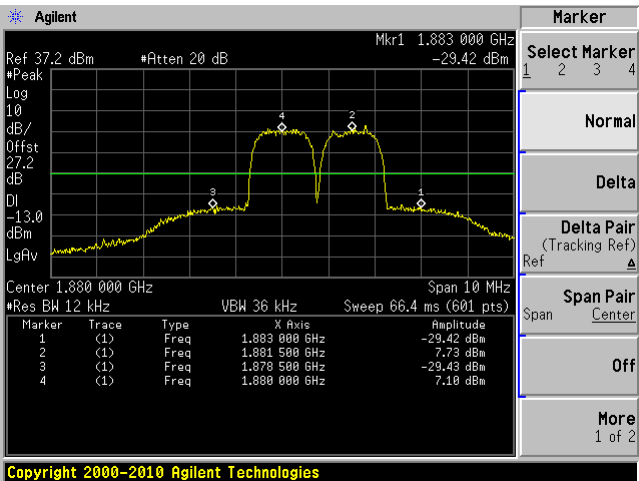
Low Channel, Output



Middle Channel, Input

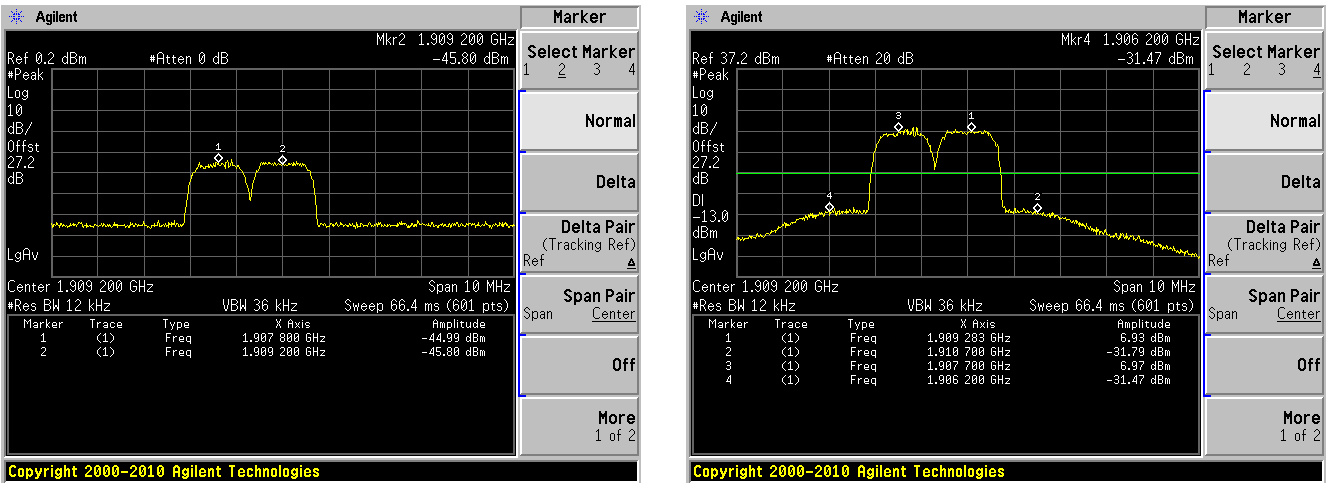


Middle Channel, Output

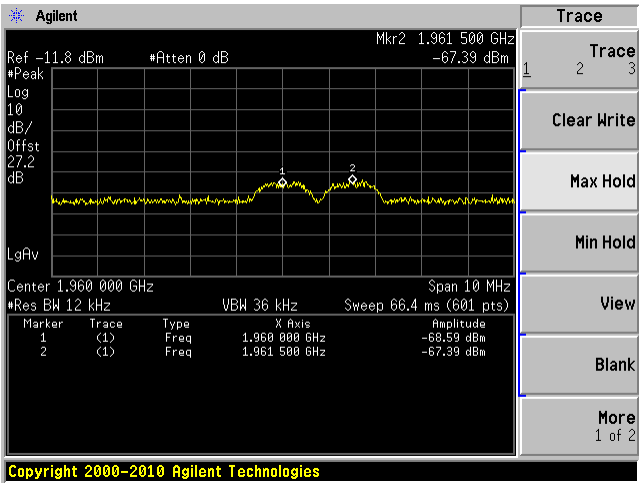


High Channel, Input

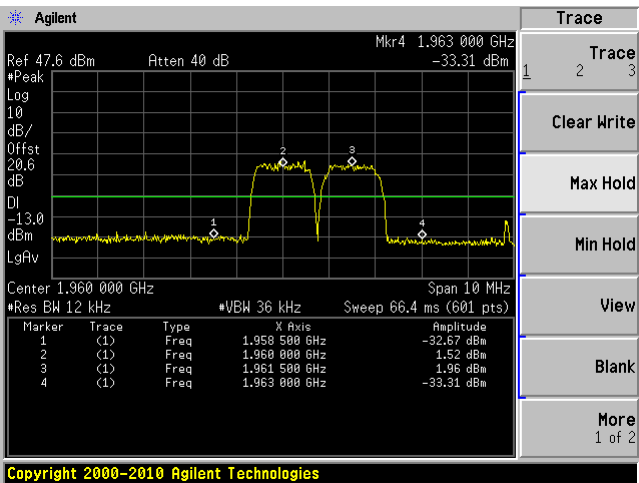
High Channel, Output



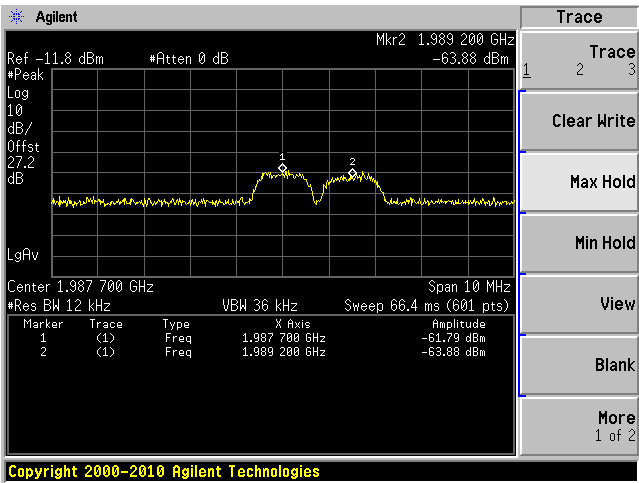
Middle Channel, Input



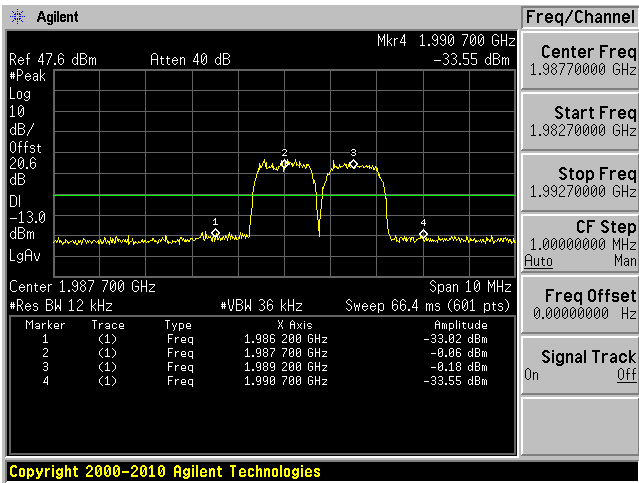
Middle Channel, Output



High Channel, Input

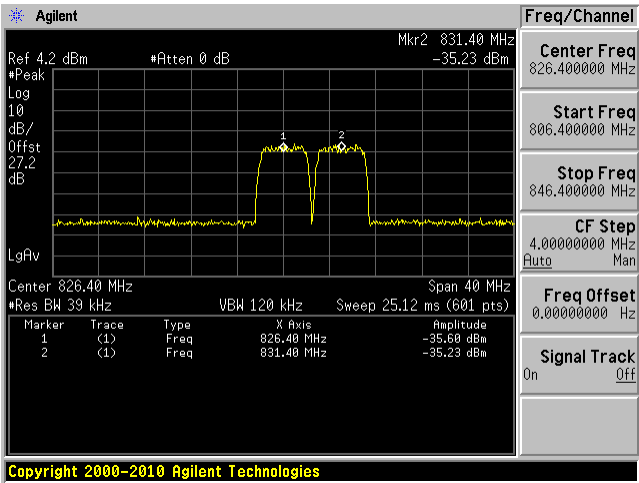


High Channel, Output

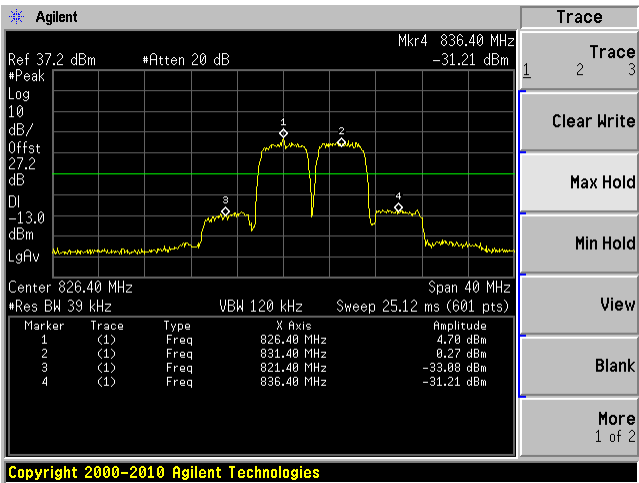


