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DATE: 12 February 2012

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Mobile Access Networks

Equipment under test:

Mobile AccessHX High-Power DAS Remote Unit MIMO

HX-C85P19L70MA17M-AC-A
(CELL/PCS Section)

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
I. Siboni, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

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Measurement/Technical Report for

Mobile Access Networks

Mobile AccessHX High-Power DAS Remote Unit

MIMO

FCC ID: OJFHXCPL70MAM

This report concerns:	Original Grant: X Class II change: Class I change:
Equipment type:	PCS Licensed Transmitter
Limits used: 47CFR Parts 2, 22, 24	

Measurement procedure used is ANSI C63.4-2003.
Substitution Method used as in ANSI/TIA-603-C: 2004

Application for Certification prepared by:
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ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail sraz@itl.co.il

Applicant for this device:
(different from "prepared by")
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Mobile Access Networks
8391 Old Courthouse Rd., Suite #300
Vienna, VA. 22182
U.S.A.
Tel: +1-541-758-2880
Fax: +1-703-848-0260
e-mail: sblum@mobileaccess.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Mobile Access Networks
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	Mobile AccessHX High-Power DAS Remote Unit MIMO
Equipment Model No.:	HX-C85P19L70MA17M-AC-A
Equipment Serial No.:	0B422A0
Date of Receipt of E.U.T:	19.12.2011
Start of Test:	19.12.2011
End of Test:	01.01.2012
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Parts 22, 24, 27

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

MobileAccess**HX** is a high power, remote solution for the MobileAccess**1000** (MA1000) and MobileAccess**2000** (MA2000) Distributed Antenna Systems. It is a fiber-fed, compact and scalable multi-service platform designed to complement the MA1000 and MA2000 and provide complete RF open space coverage for large-scale public venues, such as campuses, stadiums, convention centers, hotels, airports, and train stations. The solution can be deployed in new sites or alongside existing MA1000 and MA2000 systems, sharing a common head-end and element management system (EMS).

MobileAccess**HX** will support multiple wireless technologies and operator services over a single broadband infrastructure. Using low loss fiber optic cabling, remote units can cover distances of up to 2Km from the BTS signal sources at the head-end.

Alongside MA1000 and MA2000 deployments, MobileAccess**HX** provides a comprehensive indoor and outdoor coverage solution for varying site requirements, supporting everything from high-rise buildings and campus topologies, to stadiums and airports.

Features & Benefits:

Multi-Service Platform: Accommodates GSM, UMTS, HSPA, LTE, EDGE, EV-DO, AWS, and more. Provides MIMO configuration for LTE700, AWS and UMTS band.

Cost-Effective High Power: Optimizes and reduces the number of antennas required to cover open areas by offering 33dBm (2W) composite power per frequency band.

Indoor Models: Supports either SISO or MIMO service in a single compact enclosure.

Outdoor Models: Outdoor enclosures are compliant to IP65/NEMA standard.

Carrier-Grade Operation: Advanced signal handling and management ensures carrier-grade performance in multi-operator deployments.

Design and Deployment Flexibility: Remote unit supports both SM and MM fiber connections and are available in AC or DC power supply options. Antenna splitting schemes are possible due to the higher power output capability.

Backwards Compatible: Connects to an existing MobileAccess**1000** or MobileAccess**2000** deployment (Shares a common head-end and EMS in a single deployment).

System Architecture

MobileAccess**HX** provides a complete solution consisting of HX remote units at the remote locations, and head-end elements that are shared with any MA1000 or MA2000 system that is either installed or being installed at the site.
In the downlink, at the head-end, the BTS or BDA signal is conditioned by the **RIU**, ensuring a constant RF level. The conditioned signal is then converted by the Base Unit to an optical signal for transport over single or multi-mode fiber to the HX remote units, which are located at the remote locations. In the uplink, the process is reversed. The **SC-450 Controller** enables local and remote management, as well as controls all MA1000, MA2000, and HX elements from a single, centralized location.
The **MobileAccessHX Remote Unit** (indoor-SISO/MIMO and outdoor-SISO models) consists of a compact enclosure that houses the RF module, power elements, and the required interfaces. The RF module supports three bands (GSM, DCS, and UMTS) and two types of quad bands (Type 1: LTE700, CELL, PCS, and AWS or Type 2: CELL, EGSM, DCS, or UMTS) All mobile services are combined and distributed through a single antenna port over antennas installed at the remote locations.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Both conducted and radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB
Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the HX (High Power Remote Module) which is connected with the head-end DAS equipment using fiber optic cable.
The RF source signals (CELL and PCS) are represented in the setup by appropriate signal generators.
An "Exercise" SW on the computer was used to enable / disable transmission of the EUT, while the EUT output was connected to the spectrum analyzer.

The E.U.T. is available powered from AC or DC

To select the worst case host to be fully tested, an exploratory radiated emission test was performed inside the shielded room.

The units were placed on a 0.8 meter high wooden table, 1meter from the tests antenna, which was 1 m high.

The results of the exploratory radiated emission tests are shown in the table below.

Frequency (MHz)	AC Configuration (dBµV/m)	DC Configuration (dBµV/m)
72.60	47.5	45.5
373.00	42.9	42.6
865.00	41.9	39.9
4270.00	43.4	43.6

Based on the above exploratory radiated emission test, the AC powered configuration was selected as the "worst case" host.

2.2 EUT Exercise Software

The Element Management System EngGUI ver. 1.00 build 10 used for commands delivery.
These commands are used to enable / disable of EUT transmission.
EUT Embedded SW version 01.00 build 14

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

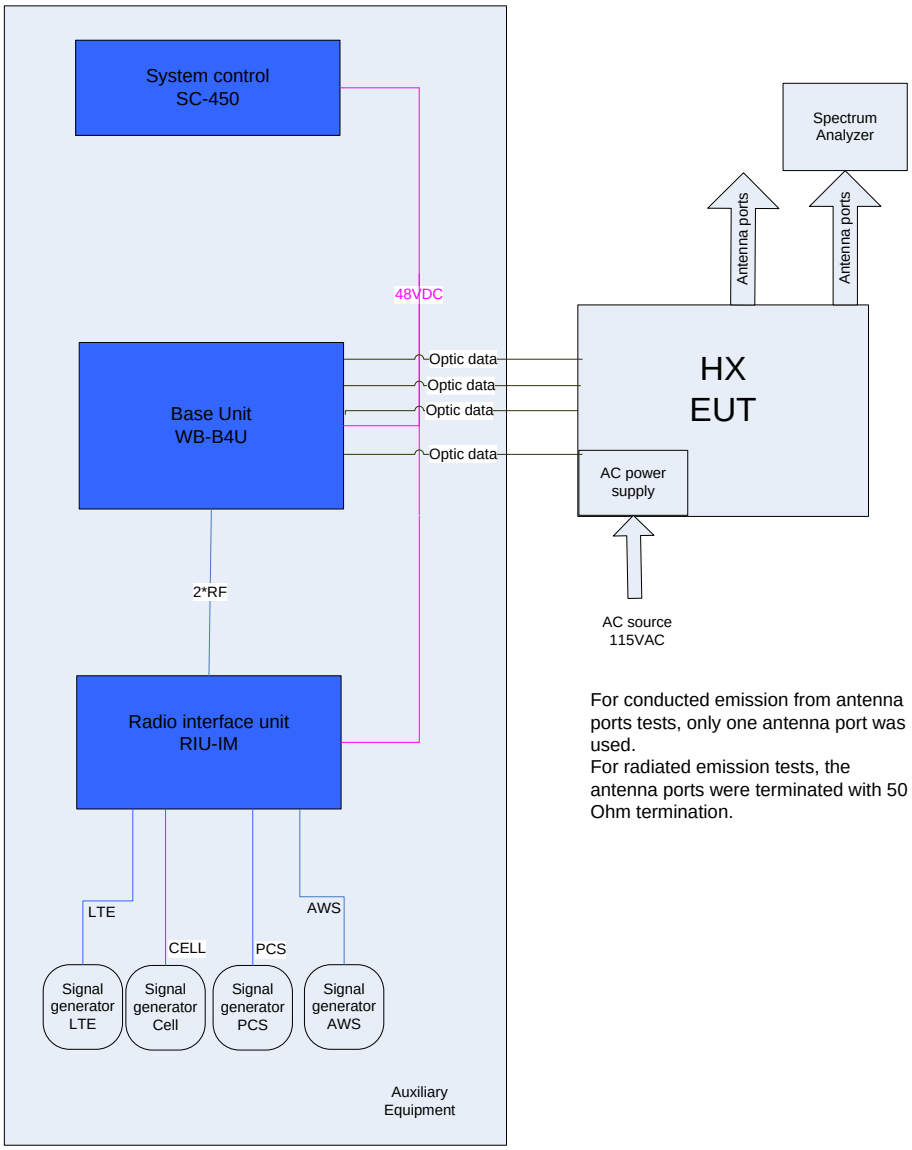

Figure 1. Tests Set-up

3. Conducted and Radiated Measurement Test Set-ups Photos

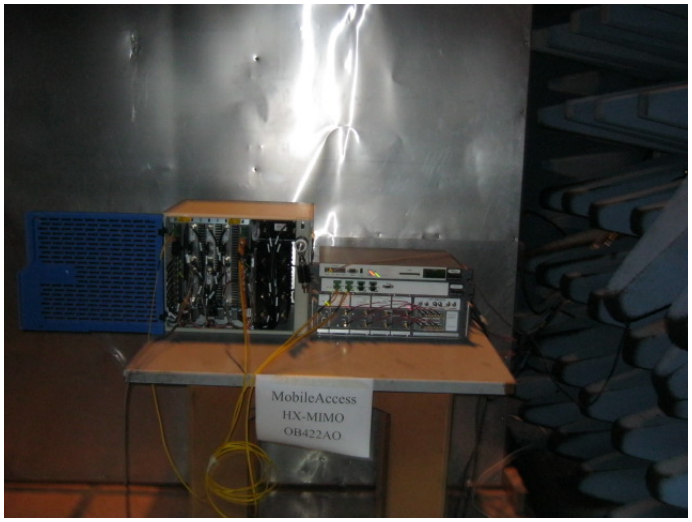

Figure 2. Conducted Emission From AC Mains Test

Figure 3. Conducted Emission From Antenna Ports Tests

Figure 4. Radiated Emission Test

4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Results

JUDGEMENT: Passed by 2.7 dB

The margin between the emission levels and the specification limit is, in the worst case, 2.7 dB for the phase line at 11.61 MHz and 3.8 dB at 11.62 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 5* to *Figure 8*.

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

Conducted Emission

E.U.T Description	Mobile AccessHX High-Power DAS Remote Unit MIMO
Type	HX-C85P19L70MA17M-AC-A
Serial Number:	0B422A0

Specification:	F.C.C., Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.151625	57.2	50.5	-28.5	34.9	-31.1	0.0
2	0.169082	54.4	48.0	-31.0	26.8	-39.2	0.0
3	0.326575	47.4	41.4	-37.6	32.1	-33.9	0.0
4	0.553687	51.2	44.1	-28.9	27.1	-32.9	0.0
5	3.436953	47.7	44.2	-28.8	32.9	-27.1	0.0
6	11.614840	57.7	57.3	-15.7	57.3	-2.7	0.0

Figure 5. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Mobile AccessHX High-Power DAS Remote Unit MIMO
Type	HX-C85P19L70MA17M-AC-A
Serial Number:	0B422A0

Specification:	F.C.C., Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

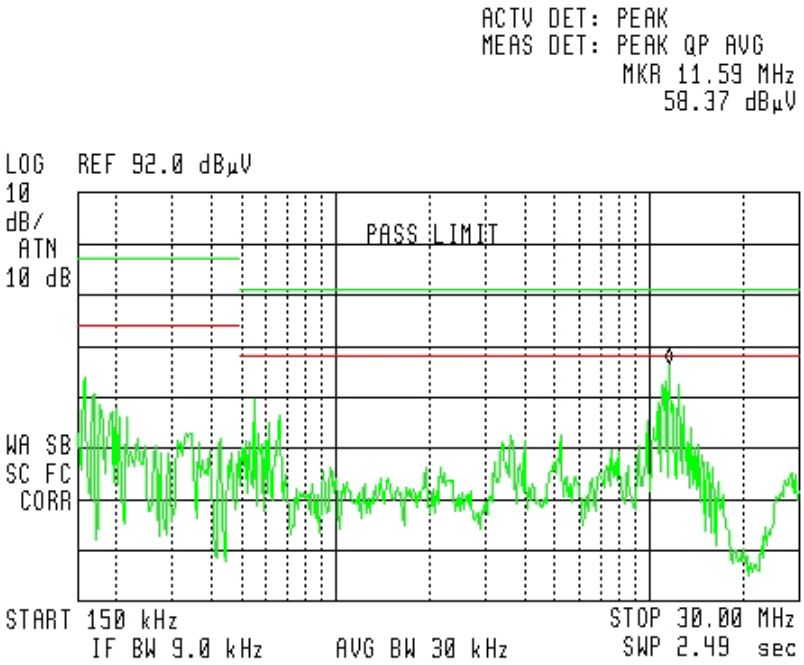

Figure 6. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description	Mobile AccessHX High-Power DAS Remote Unit MIMO
Type	HX-C85P19L70MA17M-AC-A
Serial Number:	0B422A0

Specification:	F.C.C., Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.151639	57.3	49.8	-29.2	35.0	-31.0	0.0
2	0.220585	48.3	41.5	-37.5	25.5	-40.5	0.0
3	0.641202	44.1	38.5	-34.5	20.5	-39.5	0.0
4	3.657524	47.8	43.8	-29.2	31.7	-28.3	0.0
5	5.049944	48.3	43.2	-29.8	30.7	-29.3	0.0
6	11.623800	57.1	56.3	-16.7	56.2	-3.8	0.0

Figure 7. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Mobile AccessHX High-Power DAS Remote Unit MIMO
Type	HX-C85P19L70MA17M-AC-A
Serial Number:	0B422A0

Specification:	F.C.C., Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

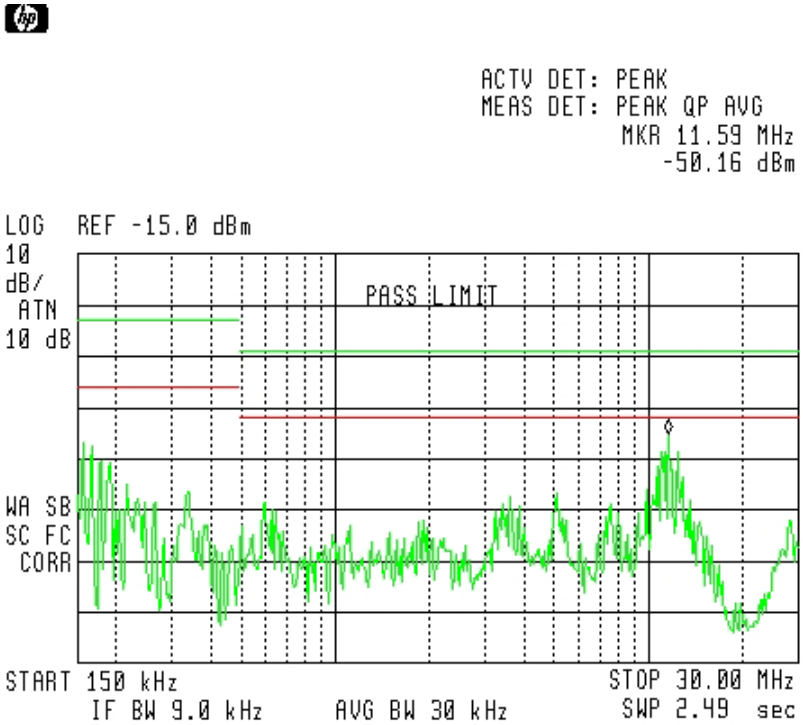

Figure 8 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2011	1 Year
EMI Receiver	HP	85422E	3906A00276	December 12 2011	1Year
RF Filter Section	HP	85420E	3705A00248	December 12 2011	1Year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

5. Peak Output Power CELL

5.1 Test Specification

FCC Part 22.913

5.2 Test procedure

Peak Power Output must not exceed 500 Watts (57dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (40 dB) and an appropriate coaxial cable (1dB). The E.U.T. RF output was modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1.0 MHz RBW. The output power level was measured at 870.20, 881.0, and 892.80 MHz.