Cellular Band Uplink, Modulation: WCDMA

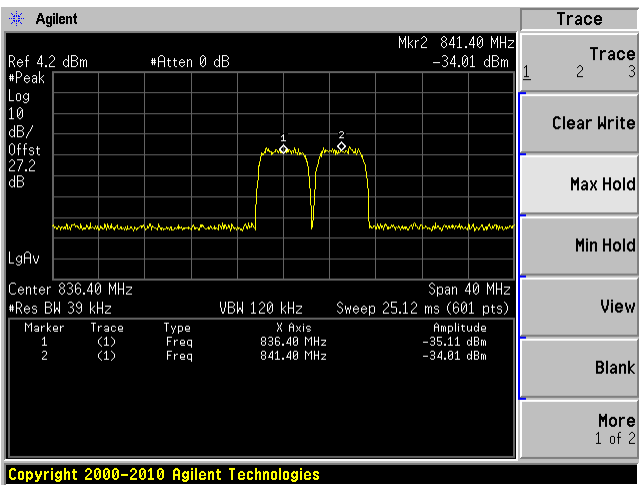
Low Channel, Input



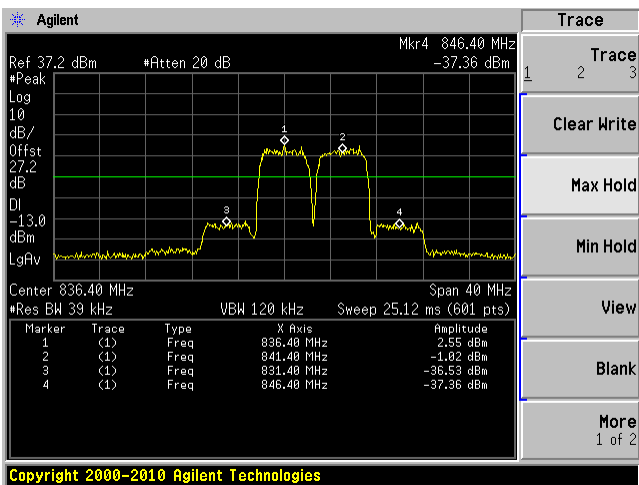
Low Channel, Output



Middle Channel, Input

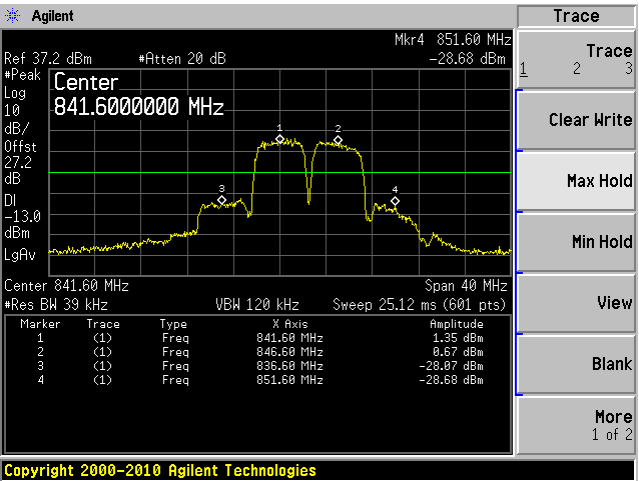
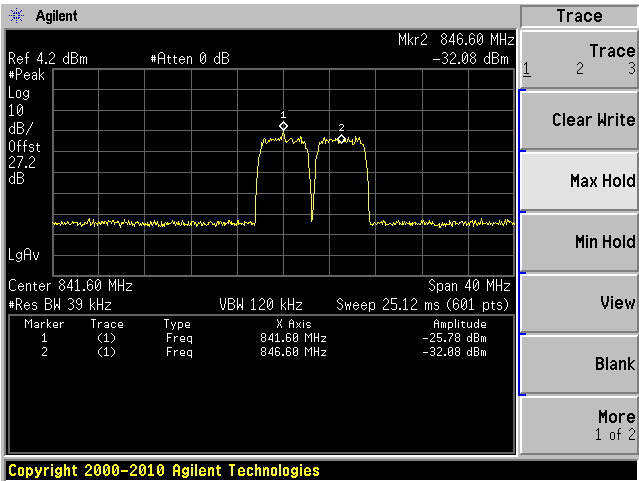


Middle Channel, Output



High Channel, Input

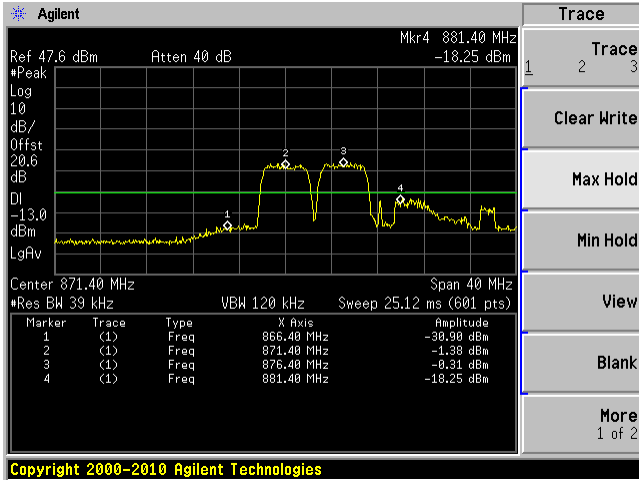
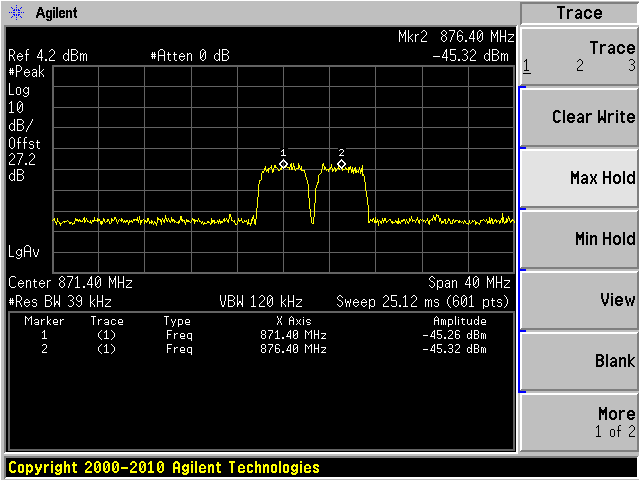
High Channel, Output



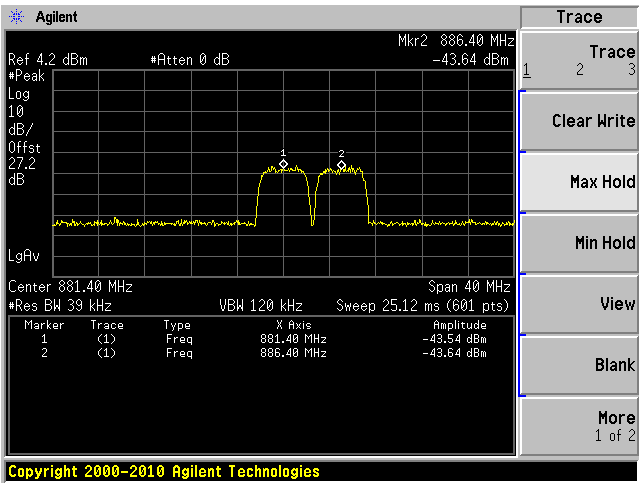
Cellular Band Downlink, Modulation: WCDMA

Low Channel, Input

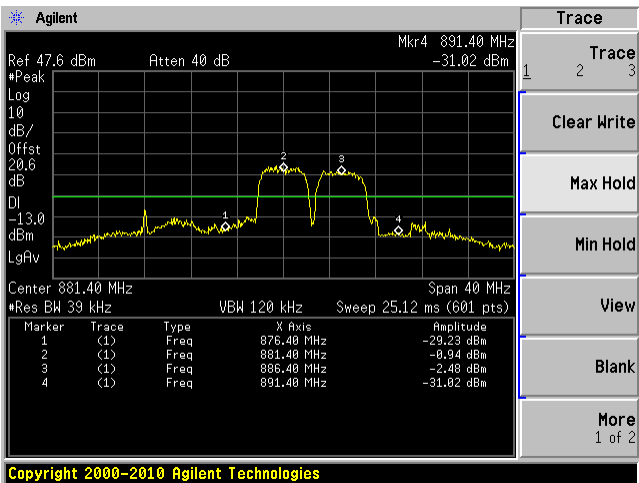
Low Channel, Output



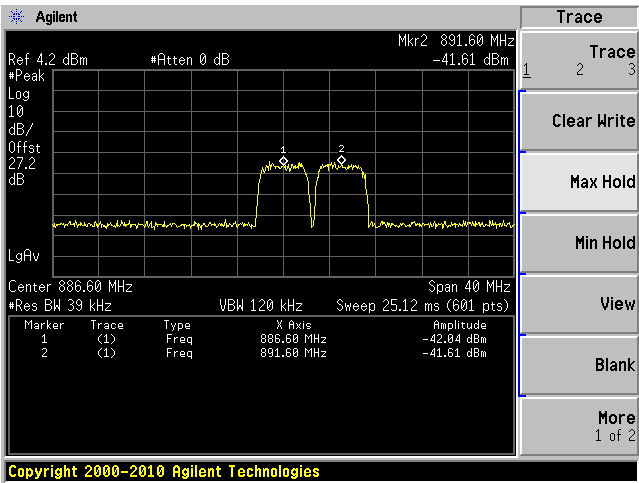
Middle Channel, Input



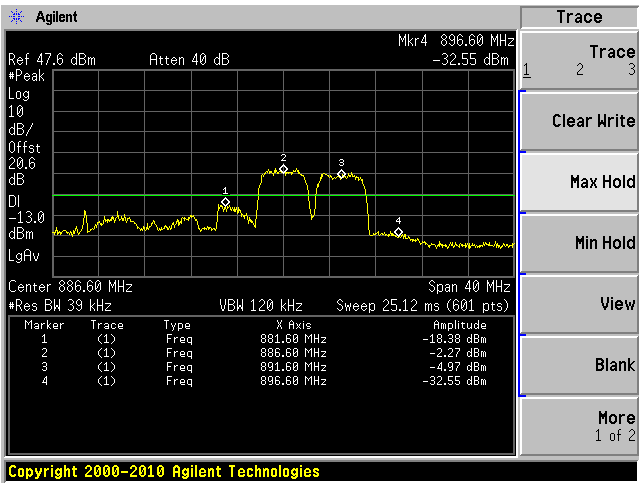
Middle Channel, Output



High Channel, Input

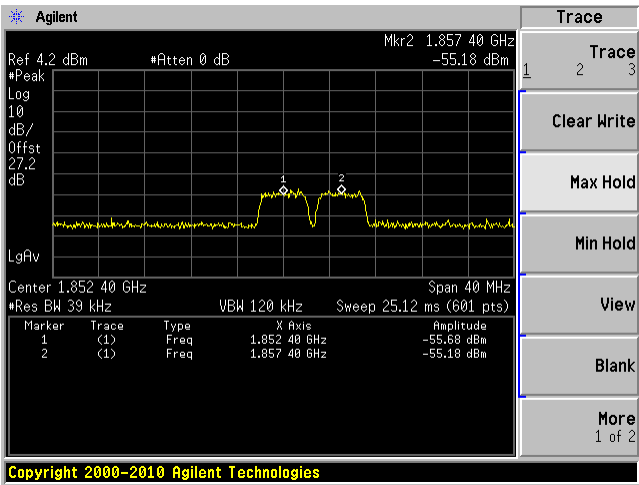


High Channel, Output

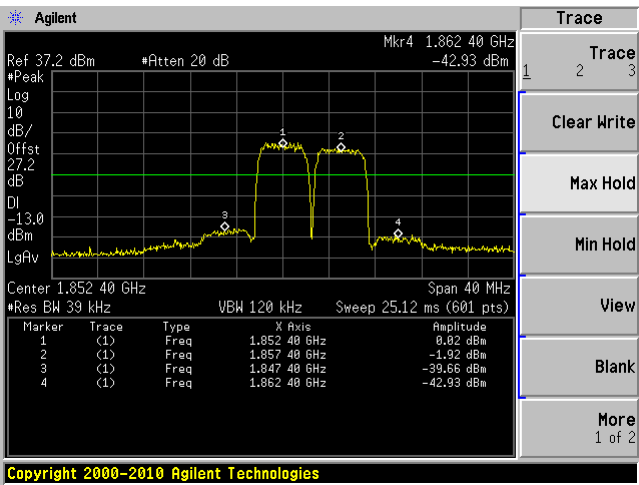


PCS Band Uplink, Modulation: WCDMA

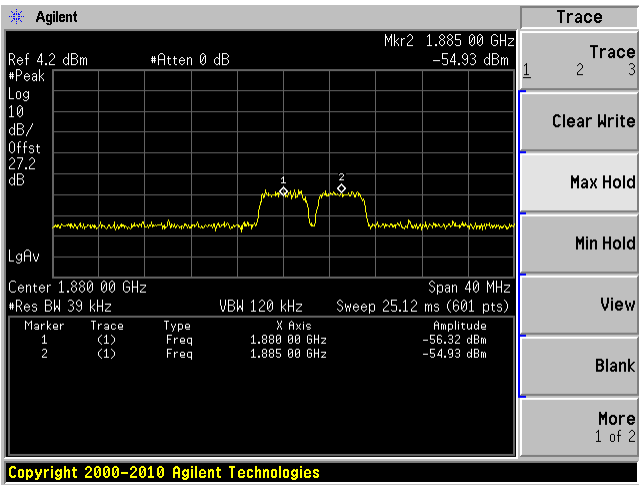
Low Channel, Input



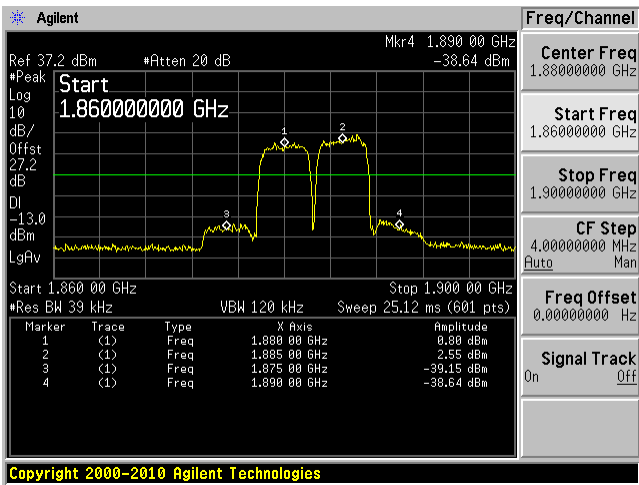
Low Channel, Output



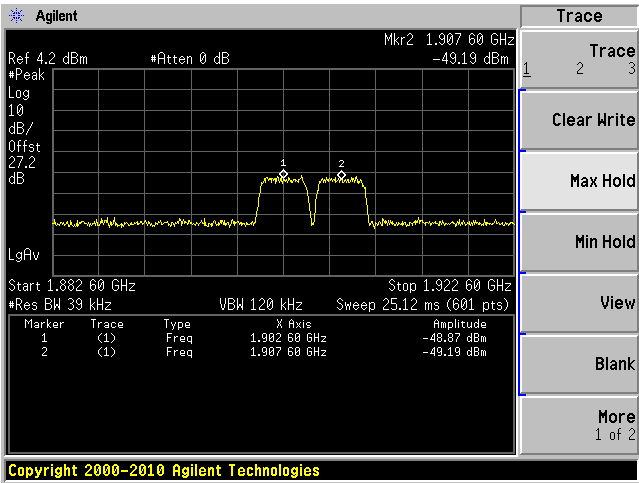
Middle Channel, Input



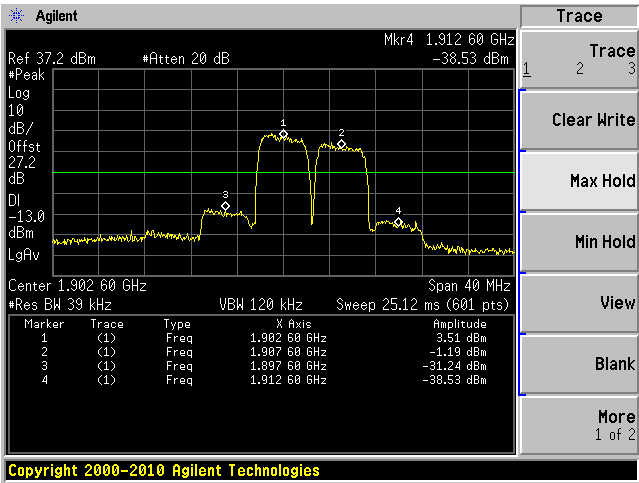
Middle Channel, Output



High Channel, Input

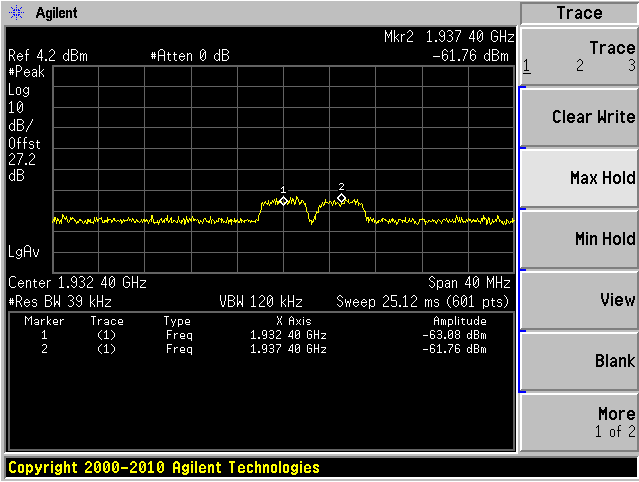