CDMA:

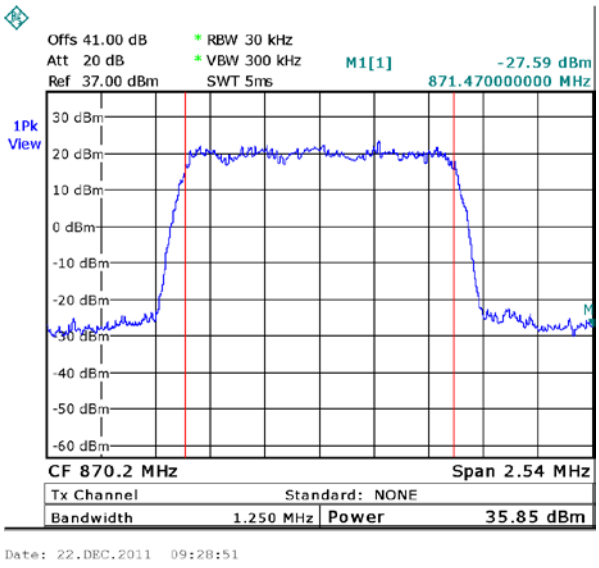

Figure 9.— 870.20 MHz

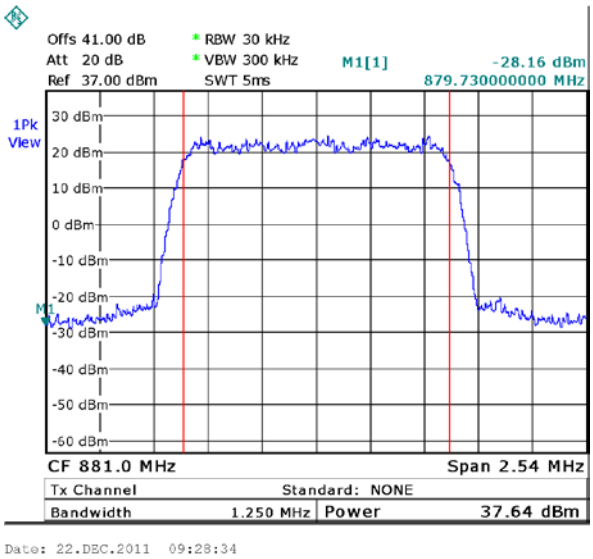

Figure 10.— 881.00 MHz

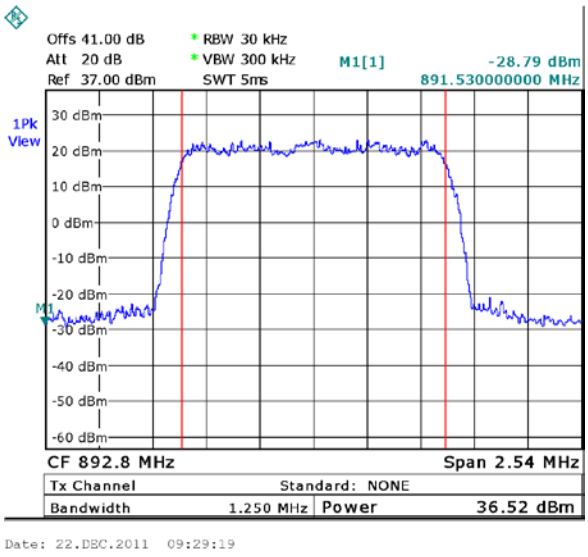

Figure 11.— 892.80 MHz

GSM:

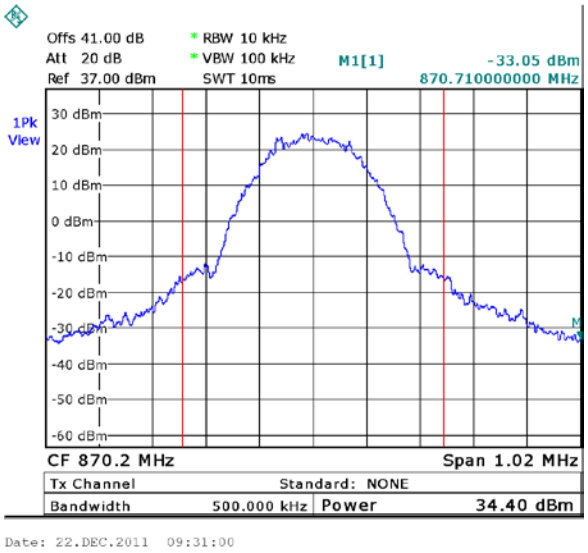

Figure 12.— 870.20 MHz

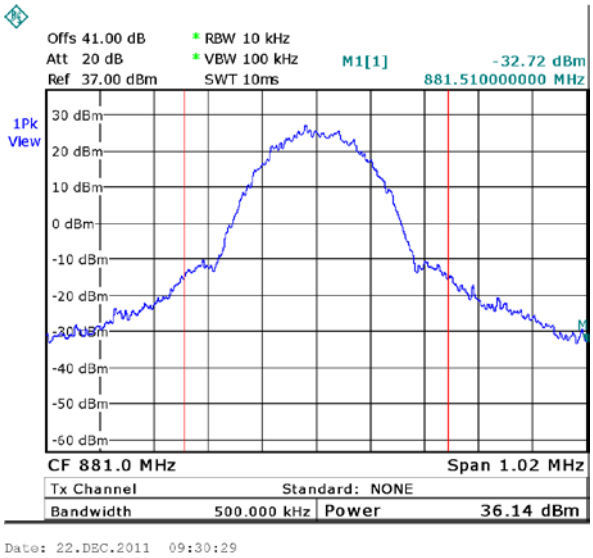

Figure 13.— 881.00 MHz

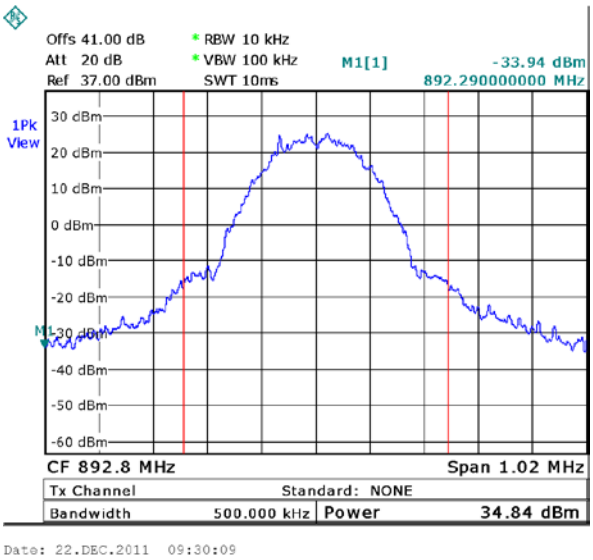

Figure 14.— 892.80 MHz

W-CDMA:

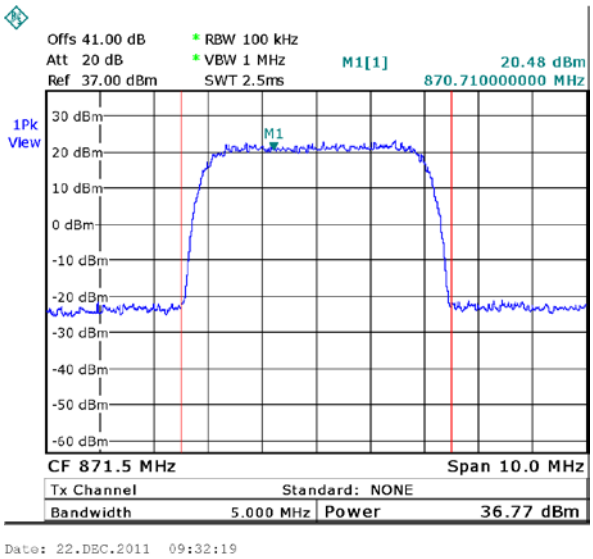

Figure 15.— 871.50 MHz

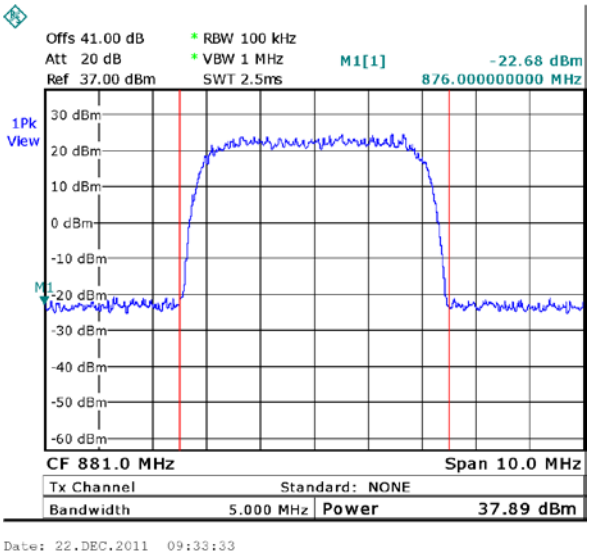

Figure 16.— 881.00 MHz

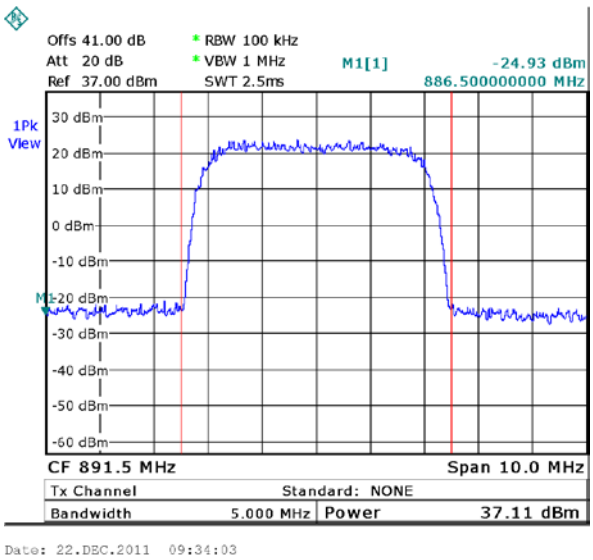

Figure 17.— 891.50 MHz

5.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 22 Section 913, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.2	35.85	57.0	-21.15
	881.0	37.64	57.0	-19.36
	892.8	36.52	57.0	-20.48
GSM	870.2	34.40	57.0	-22.60
	881.0	36.14	57.0	-20.86
	892.8	34.84	57.0	-22.16
W-CDMA	871.5	36.77	57.0	-20.23
	881.0	37.89	57.0	-19.11
	891.5	37.11	57.0	-19.89

Figure 18 Peak Output Power CELL

JUDGEMENT: Passed by 19.1 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

5.4 Test Equipment Used.

Peak Output Power CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Swartz	FSL	10-300191865	October 30, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 19 Test Equipment Used

6. Occupied Bandwidth CELL

6.1 Test Specification

FCC Part 2, Section 1049

6.2 Test Procedure

The E.U.T. was set to the applicable test frequency with modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution B.W.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.
The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

CDMA

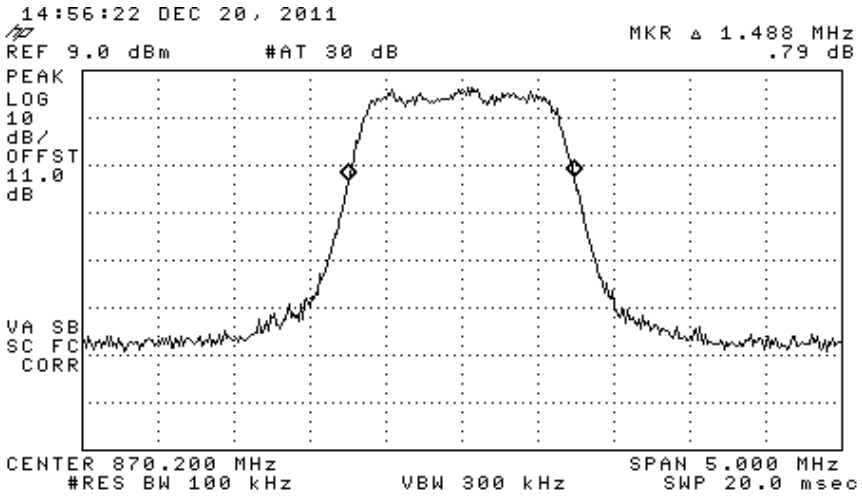

Figure 20.— Input 870.20

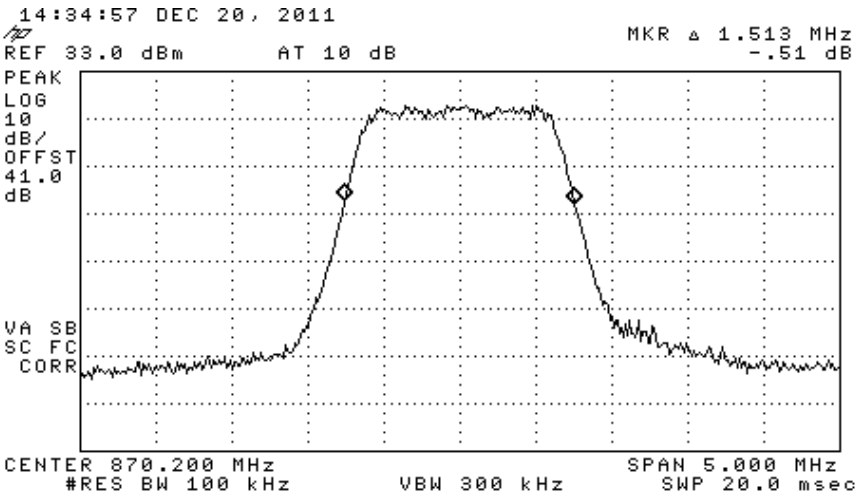

Figure 21.— Output 870.20

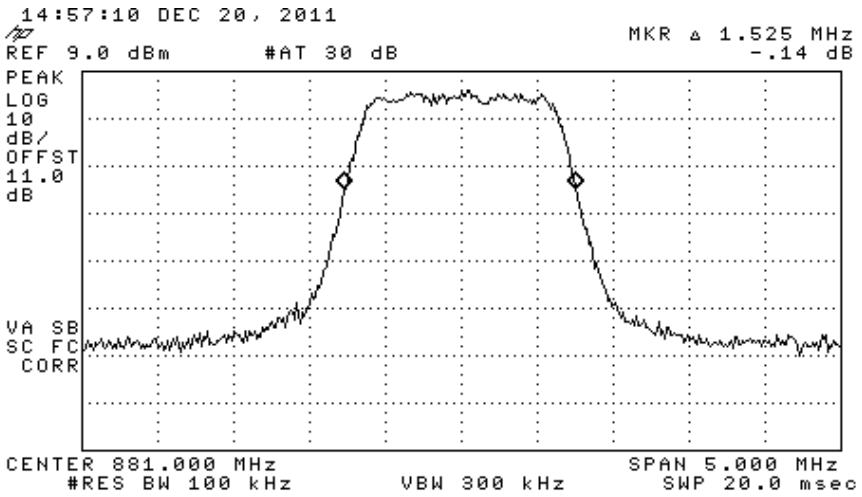

Figure 22.— Input 881.0 MHz.

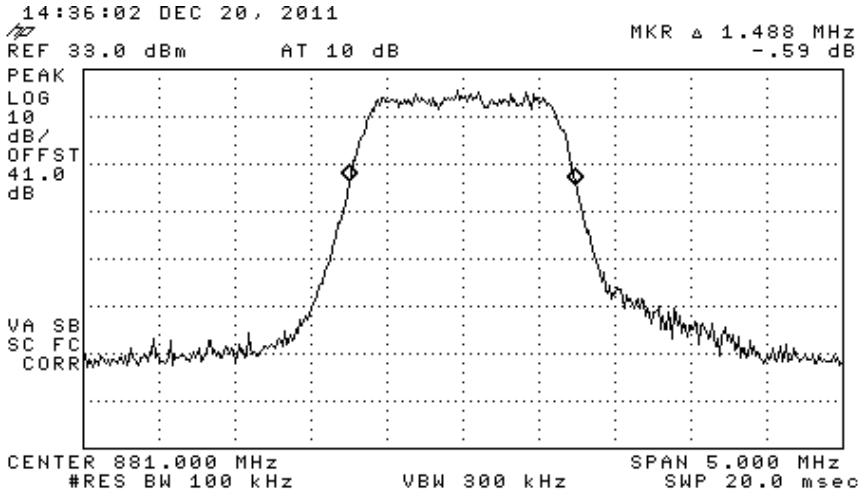

Figure 23.—Output 881.0Hz.

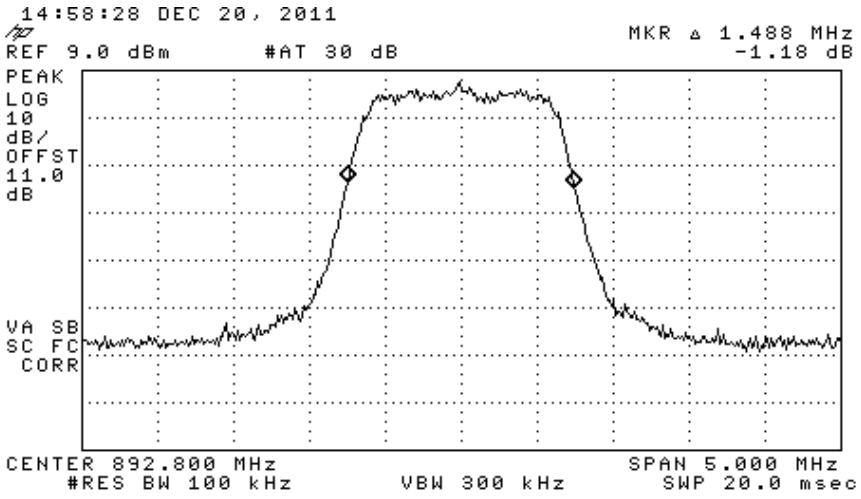

Figure 24.— Input 892.80 MHz.

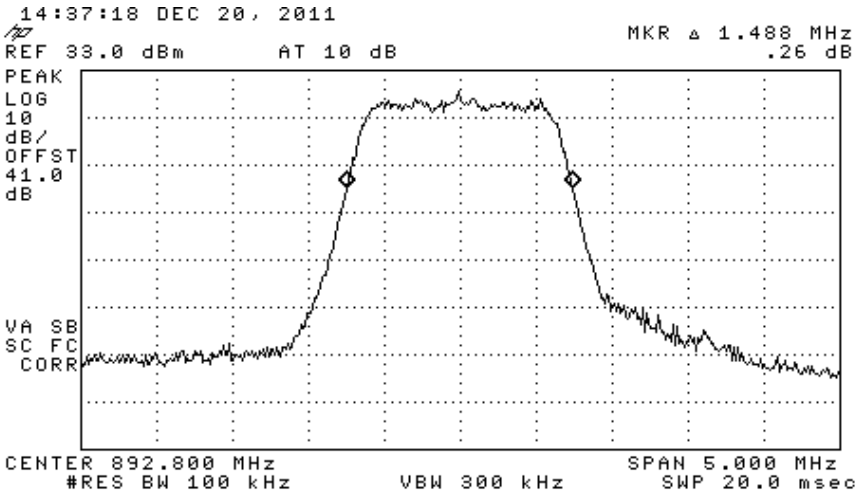

Figure 25.— Output 892.80 MHz.