High Channel, Output

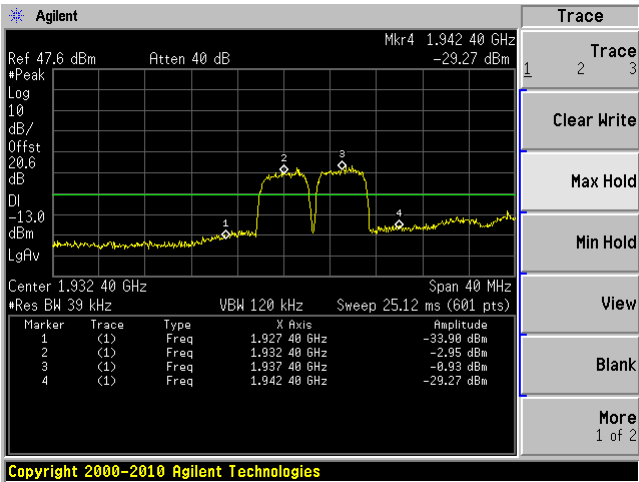


PCS Band Downlink, Modulation: WCDMA

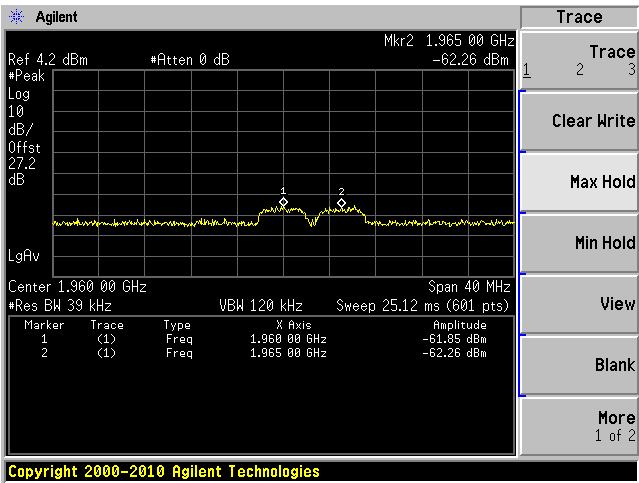
Low Channel, Input



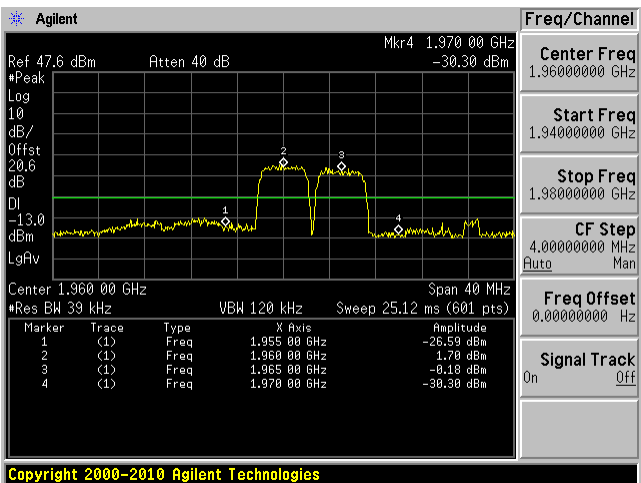
Low Channel, Output



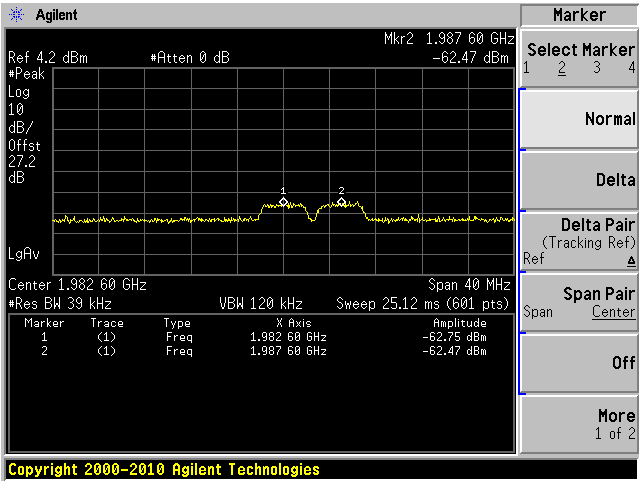
Middle Channel, Input



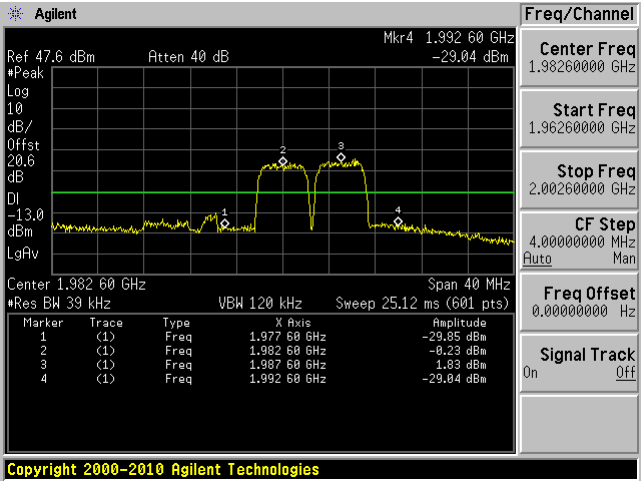
Middle Channel, Output



High Channel, Input

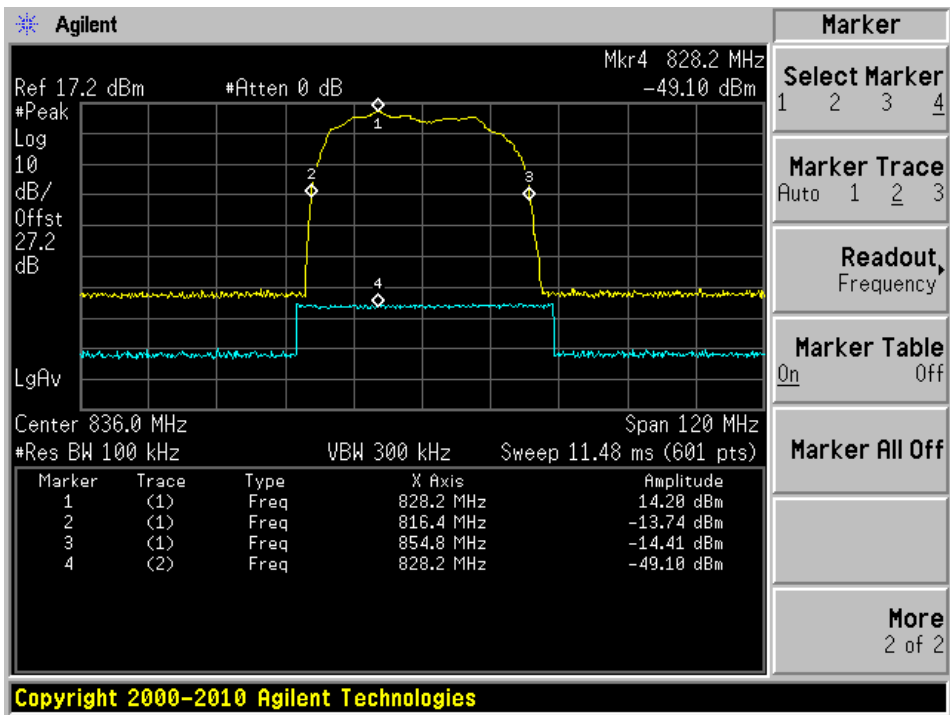


High Channel, Output

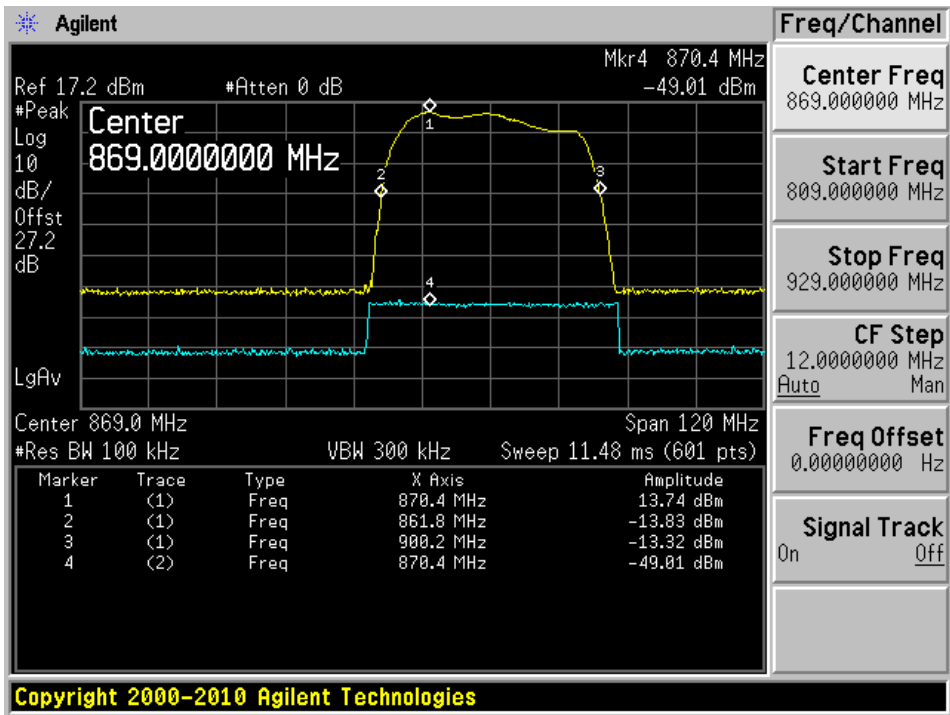


Out of Band Rejection

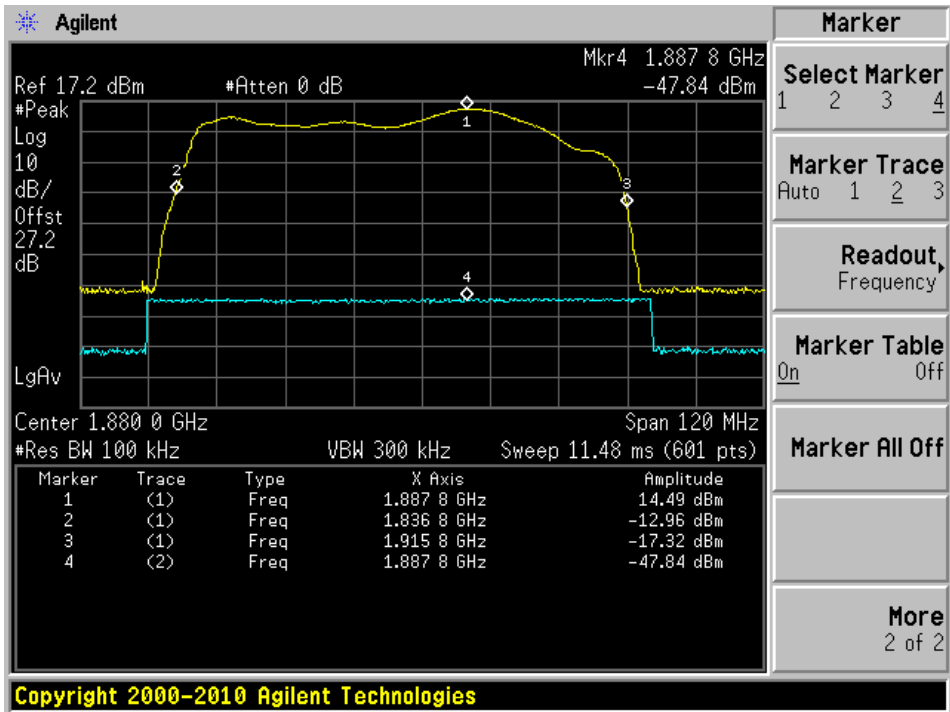
Cellular Band Uplink



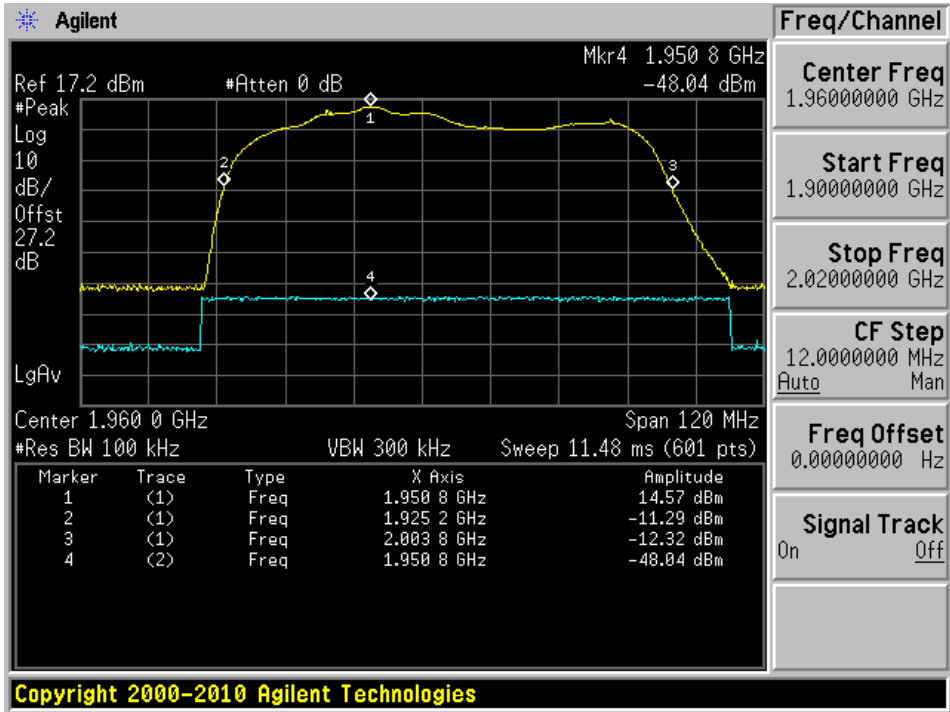
Cellular Band Downlink



PCS Band Uplink



PCS Band Downlink



8 FCC §22.917 & §24.238 - Band Edge

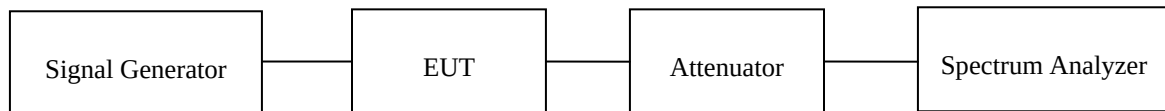
8.1 Applicable Standards

According to FCC §22.917, §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.

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 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2013-10-16	1 year
Agilent	Signal Generator	E4438C	MY45091309	2013-05-03	1 year

Statement of Traceability: *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	21° C
Relative Humidity:	42 %
ATM Pressure:	101 kPa

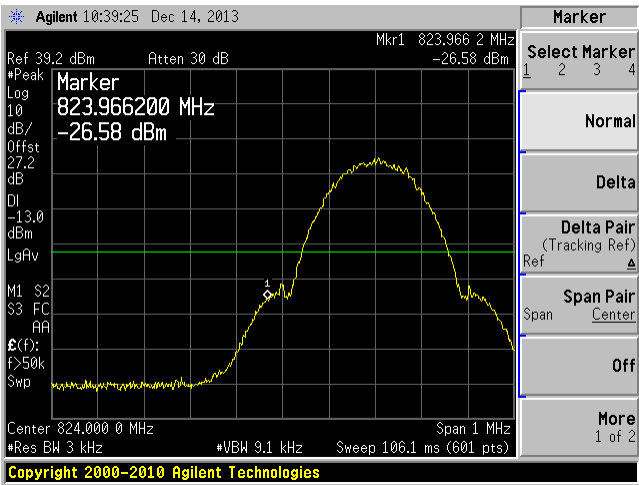
The testing was performed by Chen Ge on 2013-02-24 in the RF Site.

8.5 Test Results

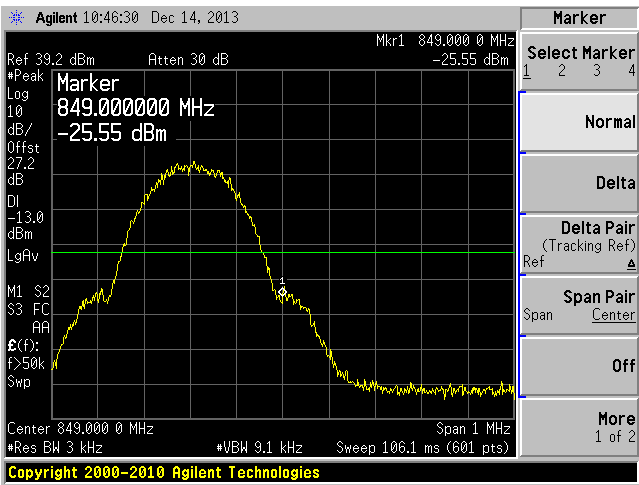
Please refer to the following plots.