GSM:

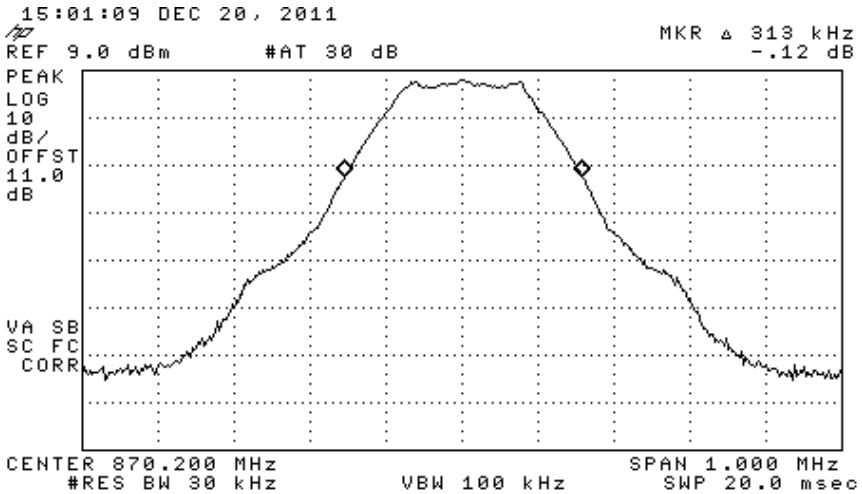

Figure 26.— Input 870.20

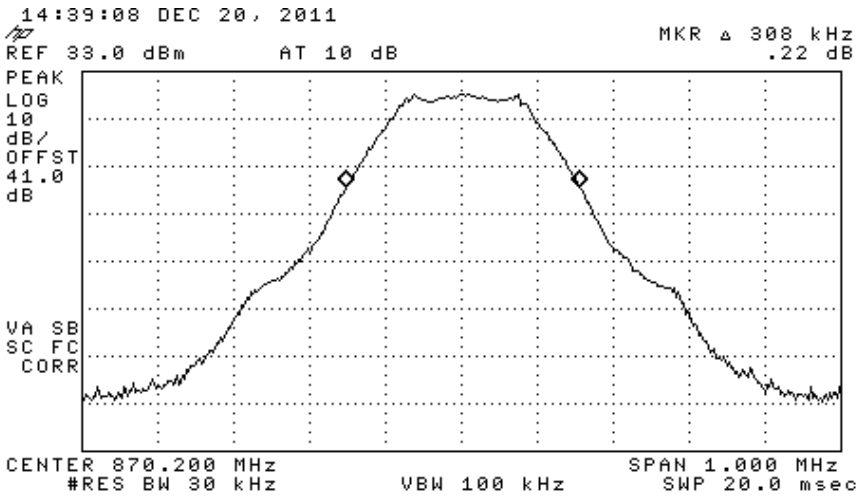

Figure 27.— Output 870.20

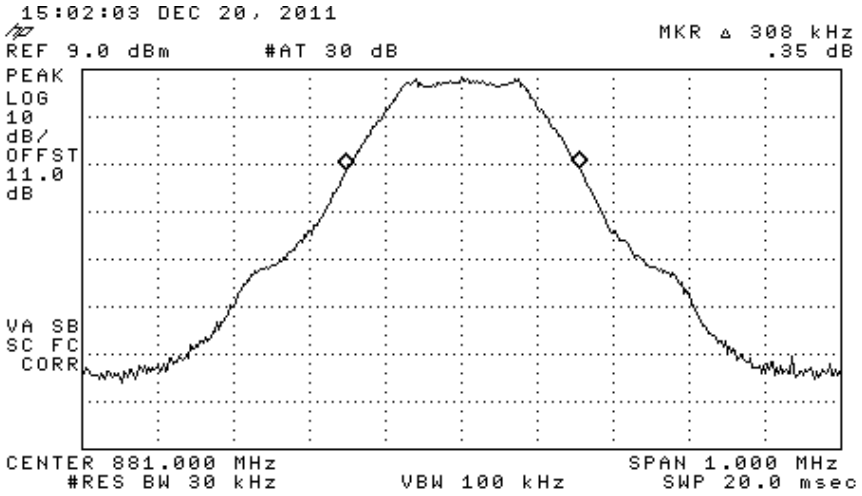

Figure 28.— Input 881.0 MHz.

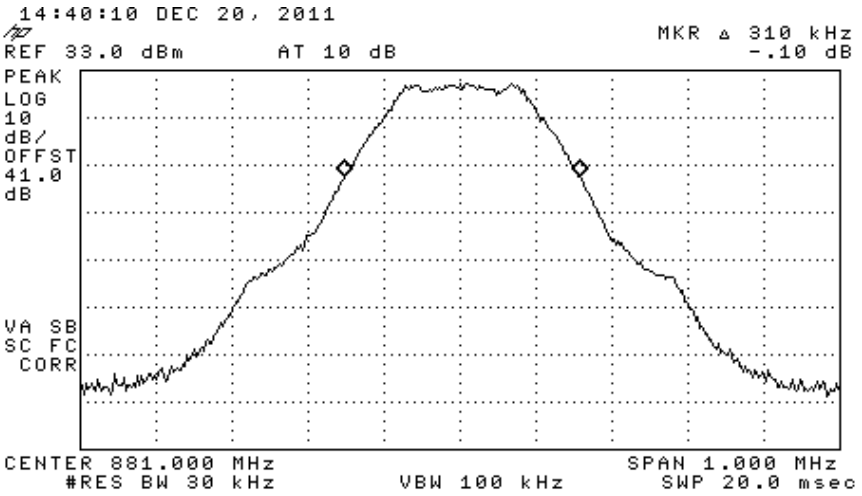

Figure 29.—Output 881.0Hz.

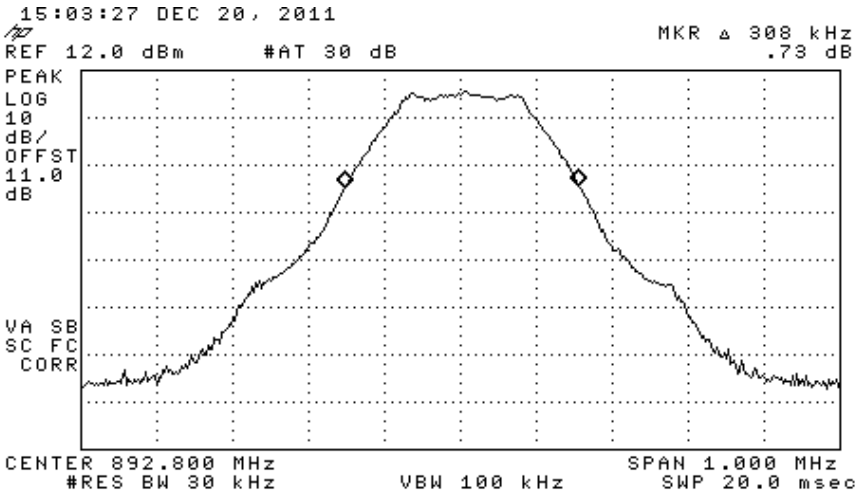

Figure 30.— Input 892.8 MHz.

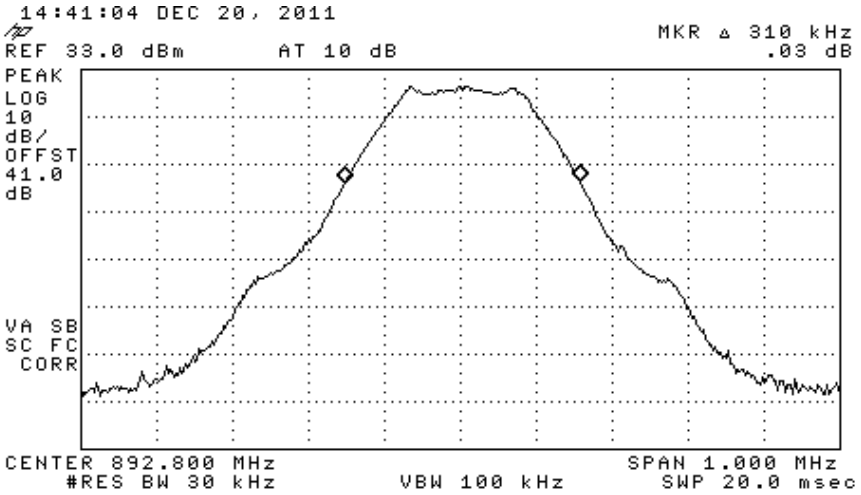

Figure 31.— Output 892.8 MHz.

W-CDMA:

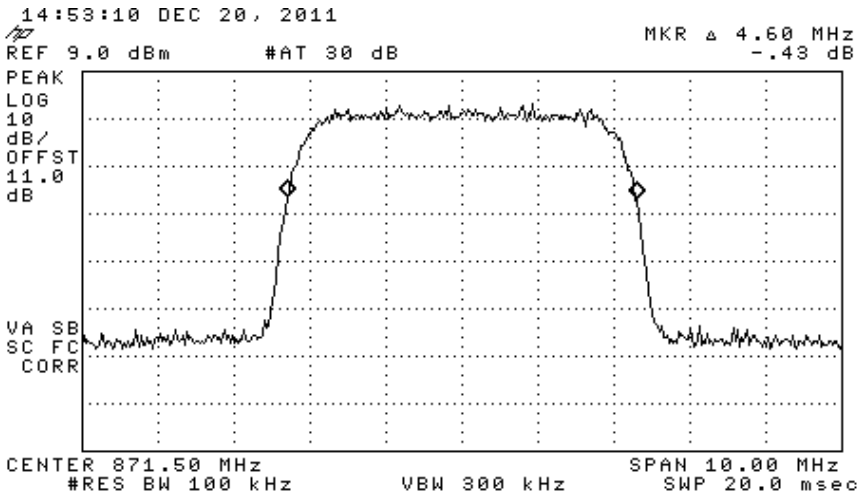

Figure 32.— Input 871.50

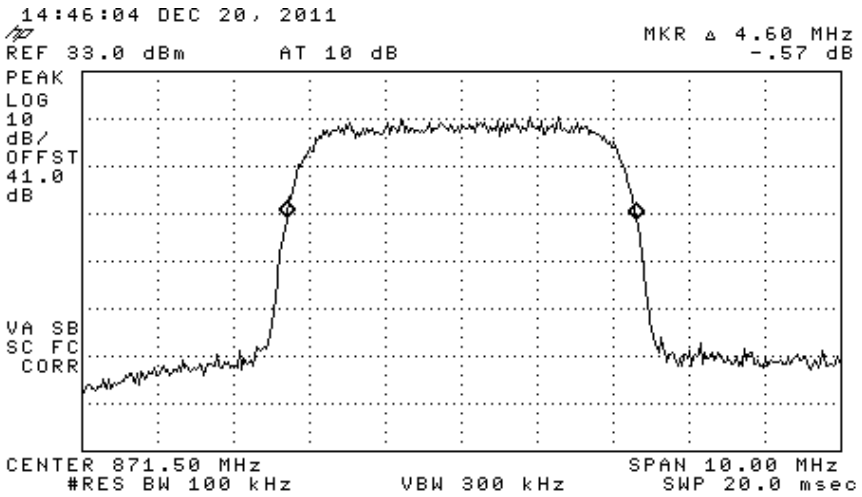

Figure 33.— Output 871.50

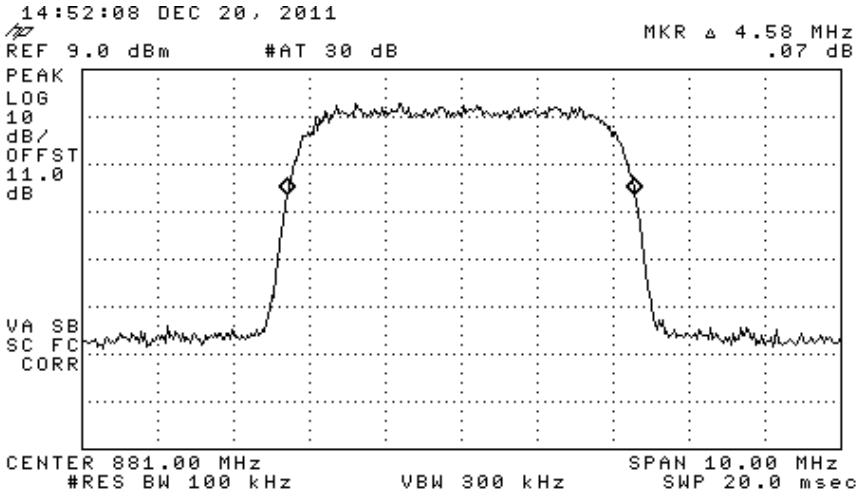

Figure 34.— Input 881.0 MHz.

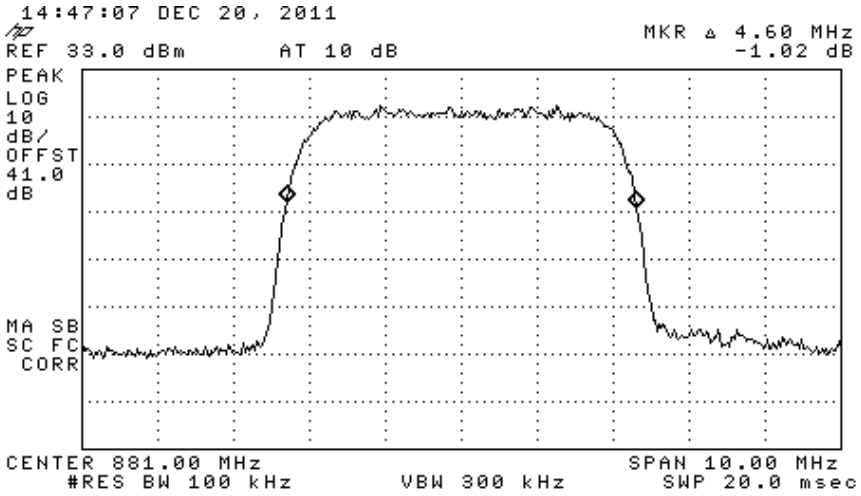

Figure 35.—Output 881.0Hz.

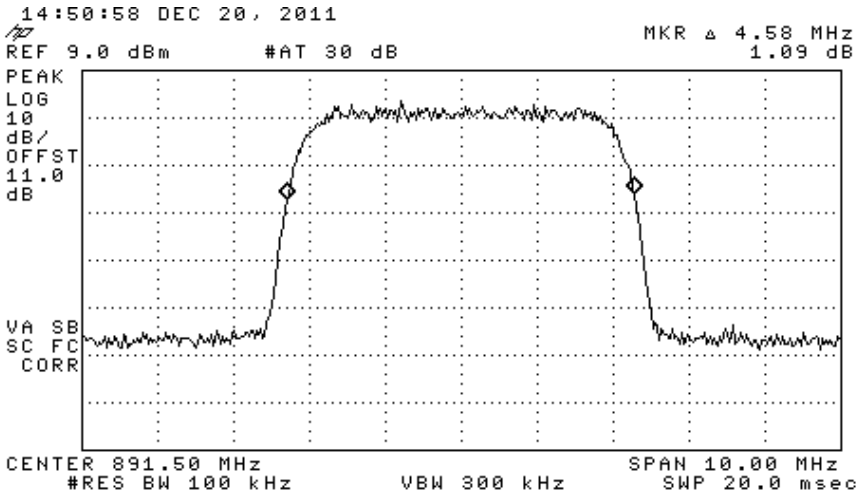

Figure 36.— Input 891.50 MHz.

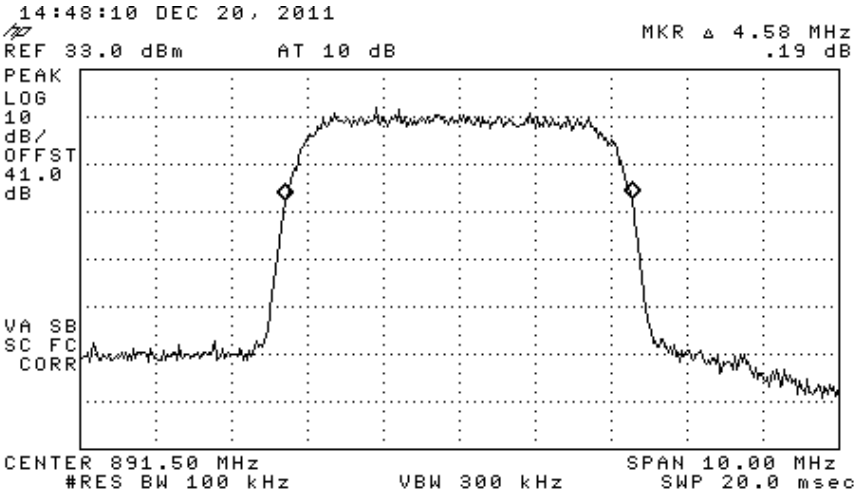

Figure 37.— Output 891.50 MHz.

6.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	870.20	1.488
	Output	870.20	1.513
	Input	881.00	1.525
	Output	881.00	1.488
	Input	892.80	1.488
	Output	892.80	1.488
GSM	Input	870.20	0.313
	Output	870.20	0.308
	Input	881.00	0.308
	Output	881.00	0.310
	Input	892.80	0.308
	Output	892.80	0.310
W-CDMA	Input	871.50	4.600
	Output	871.50	4.600
	Input	881.00	4.580
	Output	881.00	4.600
	Input	891.5	4.580
	Output	891.5	4.580

Figure 38 Occupied Bandwidth CELL

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

6.4 Test Equipment Used.

Occupied Bandwidth CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 39 Test Equipment Used