Cell Band Uplink

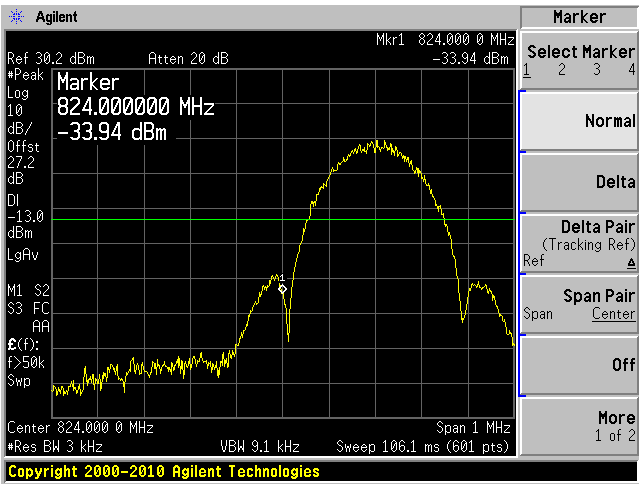
GSM - Low Channel



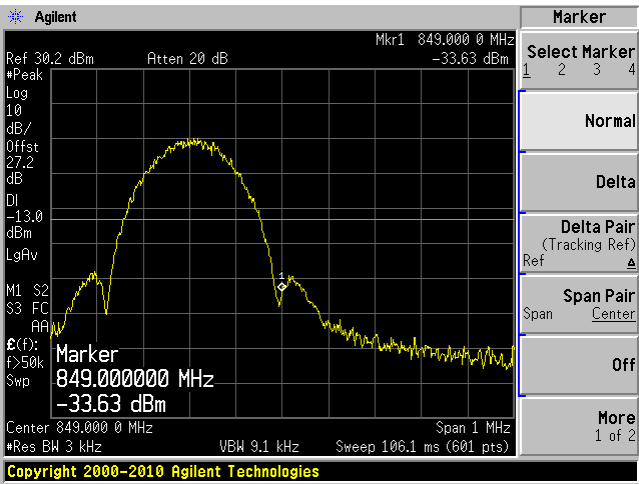
GSM - High Channel



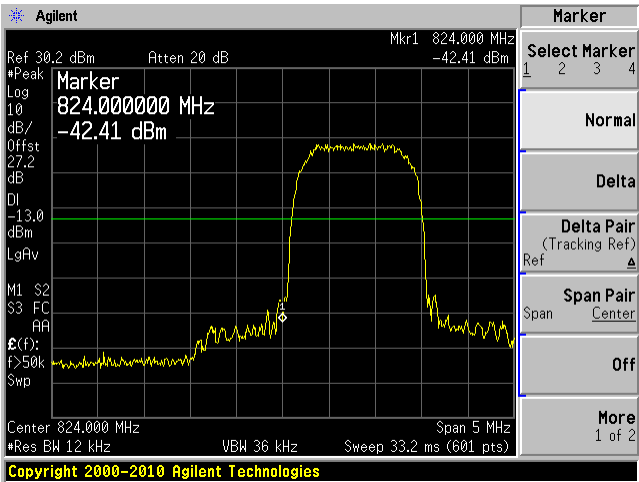
EDGE - Low Channel



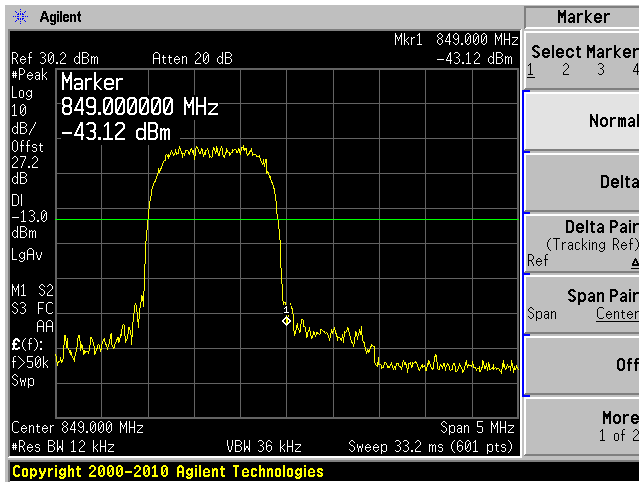
EDGE - High Channel



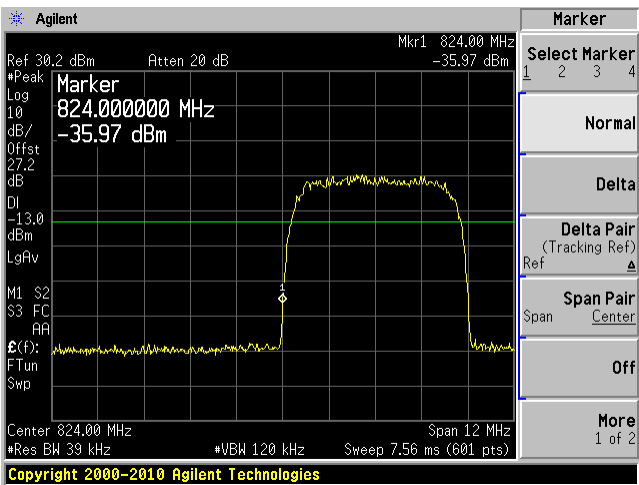
CDMA - Low Channel



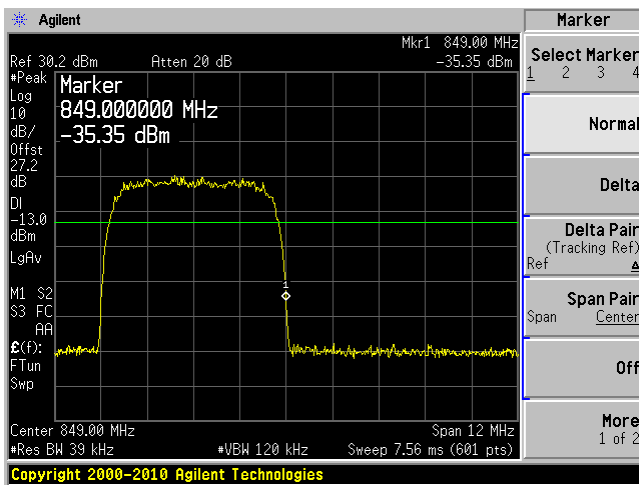
CDMA - High Channel



WCDMA - Low Channel

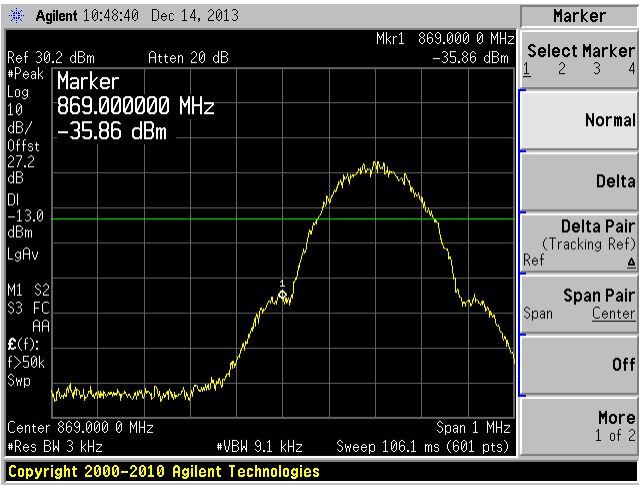


WCDMA - High Channel

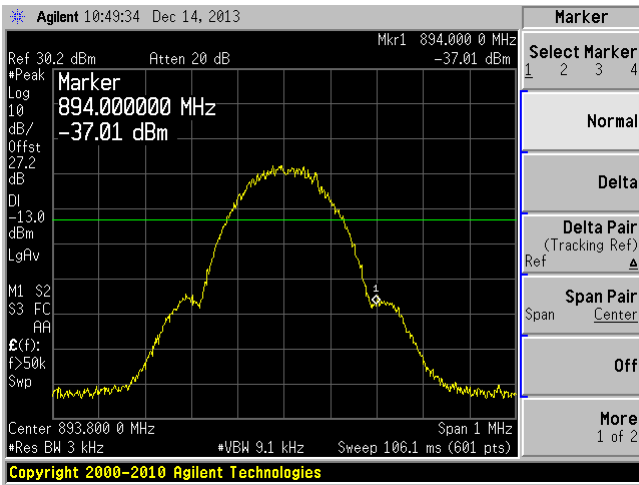


Cell Band Downlink

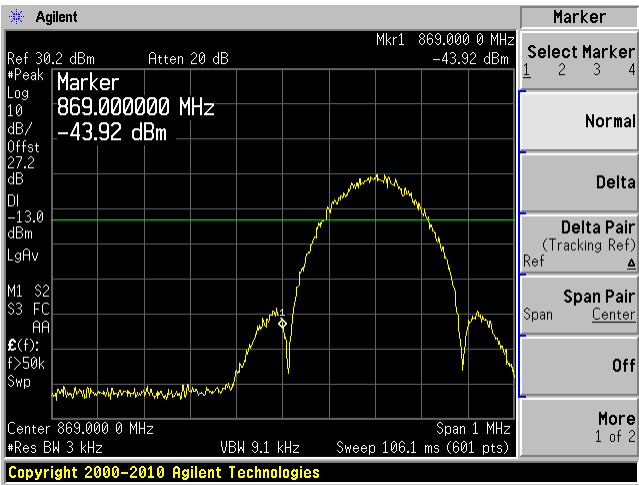
GSM - Low Channel



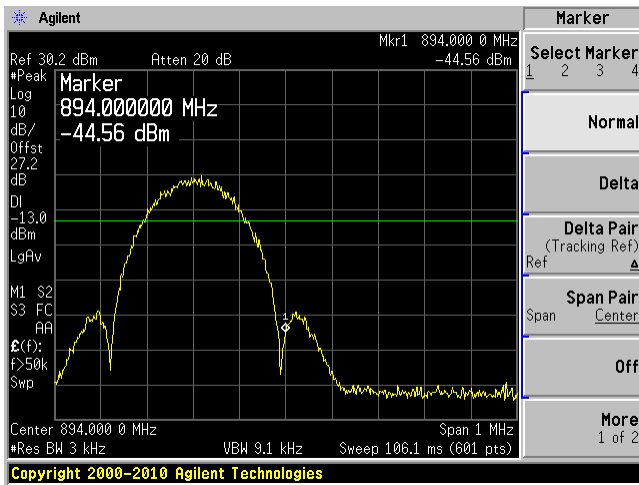
GSM - High Channel



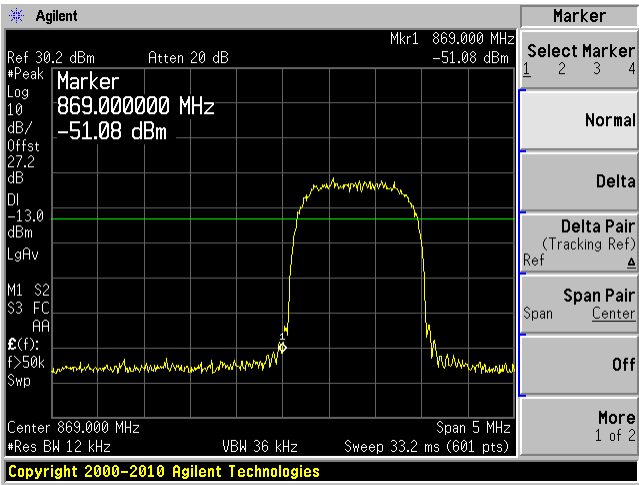
EDGE - Low Channel



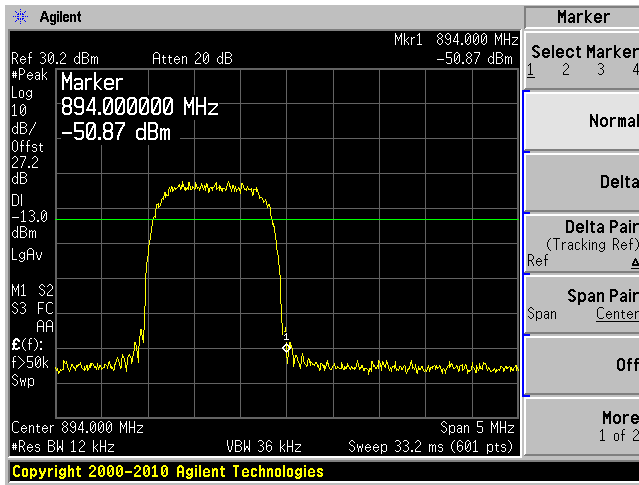
EDGE - High Channel



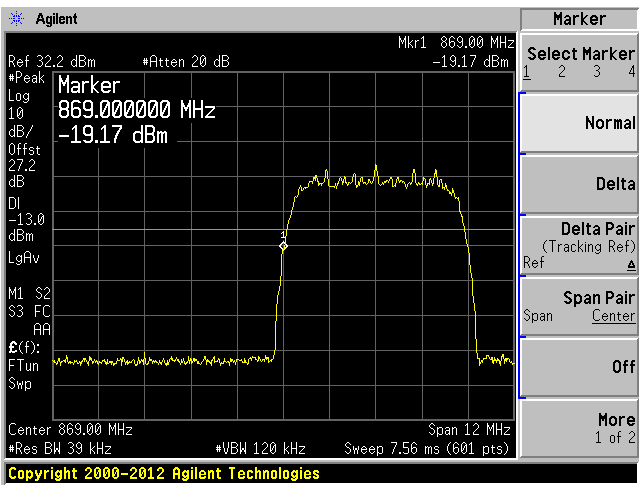
CDMA - Low Channel



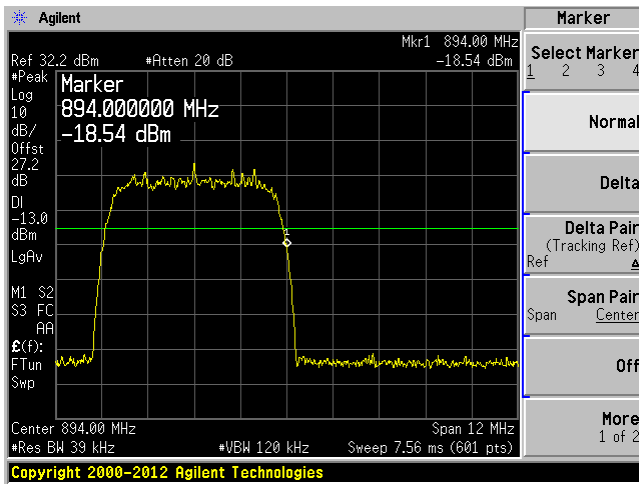
CDMA - High Channel



WCDMA - Low Channel

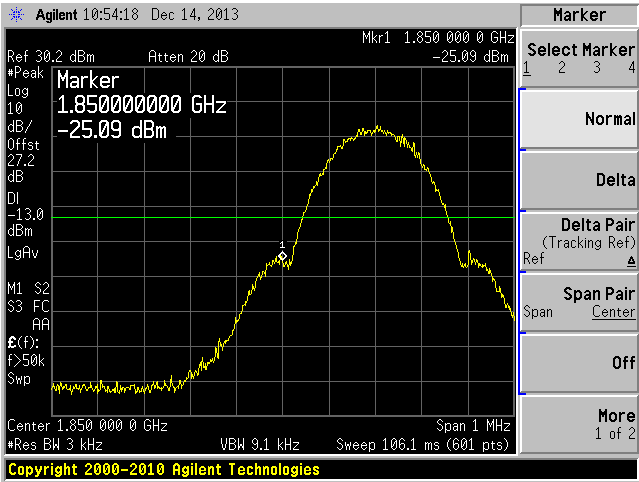


WCDMA - High Channel

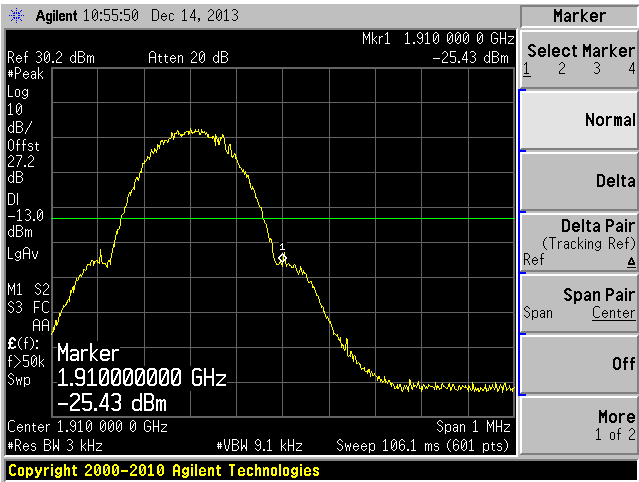


PCS Band Uplink

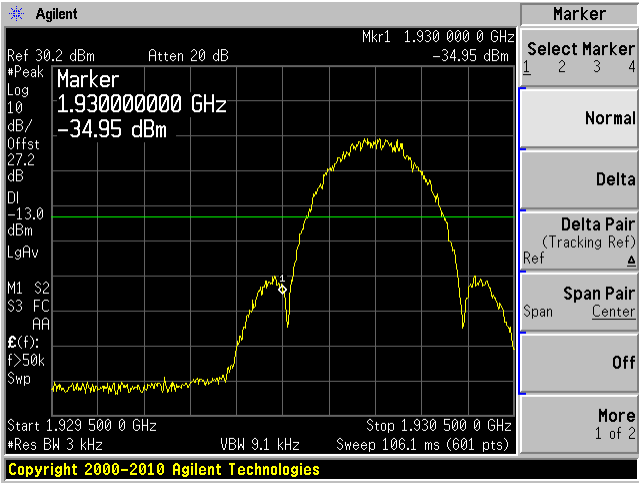
GSM - Low Channel



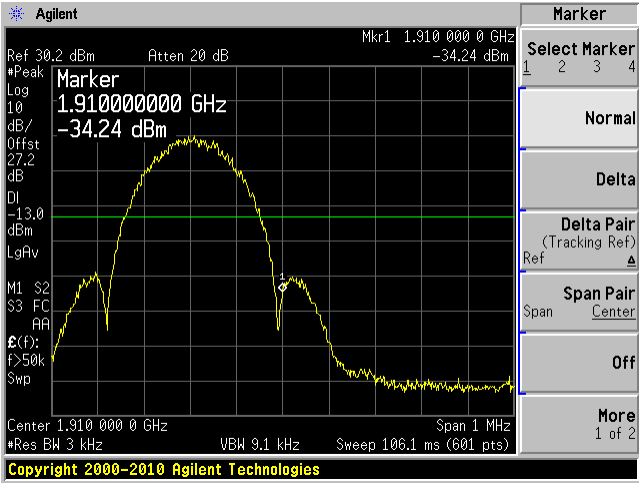
GSM - High Channel



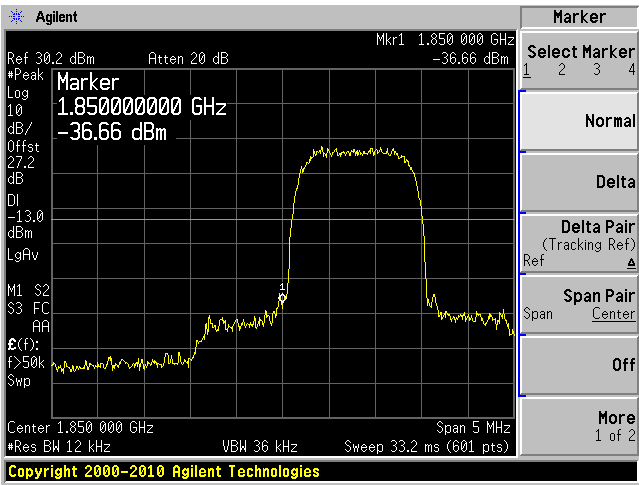
EDGE - Low Channel



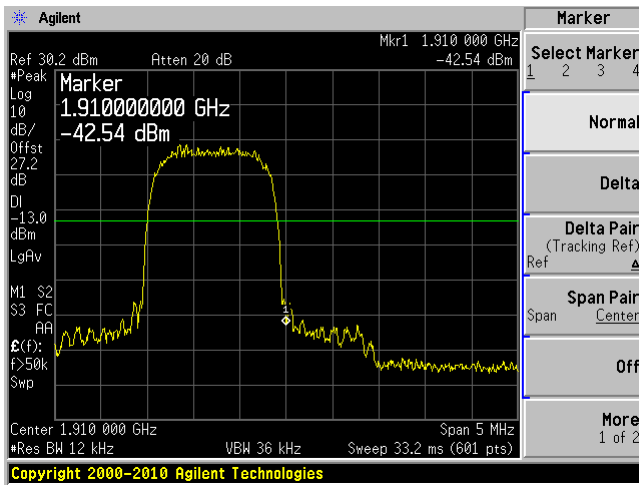
EDGE - High Channel



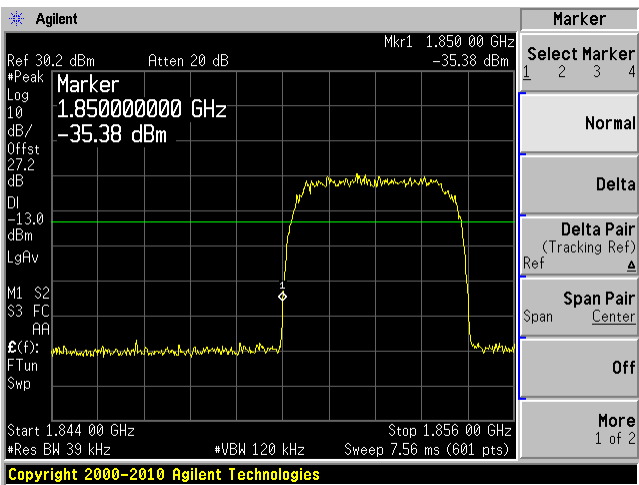
CDMA - Low Channel



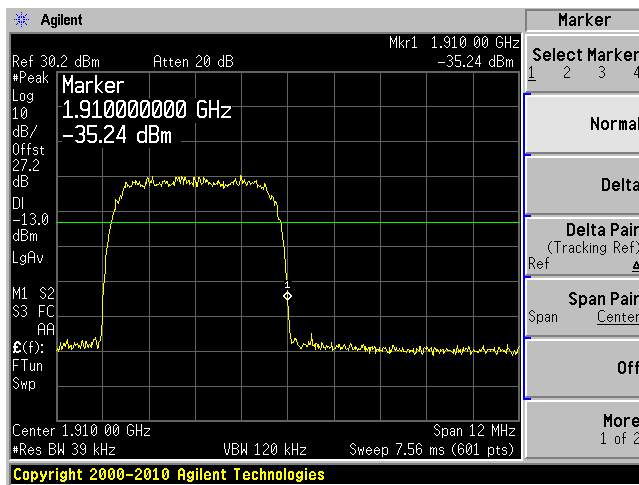
CDMA - High Channel



WCDMA - Low Channel

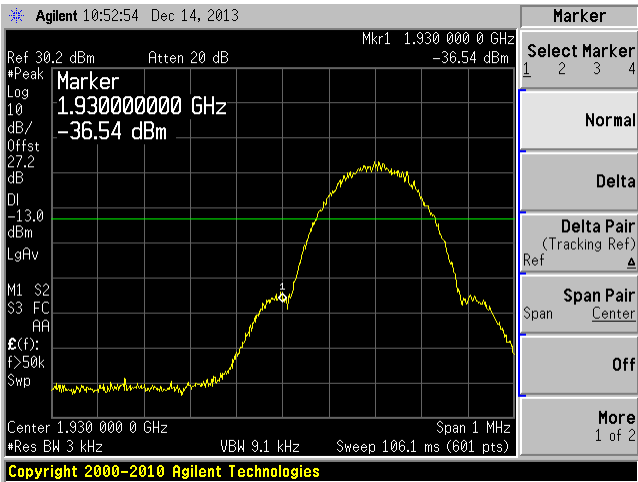


WCDMA - High Channel

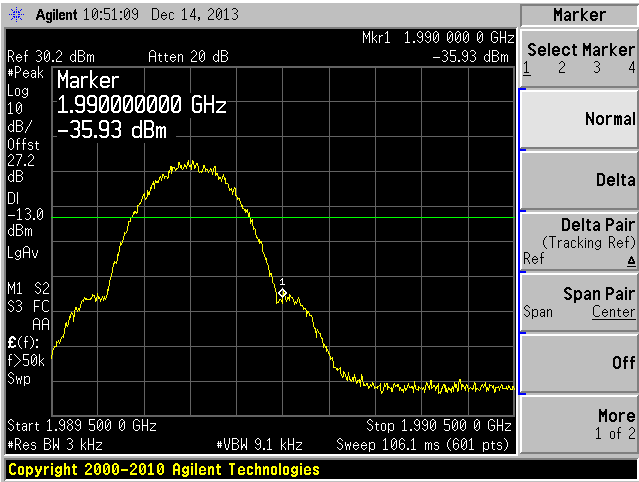


PCS Band Downlink

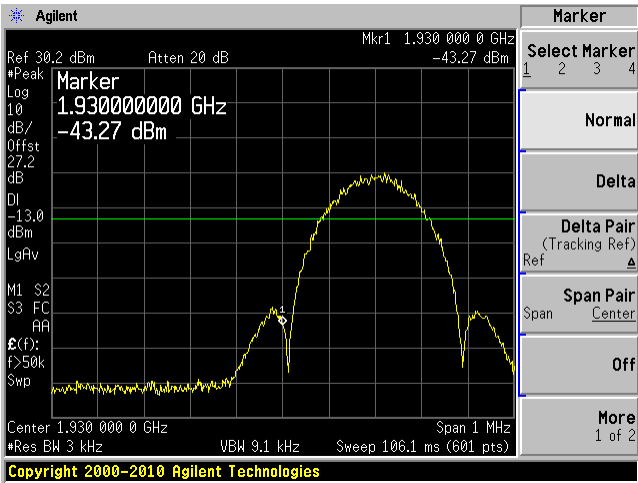
GSM - Low Channel



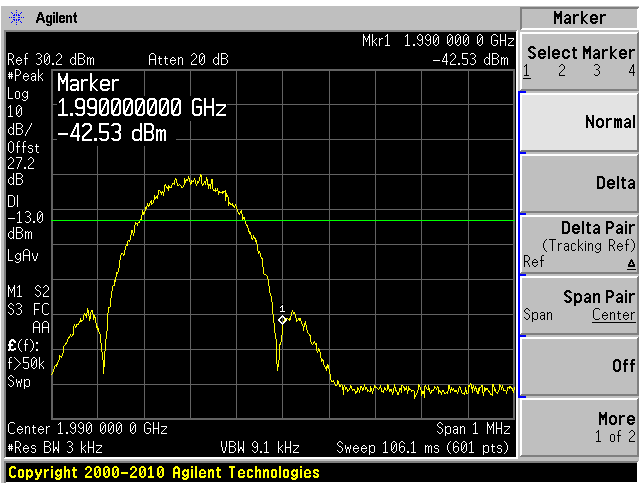
GSM - High Channel



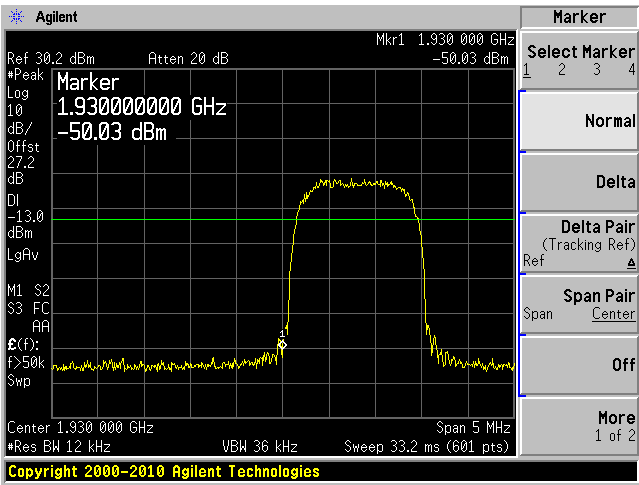
EDGE - Low Channel



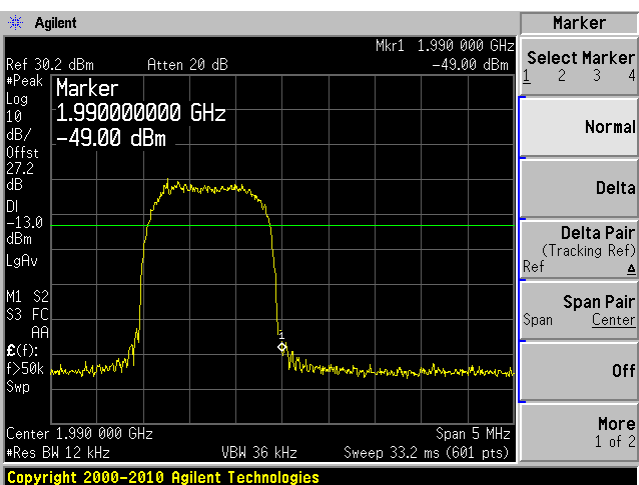
EDGE - High Channel



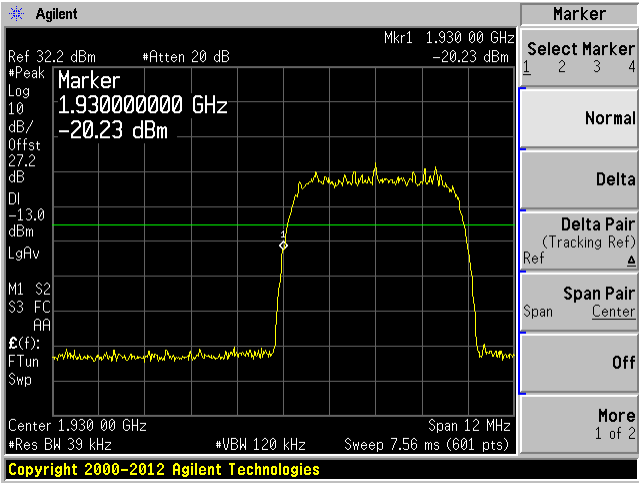
CDMA - Low Channel



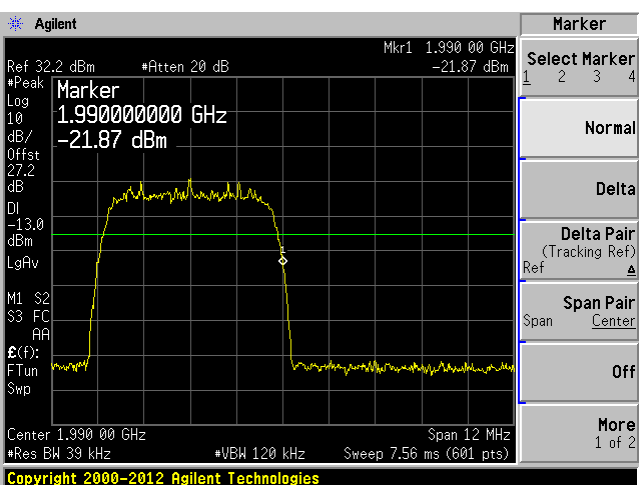
CDMA - High Channel



WCDMA - Low Channel



WCDMA - High Channel



9 FCC §1.1307(b)(1) & §2.1091 - RF Exposure

9.1 Applicable Standards

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

Note: f = frequency in MHz

* = Plane-wave equivalent power density

9.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from 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

9.3 Test Results

Cellular Band Uplink

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>20.00</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>100.00</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>848.20</u>
<u>Antenna Gain, typical (dBi):</u>	<u>5</u>
<u>Cable Loss (dB)</u>	<u>8</u>
<u>Maximum Antenna Gain+ Cable Loss (numeric):</u>	<u>0.501</u>
<u>Power density at predication frequency and distance (mW/cm²):</u>	<u>0.0692</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm²):</u>	<u>0.5654</u>

Cellular Band Downlink

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>9.99</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>9.98</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>869.2</u>