7. Out of Band Emissions at Antenna Terminals CELL

7.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

7.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

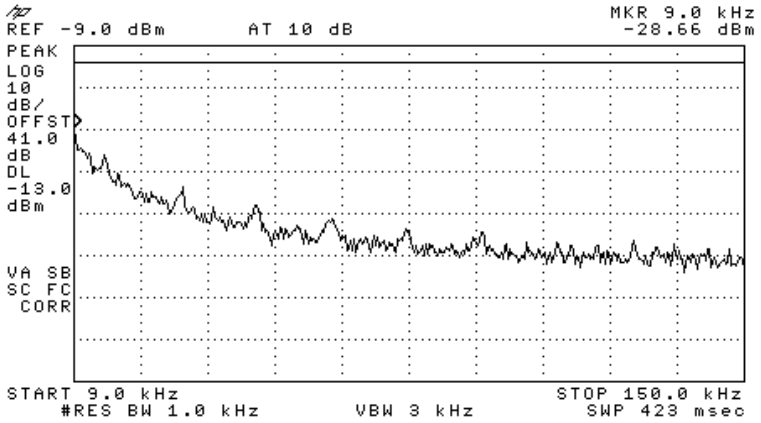

Figure 40.— 870.20 MHz

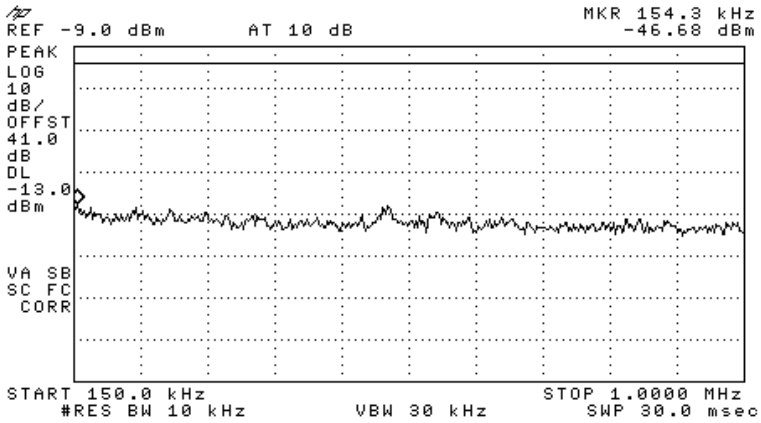

Figure 41.— 870.20 MHz

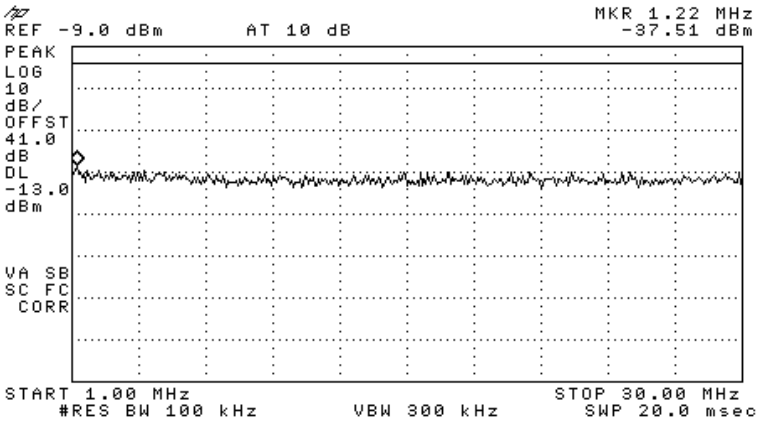

Figure 42.— 870.20 MHz

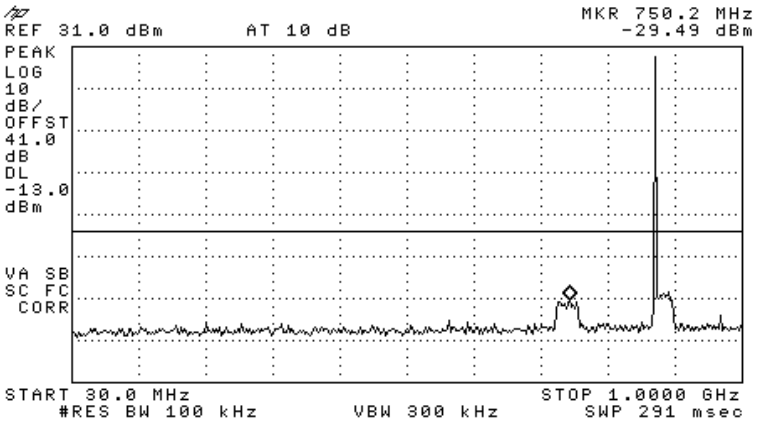

Figure 43.— 870.20 MHz

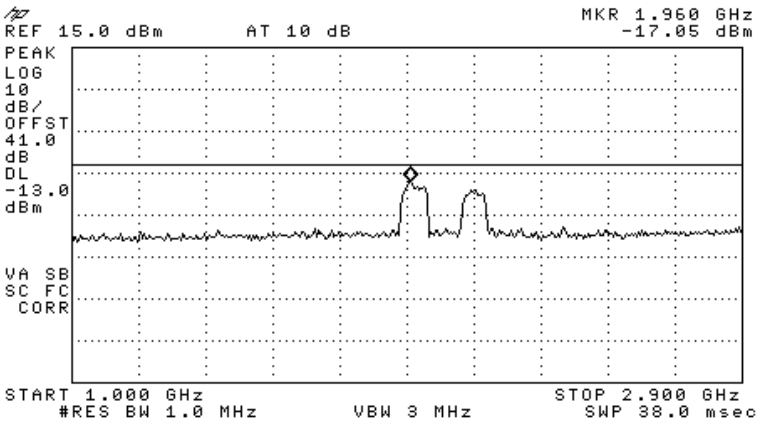

Figure 44.— 870.20 MHz

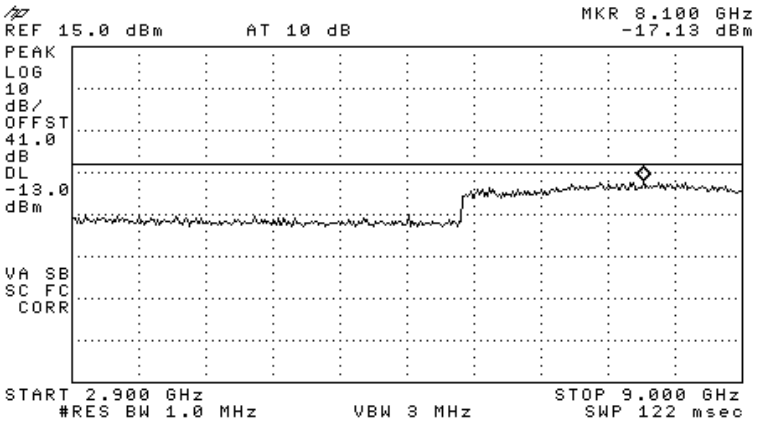

Figure 45.— 870.20 MHz

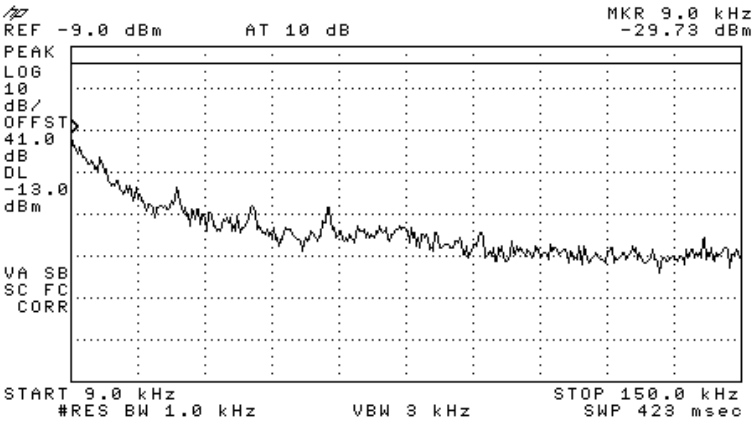

Figure 46.— 881.00 MHz

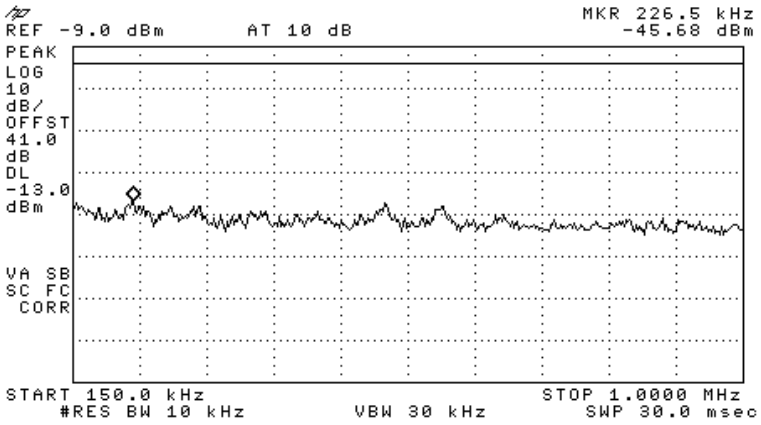

Figure 47.— 881.00 MHz

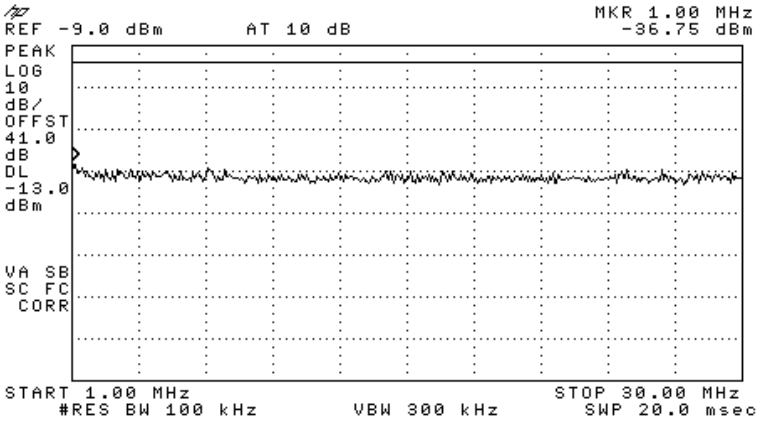

Figure 48.— 881.00 MHz

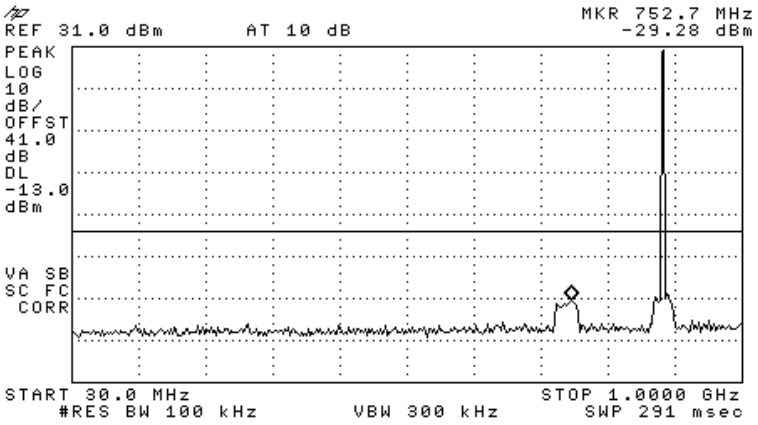

Figure 49.— 881.00 MHz

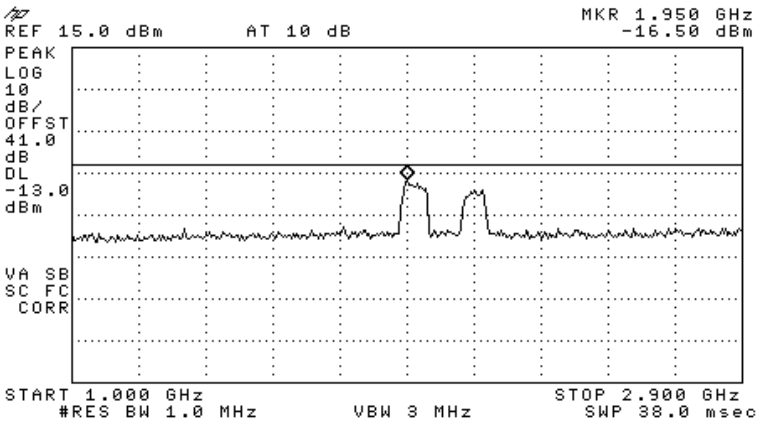

Figure 50.— 881.00 MHz

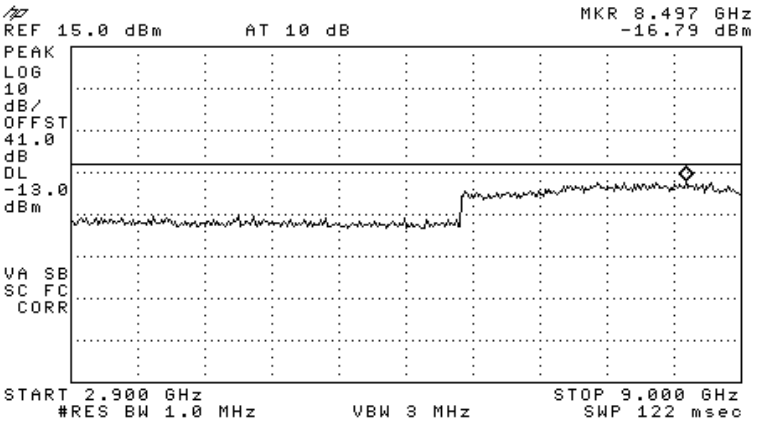

Figure 51.— 881.00 MHz

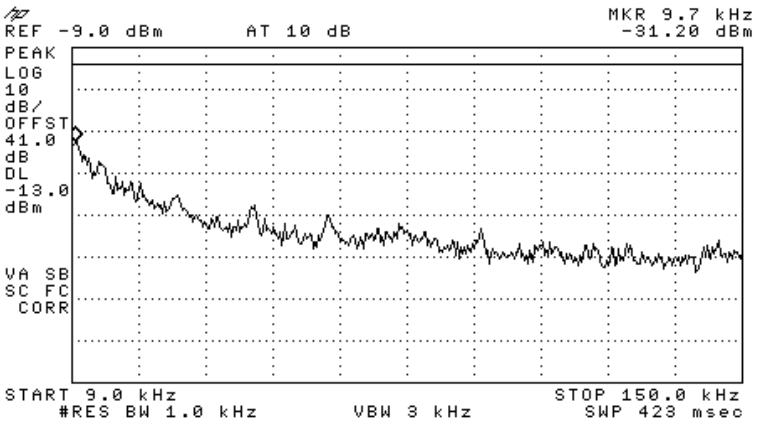

Figure 52.— 892.80 MHz

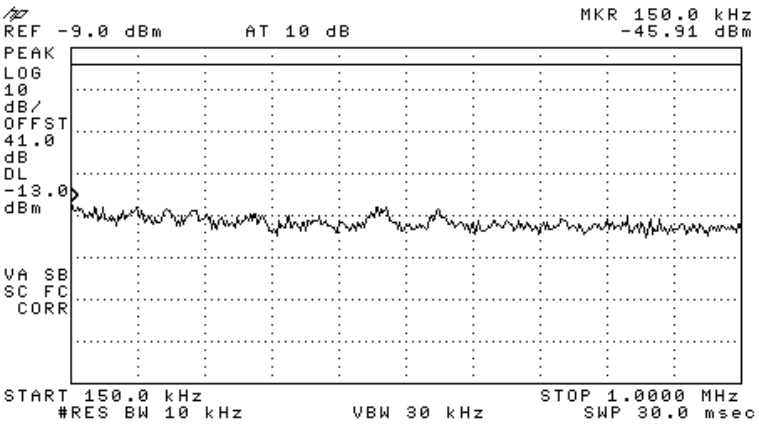

Figure 53.— 892.80 MHz

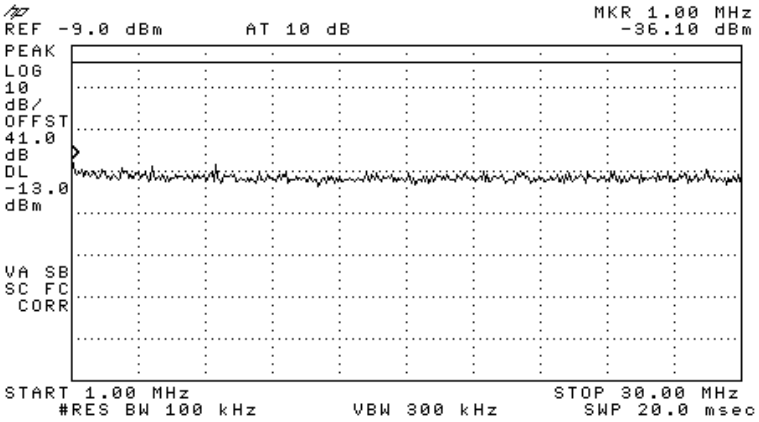

Figure 54.— 892.80 MHz

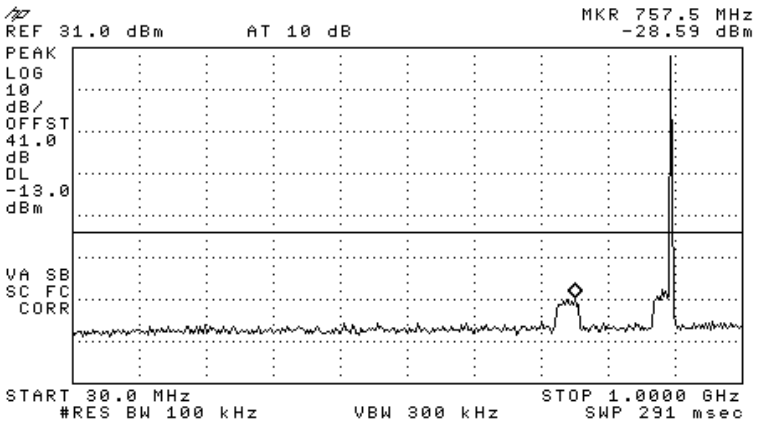

Figure 55.— 892.80 MHz

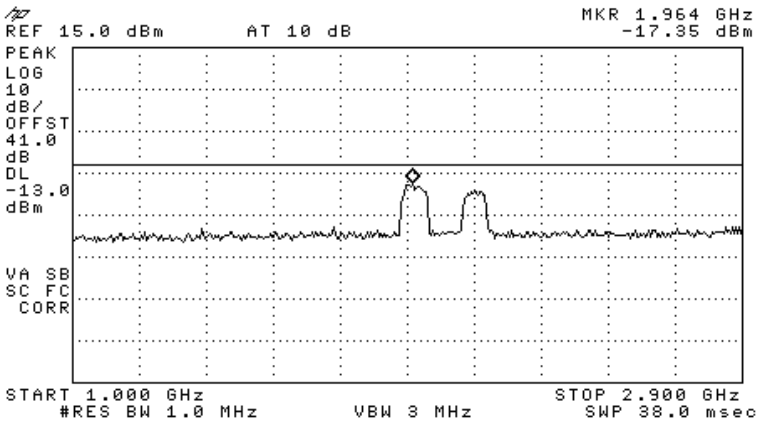

Figure 56.— 892.80 MHz

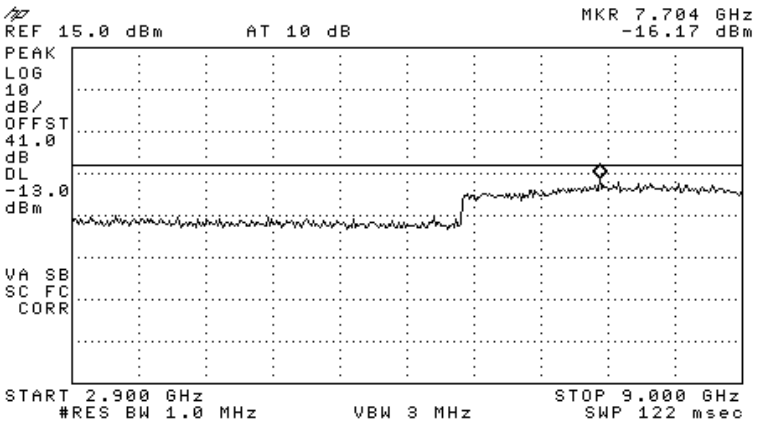

Figure 57.— 892.80 MHz

GSM:

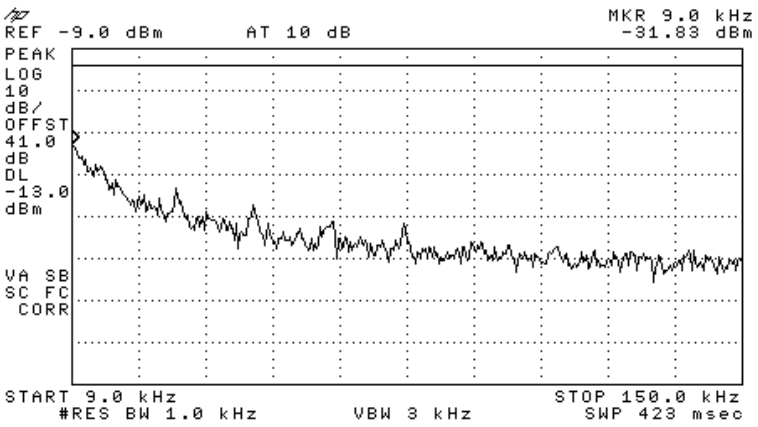

Figure 58.— 870.20 MHz

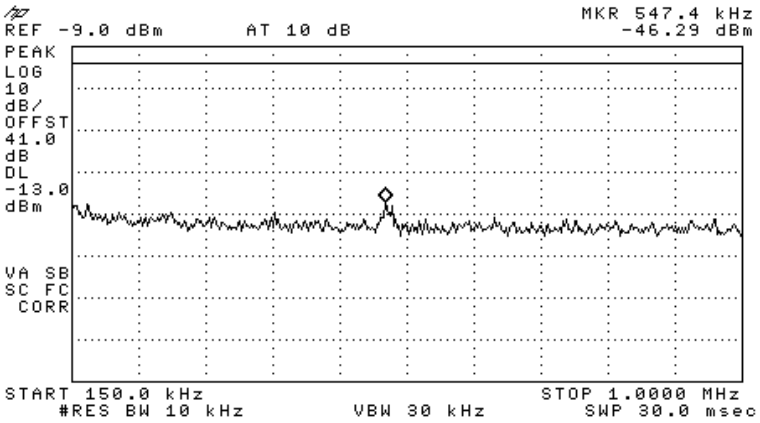

Figure 59.— 870.20 MHz

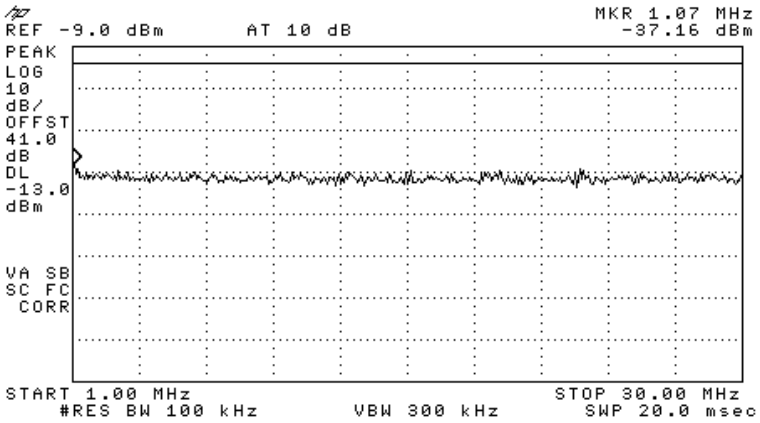

Figure 60.— 870.20 MHz

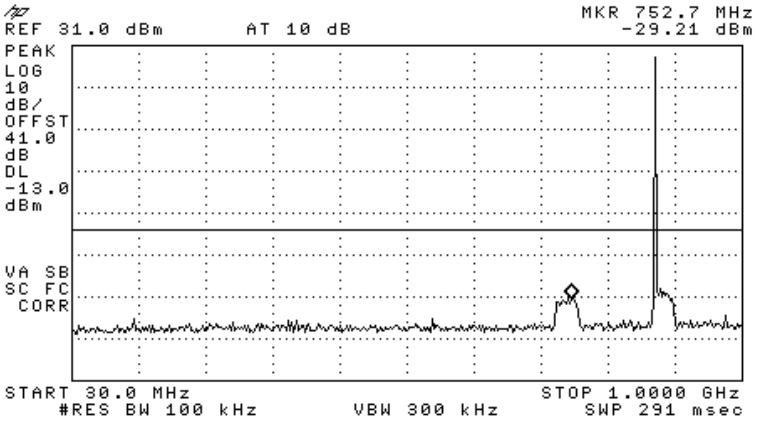

Figure 61.— 870.20 MHz

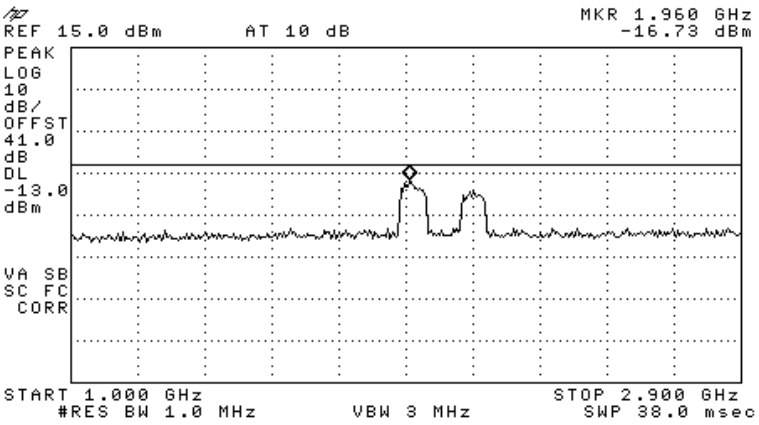

Figure 62.— 870.20 MHz

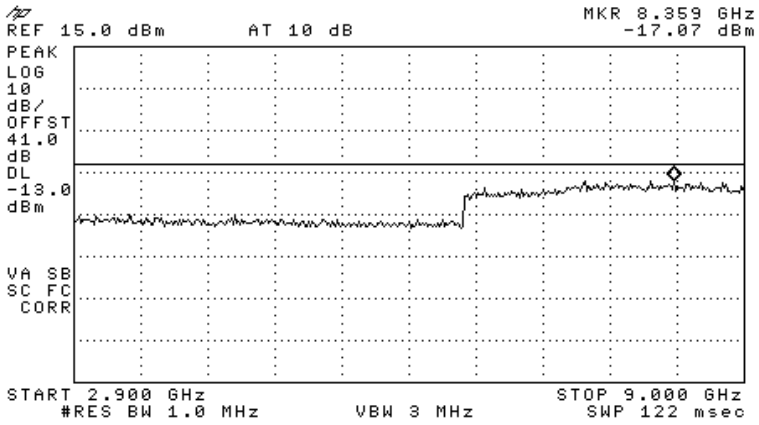

Figure 63.— 870.20 MHz

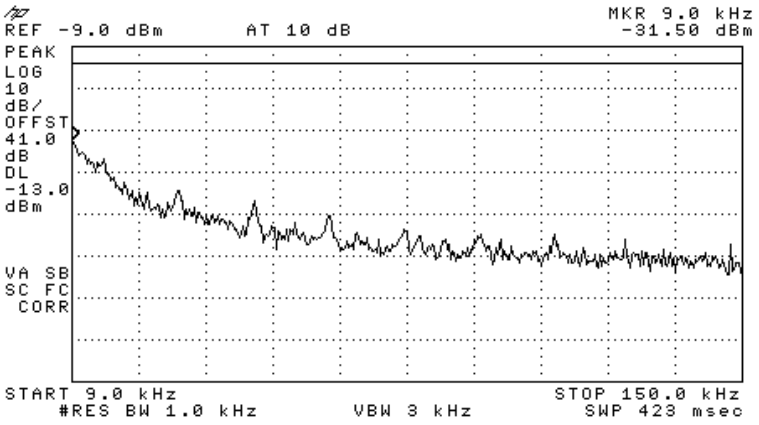

Figure 64.— 881.00 MHz

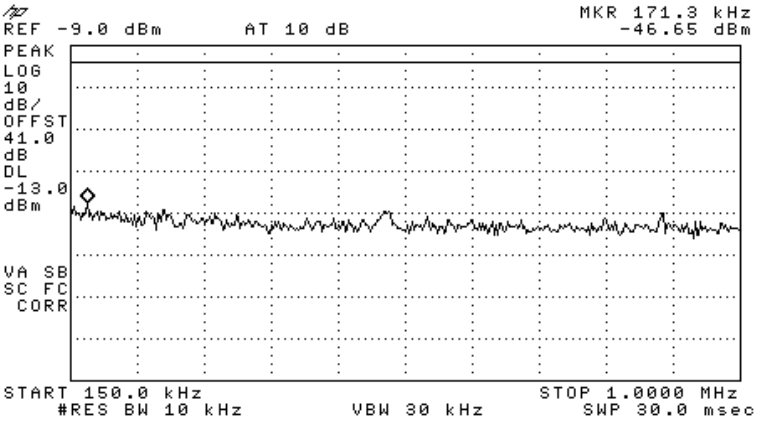

Figure 65.— 881.00 MHz

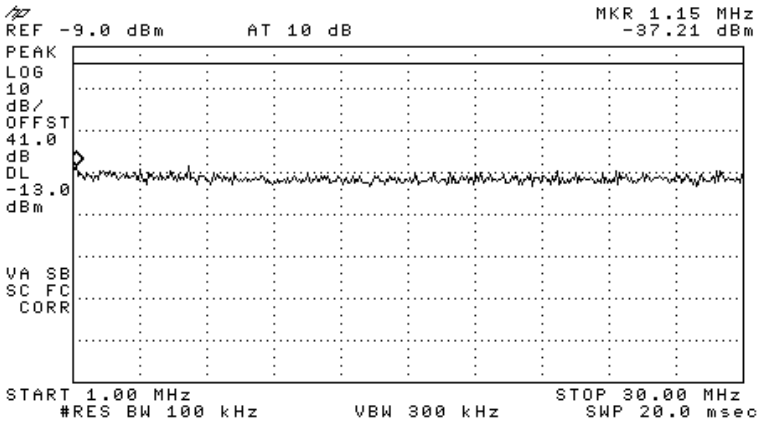

Figure 66.— 881.00 MHz

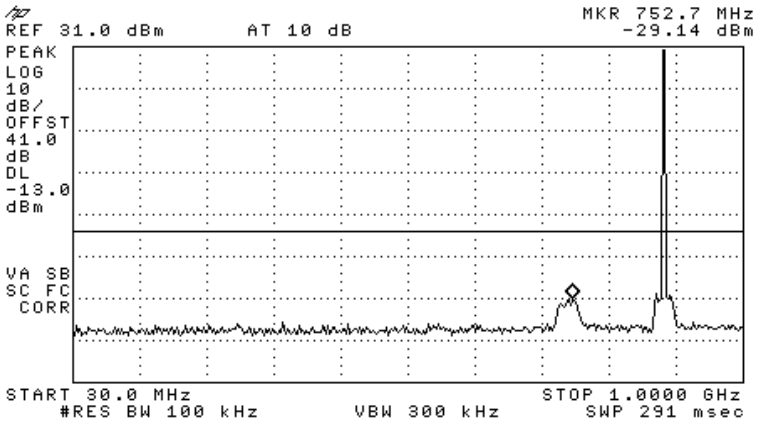

Figure 67.— 881.00 MHz

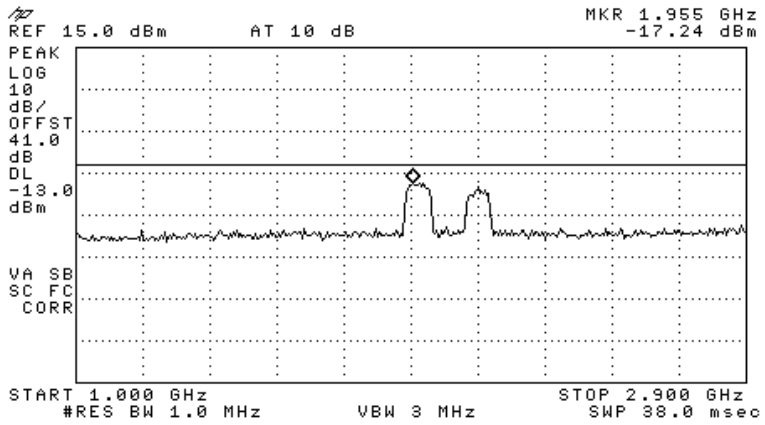

Figure 68.— 881.00 MHz

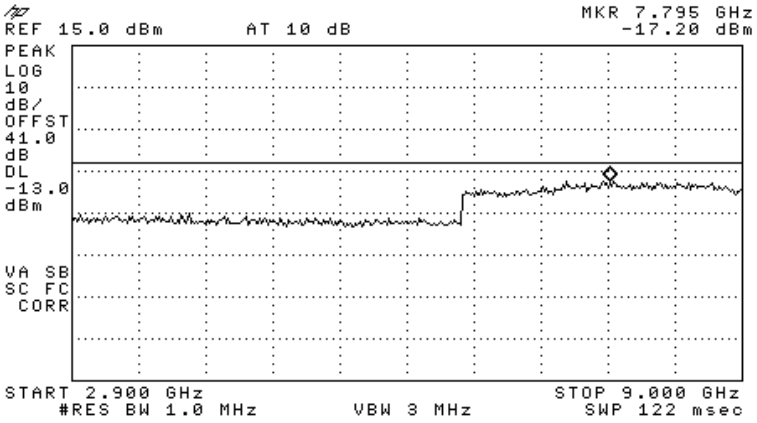

Figure 69.— 881.00 MHz

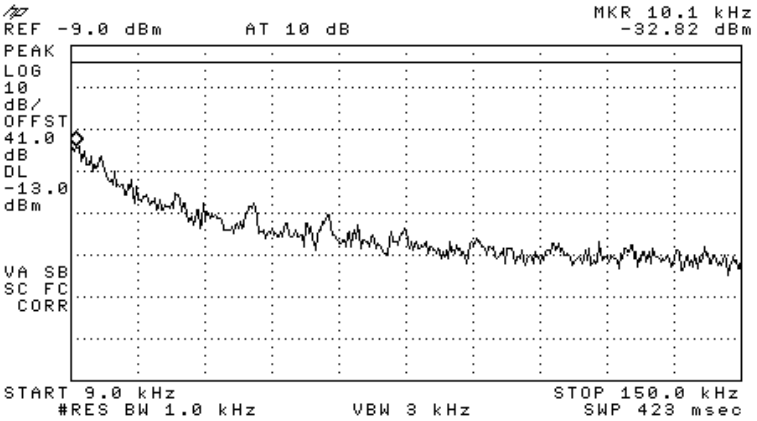

Figure 70.— 892.80 MHz

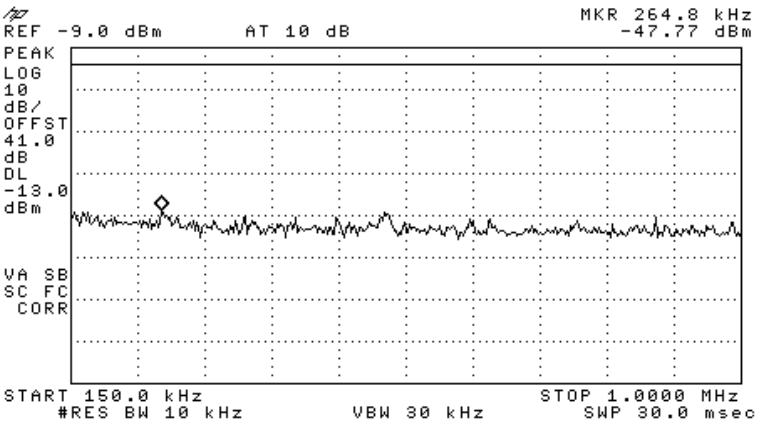

Figure 71.— 892.80 MHz

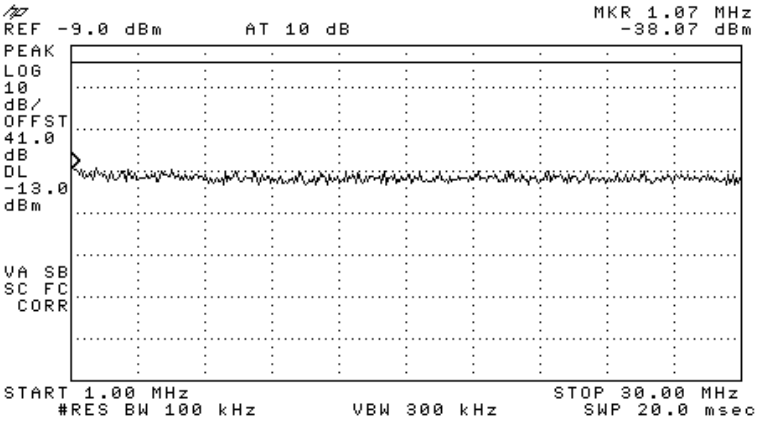

Figure 72.— 892.80 MHz

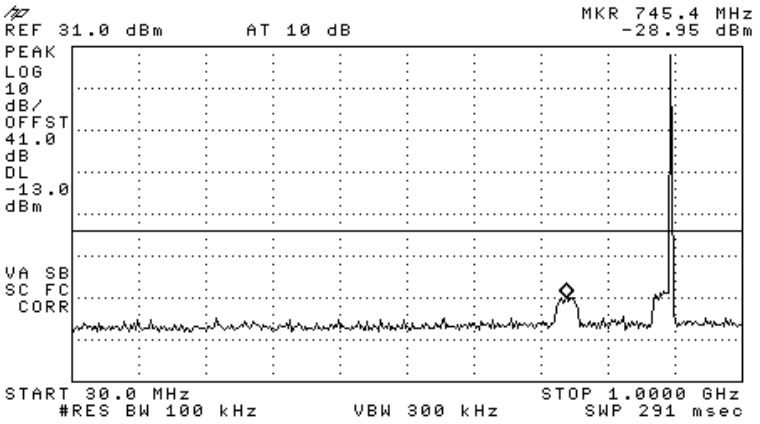

Figure 73.— 892.80 MHz

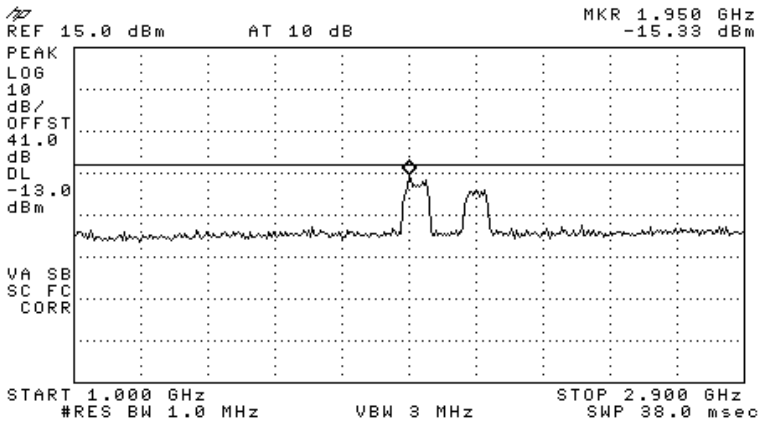

Figure 74.— 892.80 MHz

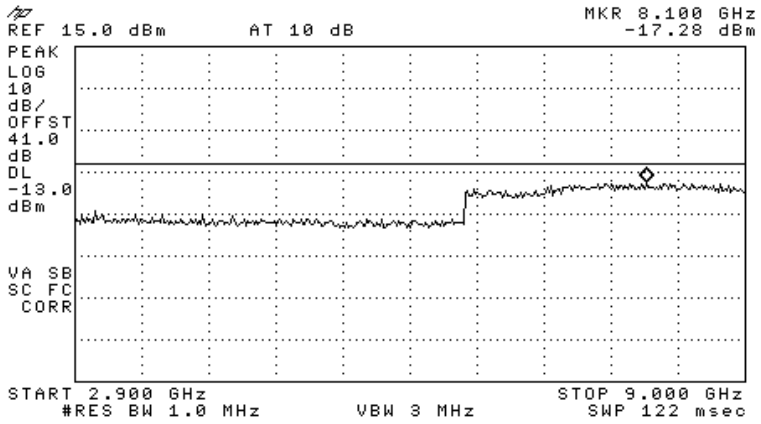

Figure 75.— 892.80 MHz

W-CDMA:

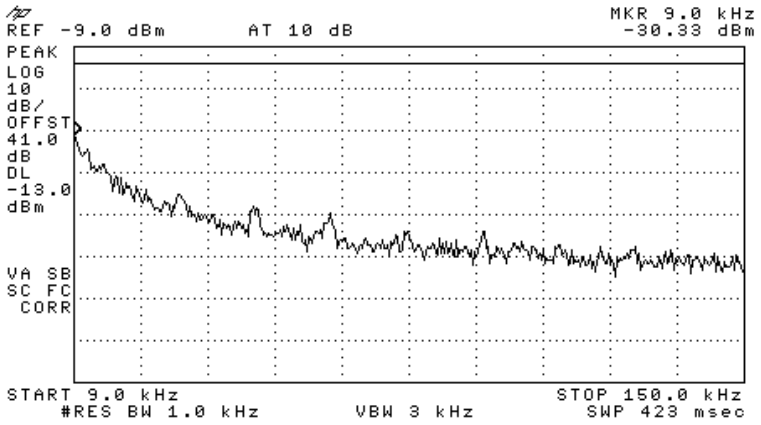

Figure 76.— 871.50 MHz

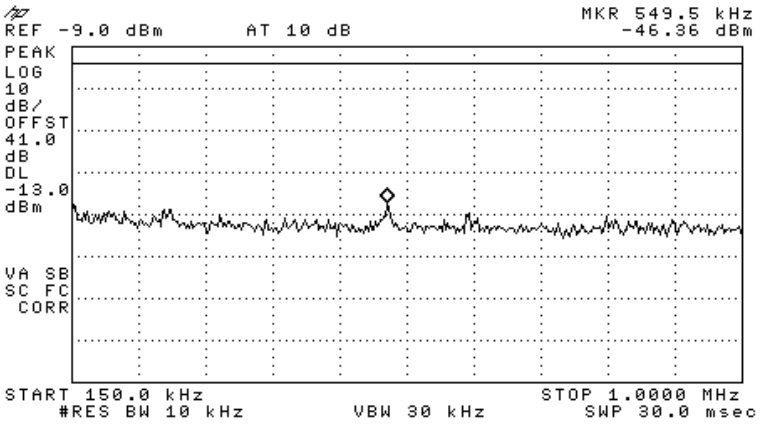

Figure 77.— 871.50 MHz

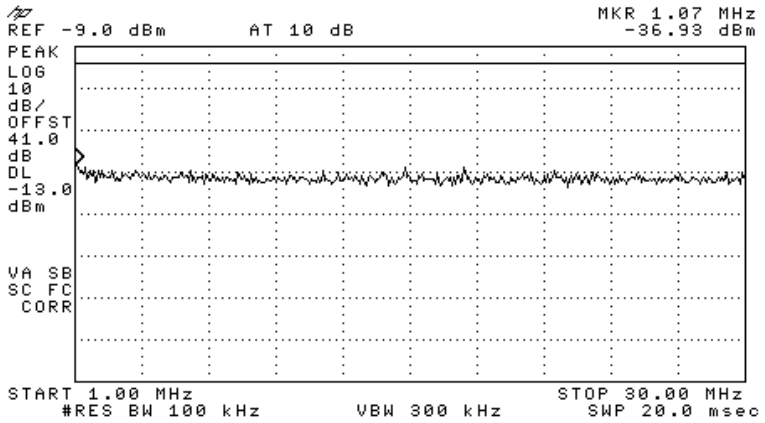

Figure 78.— 871.50 MHz

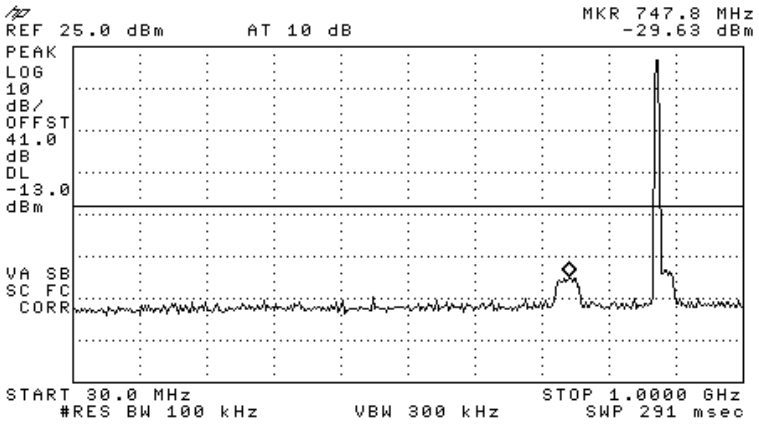

Figure 79.— 871.50 MHz

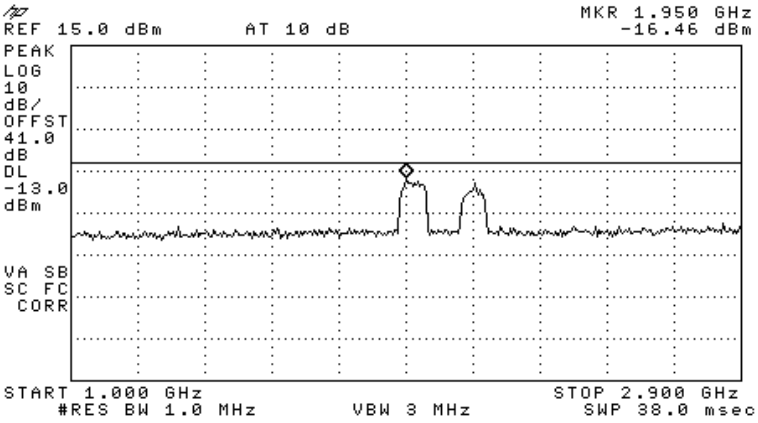

Figure 80.— 871.50 MHz

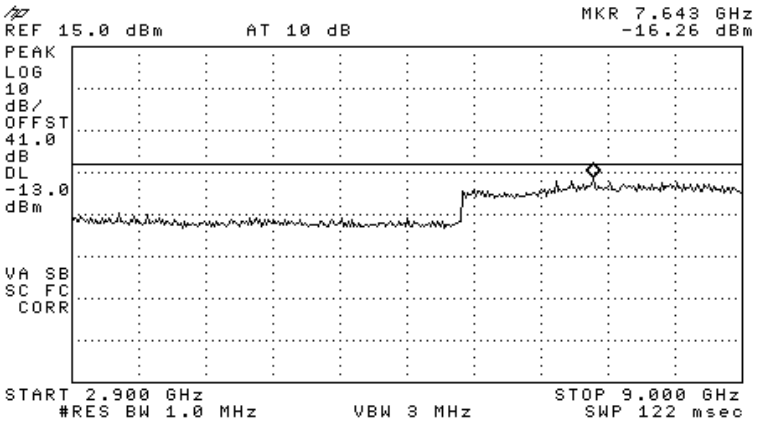

Figure 81.— 871.50 MHz

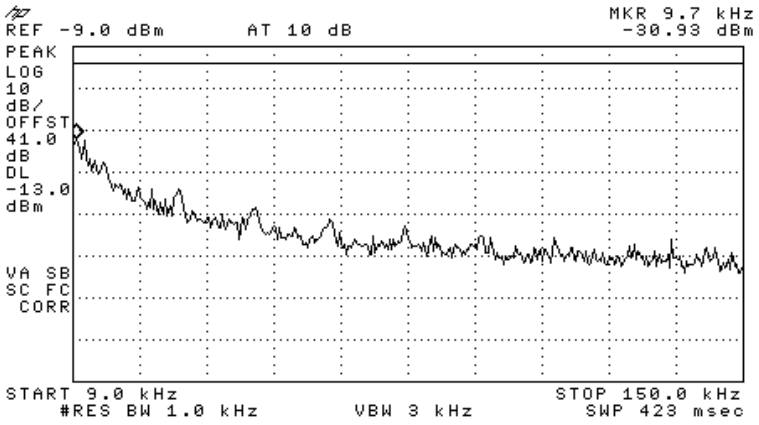

Figure 82.— 881.00 MHz

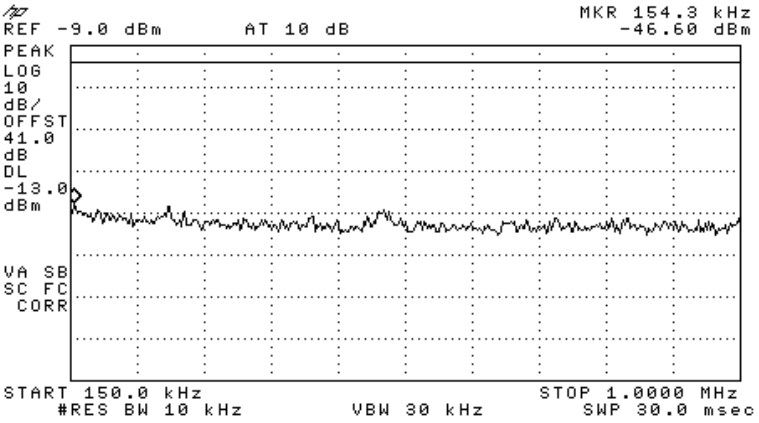

Figure 83.— 881.00 MHz

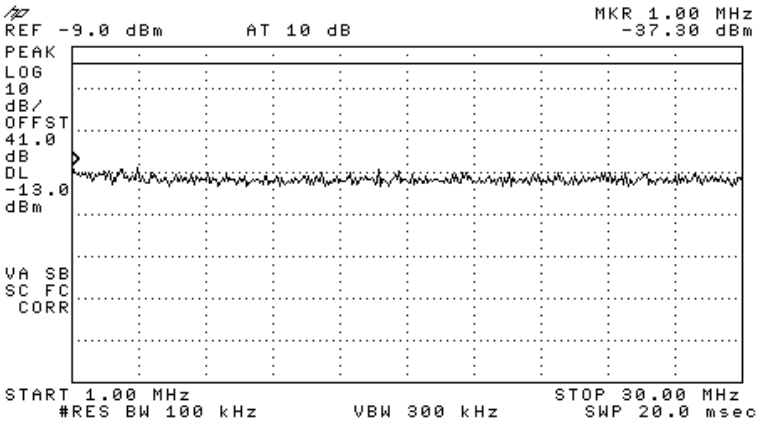

Figure 84.— 881.00 MHz

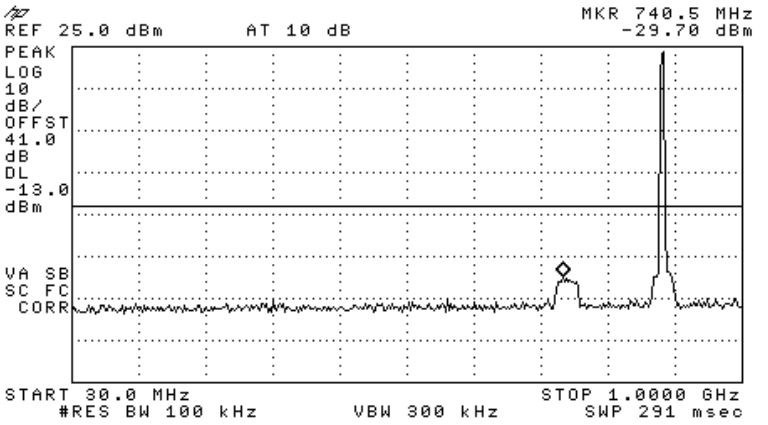

Figure 85.— 881.00 MHz

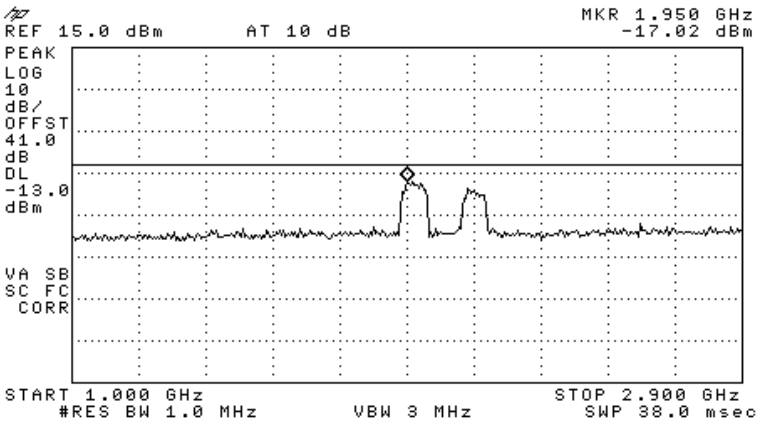

Figure 86.— 881.00 MHz

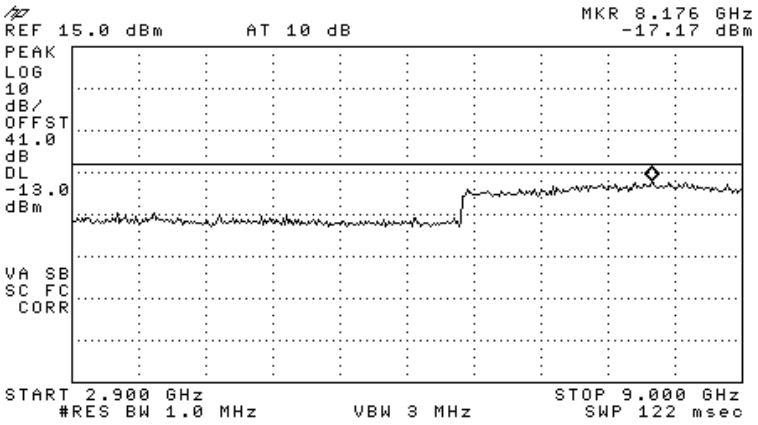

Figure 87.— 881.00 MHz

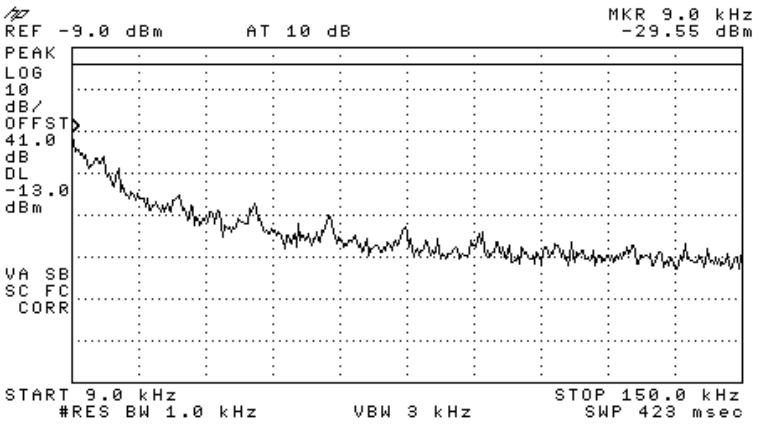

Figure 88.— 891.50 MHz

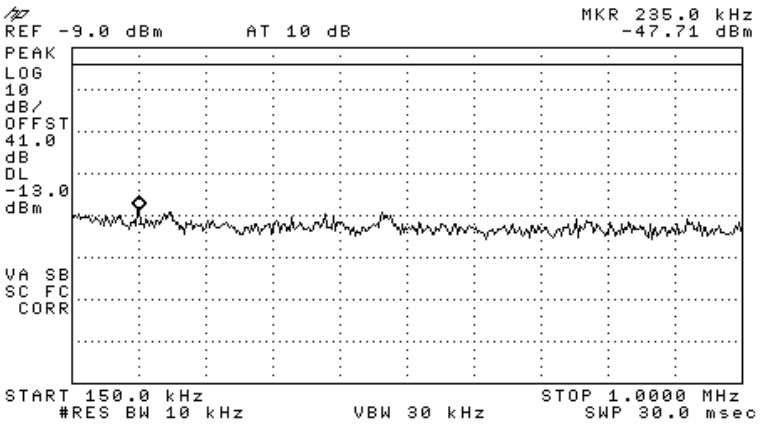

Figure 89.— 891.50 MHz

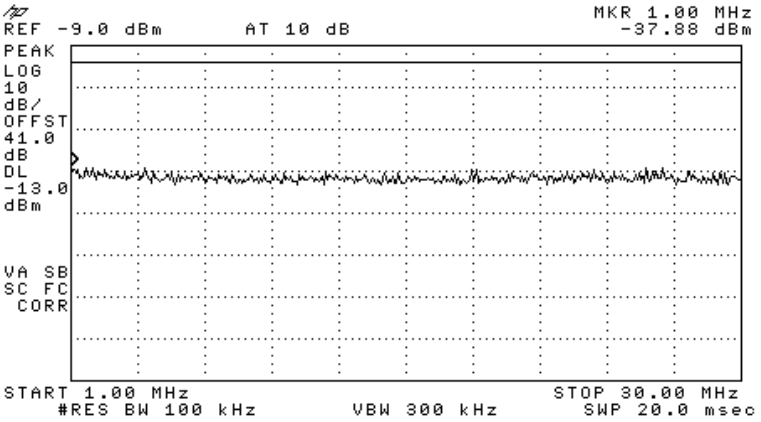

Figure 90.— 891.50 MHz

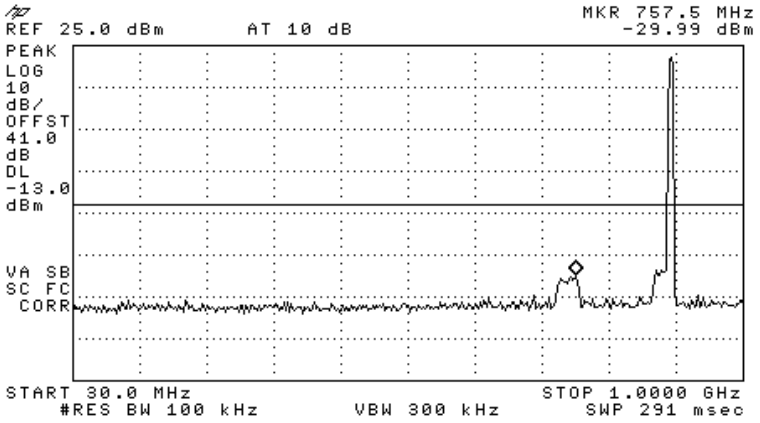

Figure 91.— 891.50 MHz

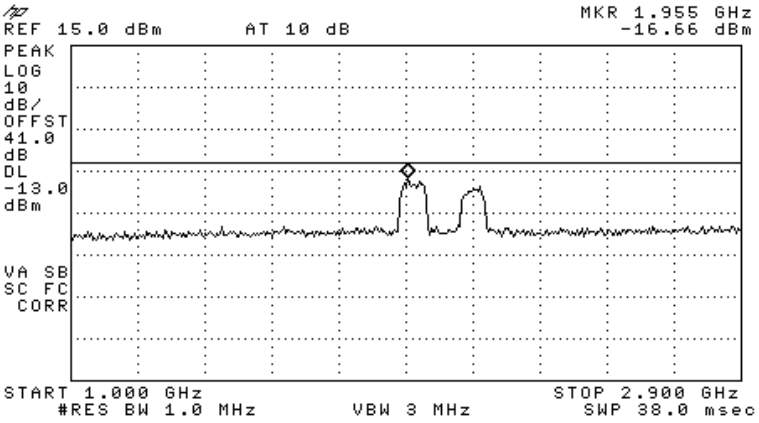

Figure 92.— 891.50 MHz

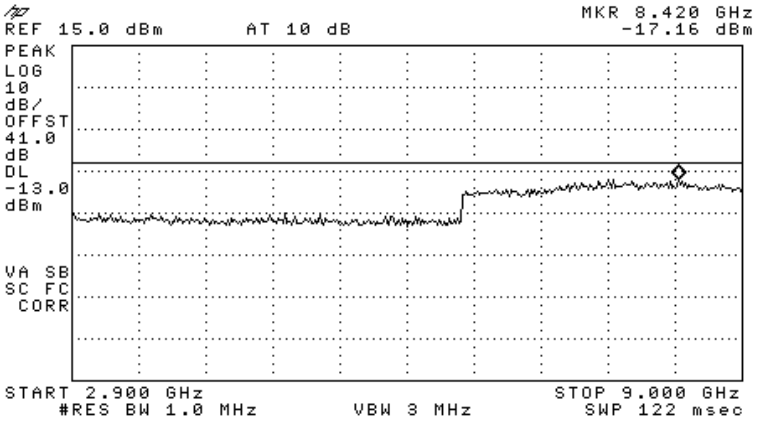

Figure 93.— 891.50 MHz

7.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
FCC Part 22, Section 917; FCC Part 2.1051