<u>Antenna Gain, typical (dBi):</u>	<u>5</u>
<u>Cable Loss (dB)</u>	<u>8</u>
<u>Maximum Antenna Gain+ Cable Loss (numeric):</u>	<u>0.501</u>
<u>Power density at predication frequency and distance (mW/cm²):</u>	<u>0.0062</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm²):</u>	<u>0.5794</u>

PCS Band Uplink

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>20.00</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>100.00</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>1880.0</u>
<u>Antenna Gain, typical (dBi):</u>	<u>3</u>
<u>Cable Loss (dB)</u>	<u>5</u>
<u>Maximum Antenna Gain+ Cable Loss (numeric):</u>	<u>1.584</u>
<u>Power density at predication frequency and distance (mW/cm²):</u>	<u>0.0396</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm²):</u>	<u>1.0</u>

PCS Band Downlink

<u>Maximum peak output power at antenna input terminal (dBm):</u>	<u>10.02</u>
<u>Maximum peak output power at antenna input terminal (mW):</u>	<u>10.05</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>1930.2</u>
<u>Antenna Gain, typical (dBi):</u>	<u>3</u>
<u>Cable Loss (dB)</u>	<u>5</u>
<u>Maximum Antenna Gain+ Cable Loss (numeric):</u>	<u>1.584</u>
<u>Power density at predication frequency and distance (mW/cm²):</u>	<u>0.0039</u>
<u>MPE limit for uncontrolled exposure at predication frequency (mW/cm²):</u>	<u>1.0</u>

Results

For uplink and downlink, the highest power density levels at 20 cm are below the MPE uncontrolled exposure limit.