Modulation	Operation Frequency (MHz)	Frequency (GHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.20	1.960	-17.05	-13.0	-4.05
	881.00	1.950	-16.50	-13.0	-3.50
	892.80	7.704	-16.17	-13.0	-3.17
GSM	870.20	1.960	-16.73	-13.0	-3.73
	881.00	7.795	-17.20	-13.0	-4.20
	892.80	1.950	-15.33	-13.0	-2.33
W-CDMA	871.50	7.643	-16.26	-13.0	-3.26
	881.00	1.950	-17.02	-13.0	-4.02
	895.50	1.955	-16.66	-13.0	-3.66

Figure 94 Out of Band Emission Results CELL

JUDGEMENT: Passed by 2.33 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

7.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 95 Test Equipment Used

8. Band Edge Spectrum CELL

8.1 Test Specification

FCC Part 22, FCC Part 2.1051

8.2 Test procedure

For CDMA and GSM:

Enclosed are spectrum analyzer plots for the lowest operation frequency (870.20 MHz) and the highest operation frequency (892.8 MHz) in which the E.U.T. is planned to be used.

For W-CDMA:

Enclosed are spectrum analyzer plots for the lowest operation frequency (871.50 MHz) and the highest operation frequency (891.5 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (21 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

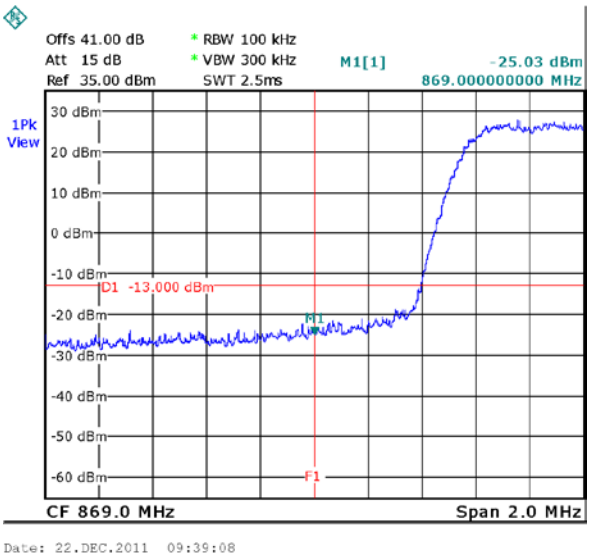

Figure 96.— 870.20 MHz

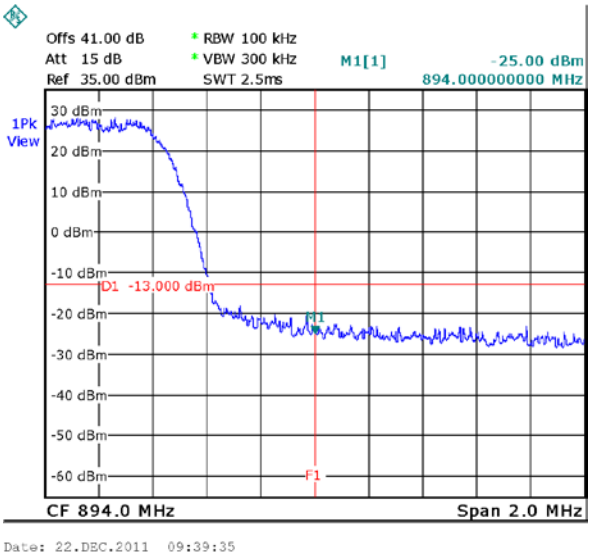

Figure 97.— 892.80 MHz

GSM:

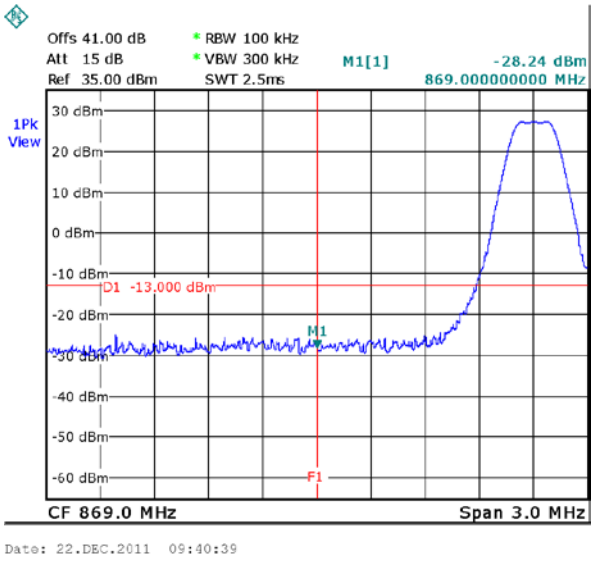

Figure 98.— 870.20 MHz

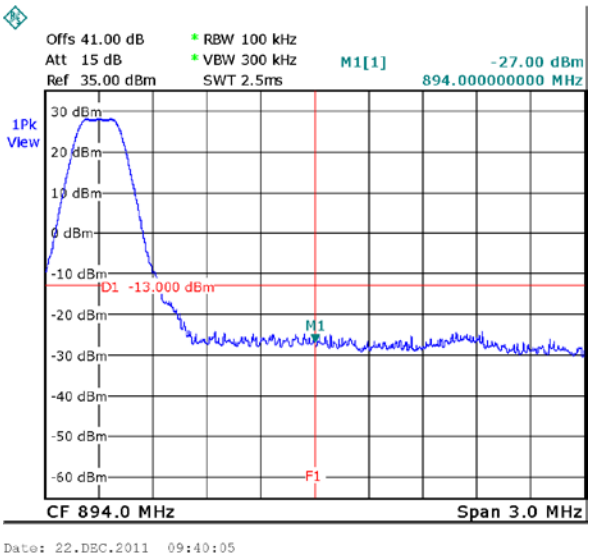

Figure 99.— 892.80 MHz

W-CDMA:

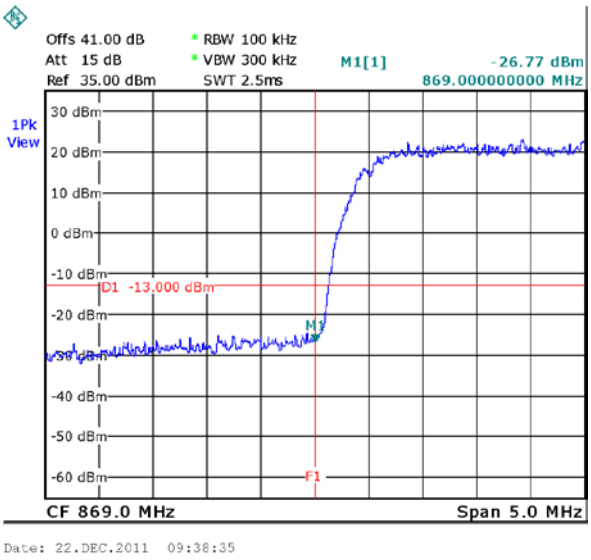

Figure 100.— 871.50 MHz

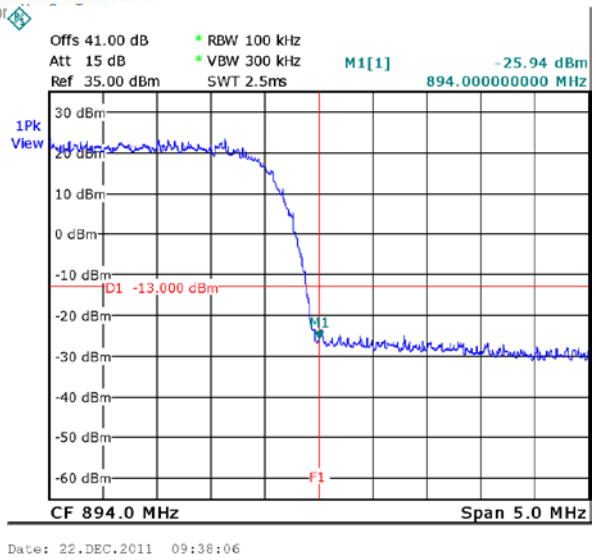

Figure 101.— 891.50 MHz

8.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	870.2	869.0	-25.03	-13.0	-12.03
	892.8	894.0	-25.00	-13.0	-12.00
GSM	870.2	869.0	-28.24	-13.0	-15.24
	892.8	894.0	-27.00	-13.0	-14.00
W-CDMA	871.5	869.0	-26.77	-13.0	-13.77
	891.5	894.0	-25.94	-13.0	-12.94

Figure 102 Band Edge Spectrum Results CELL

JUDGEMENT: Passed by 12.00 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: V. Siboni

8.4 Test Equipment Used.

Band Edge Spectrum CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	R&S	FSL6	10-300191865	30.10.2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 103 Test Equipment Used

9. Out of Band Emissions (Radiated) CELL

9.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

9.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (869 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

(a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.1.
The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

(b) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
P_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

9.3 Results Table

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
870.20	1740.4	V	47.1	-53.71	5.45	7.64	-51.52	-13.0	-38.52
870.20	1740.4	H	46.4	-54.24	5.45	7.64	-52.05	-13.0	-39.05
881.00	1762	V	48.0	-51.79	5.6	7.66	-49.73	-13.0	-36.73
881.00	1762	H	47.5	-52.55	5.6	7.66	-50.49	-13.0	-37.49
892.80	1785.6	V	47.8	-51.99	5.6	7.66	-49.93	-13.0	-36.93
892.80	1785.6	H	45.4	-54.65	5.6	7.66	-52.59	-13.0	-39.59

Figure 104 Out of Band (Radiated) CELL

The E.U.T met the requirements of the FCC Part 22, Section 917;
FCC Part 2.1053 specifications.

Judgment: Passed by 36.73 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

9.4 Test Instrumentation Used, Radiated Measurements CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2011	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	November 13, 2011	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2011	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 Year
Signal Generator	HP	E4432B ESG-D	GB40050702	May 4, 2011	1 year
Signal Generator	HP	E4438C ESG	MY45091956	May 4, 2011	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

10. Peak Output Power PCS

10.1 Test Specification

FCC Part 24, Subpart E

10.2 Test procedure

Peak Power Output must not exceed 100 Watts (50dBm).

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (40 dB) and an appropriate coaxial cable (1dB). The E.U.T. RF output was W-CDMA and GSM and CDMA modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

CDMA

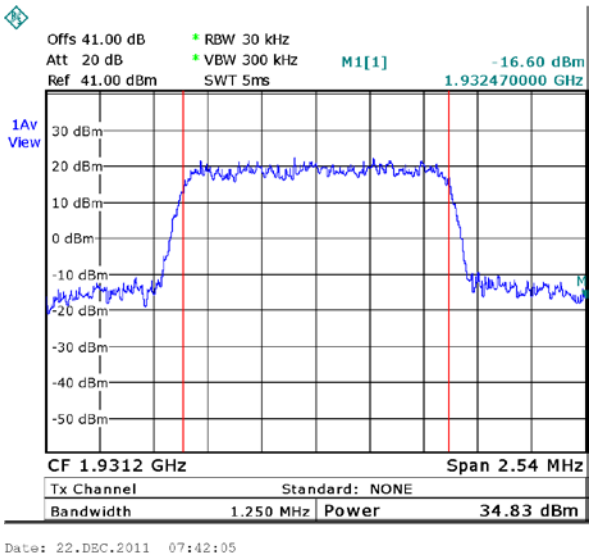

Figure 105.— 1931.20 MHz

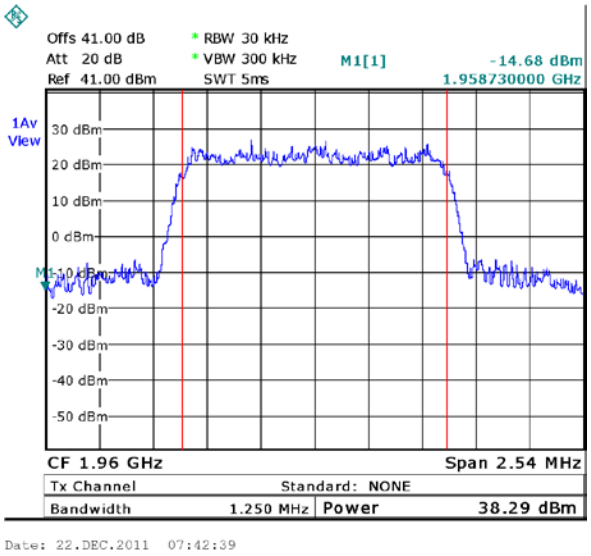

Figure 106.— 1960.00 MHz

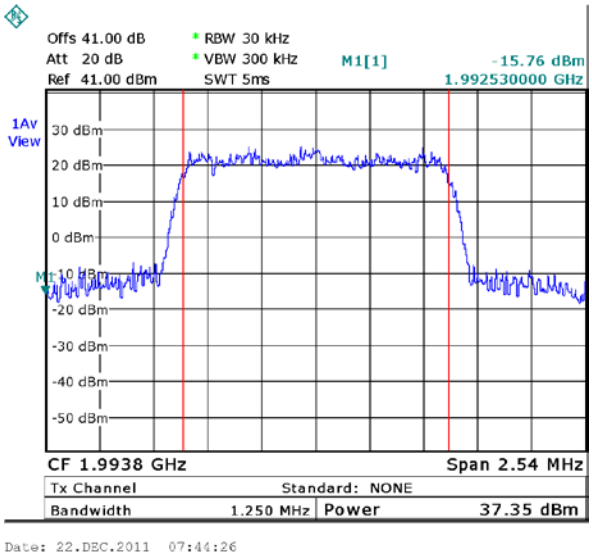

Figure 107.— 1993.80 MHz

GSM:

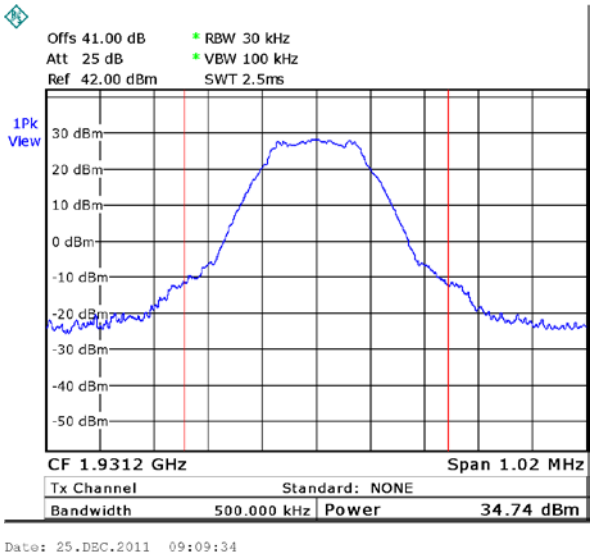

Figure 108.— 1931.20 MHz

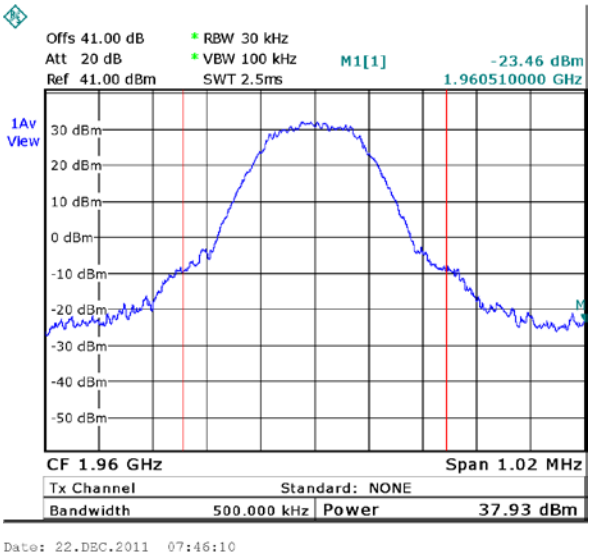

Figure 109.— 1960.00 MHz

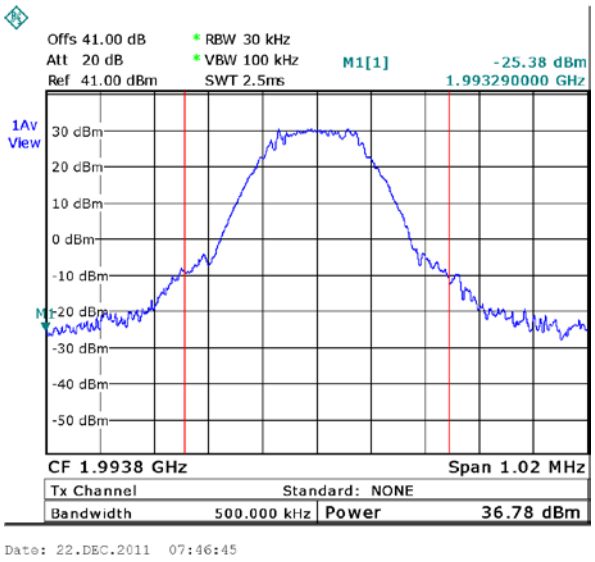

Figure 110.— 1993.80 MHz

W-CDMA:

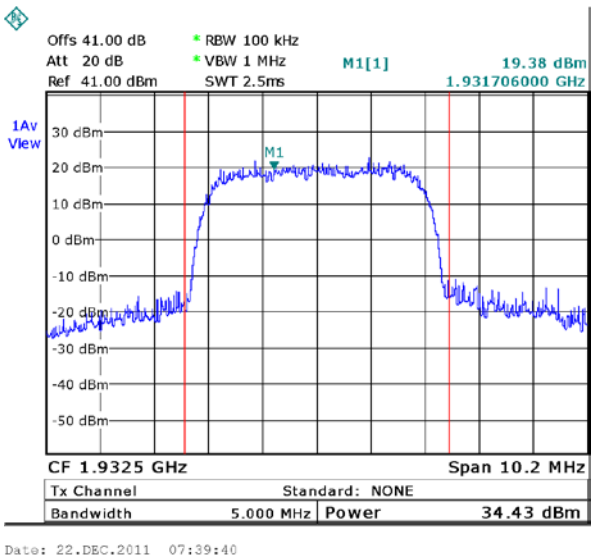

Figure 111.— 1932.50 MHz

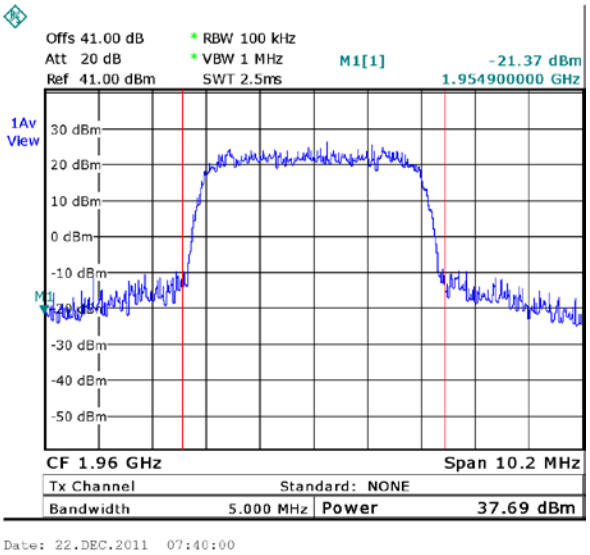

Figure 112.— 1960.00 MHz

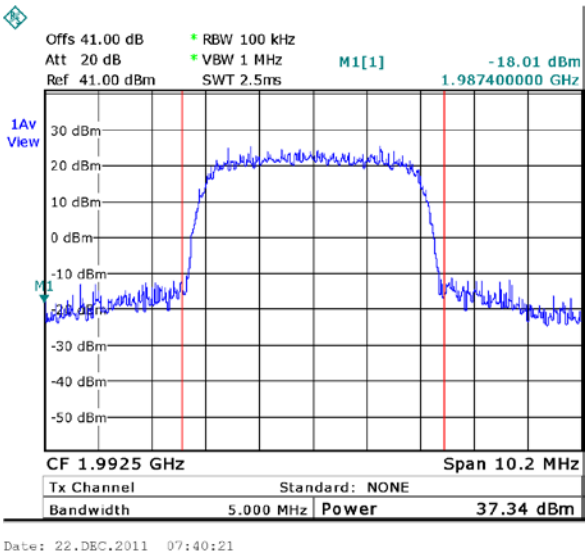

Figure 113.— 1992.50 MHz

10.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 24, Subpart E, Section 232, FCC Part 2, Section 1046

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.2	34.83	50.0	-15.17
	1960.0	38.29	50.0	-11.71
	1993.8	37.35	50.0	-12.65
GSM	1931.2	34.74	50.0	-15.26
	1960.0	37.93	50.0	-12.07
	1993.8	36.78	50.0	-13.22
W-CDMA	1932.5	34.43	50.0	-15.57
	1960.0	37.69	50.0	-12.31
	1992.5	37.34	50.0	-12.66

Figure 114 Peak Output Power PCS

JUDGEMENT: Passed by 11.71 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

10.4 Test Equipment Used.

Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	R&S	FSL6	10-300191865	October 30, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	December 12, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	December 12, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 115 Test Equipment Used

11. Occupied Bandwidth PCS

11.1 Test Specification

FCC Part 2, Section 1049

11.2 Test Procedure

The E.U.T. was set to the applicable test frequency with CDMA, GSM and W-CDMA modulation. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution B.W.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.
The occupied bandwidth of the E.U.T. at the points of 20 dB below maximum peak power was measured and recorded.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

CDMA

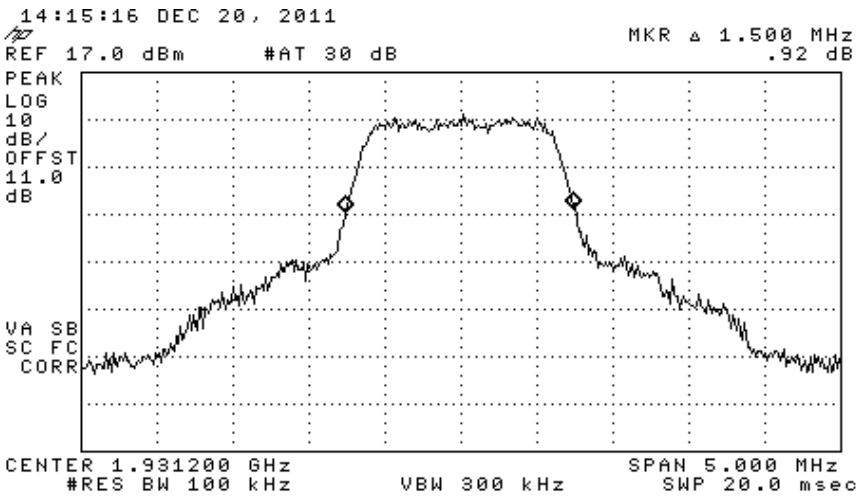

Figure 116.— Input 1931.20 MHz

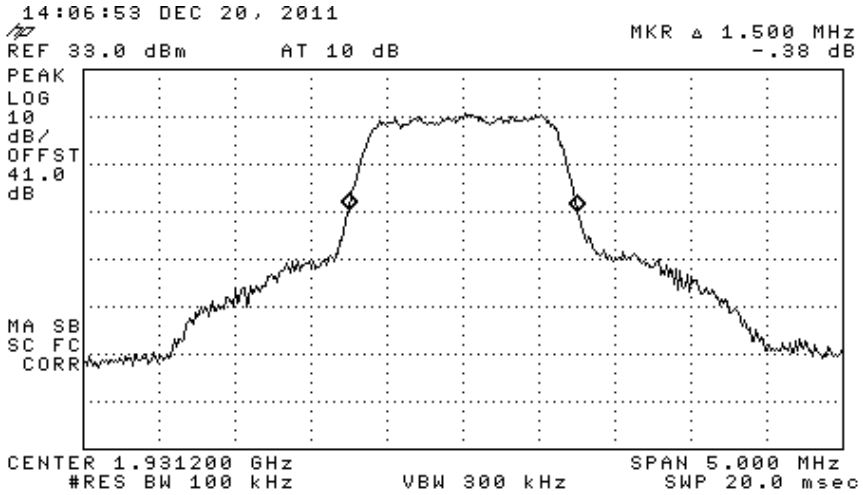

Figure 117.— Output 1931.20 MHz

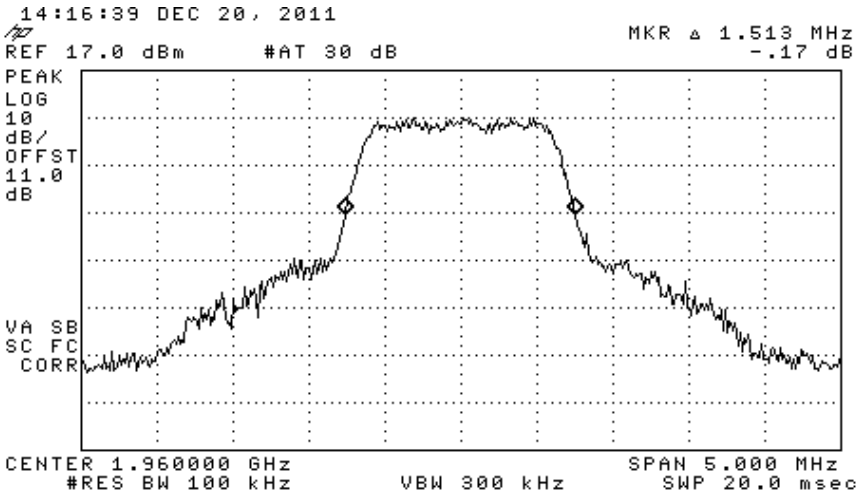

Figure 118.— Input 1960.00 MHz

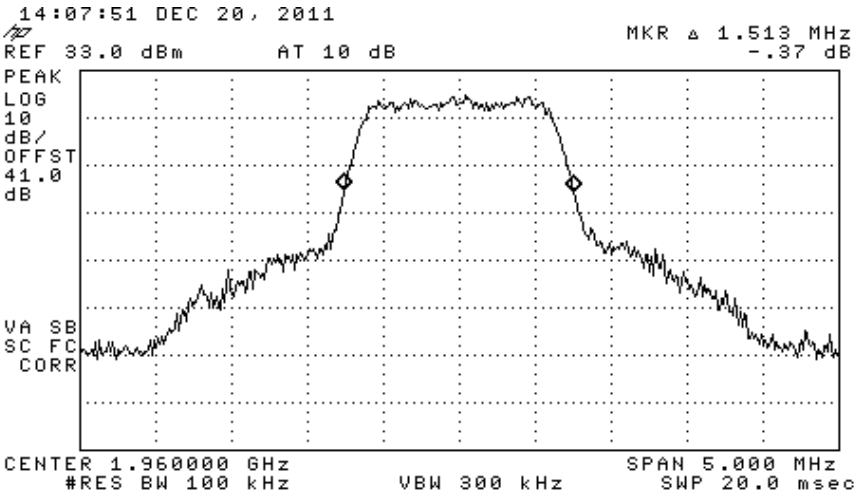

Figure 119.— Output 1960.00 MHz

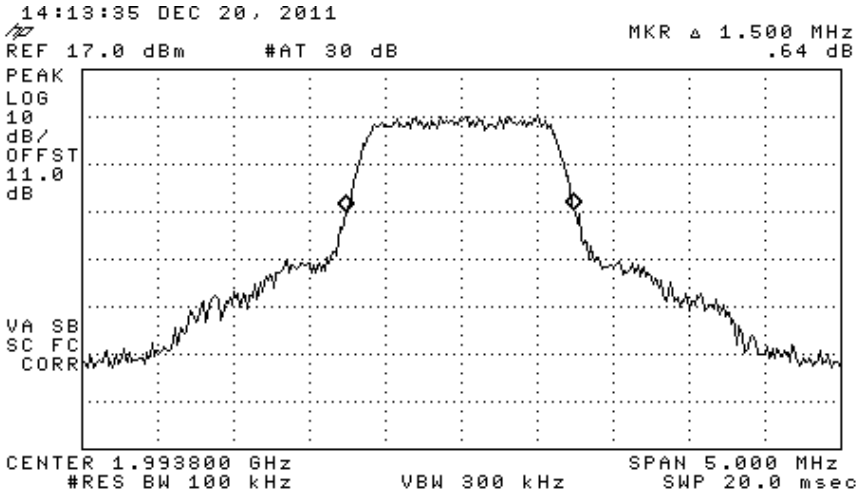

Figure 120.— Input 1993.80 MHz

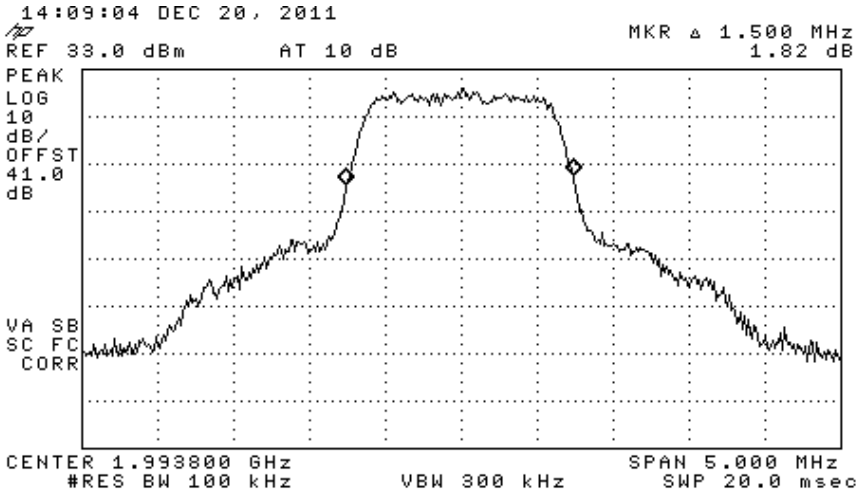

Figure 121.— Output 1993.80 MHz

GSM:

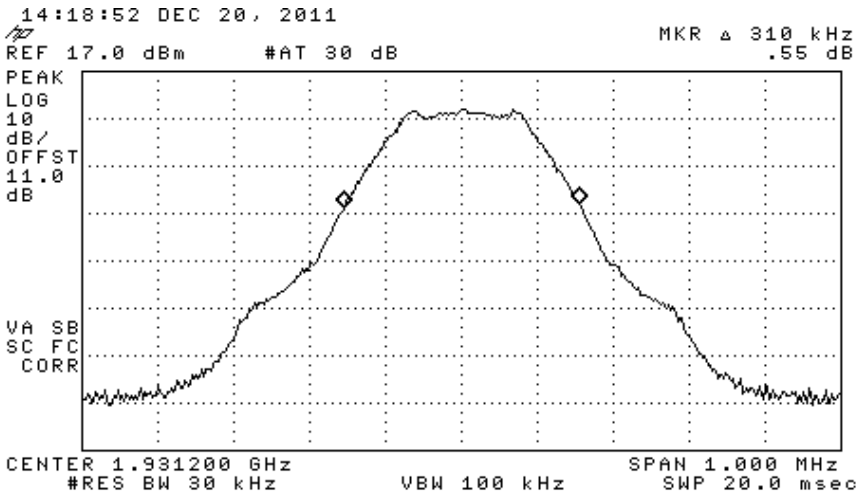

Figure 122.— Input 1931.20 MHz

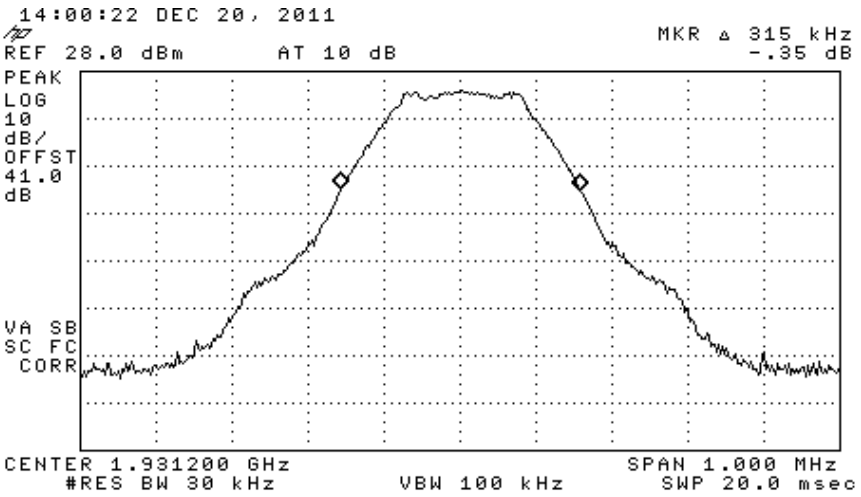

Figure 123.— Output 1931.20 MHz

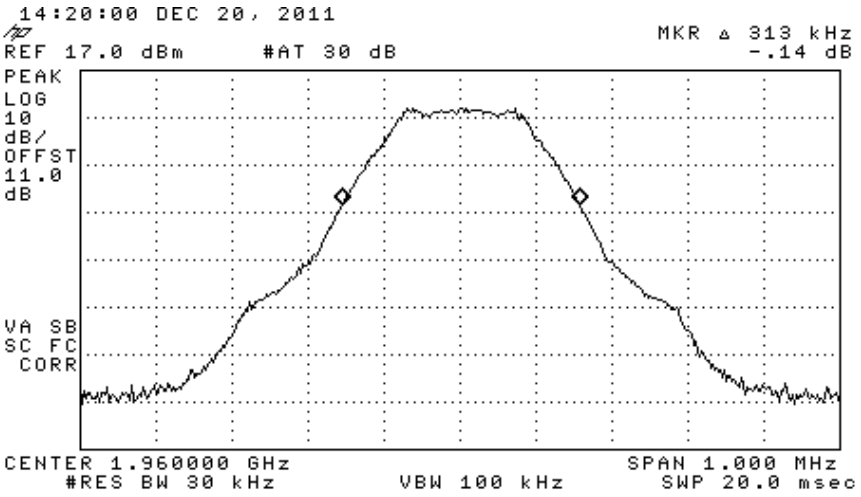

Figure 124.— Input 1960.00 MHz

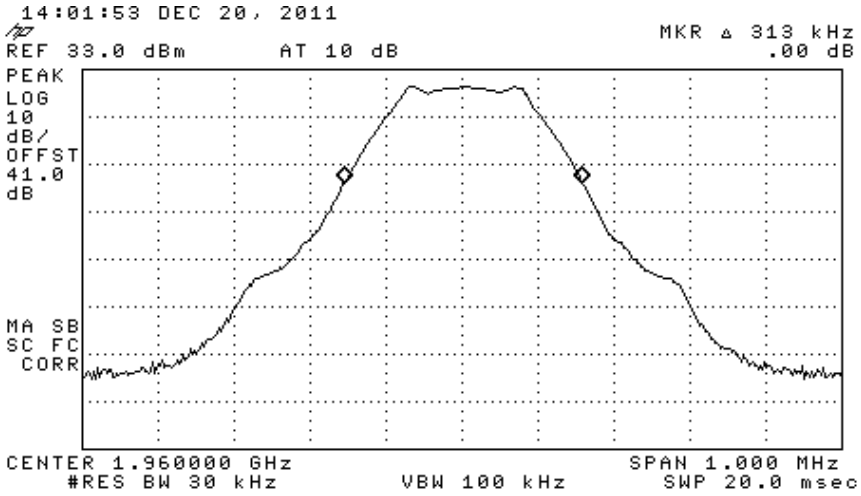

Figure 125.— Output 1960.00 MHz

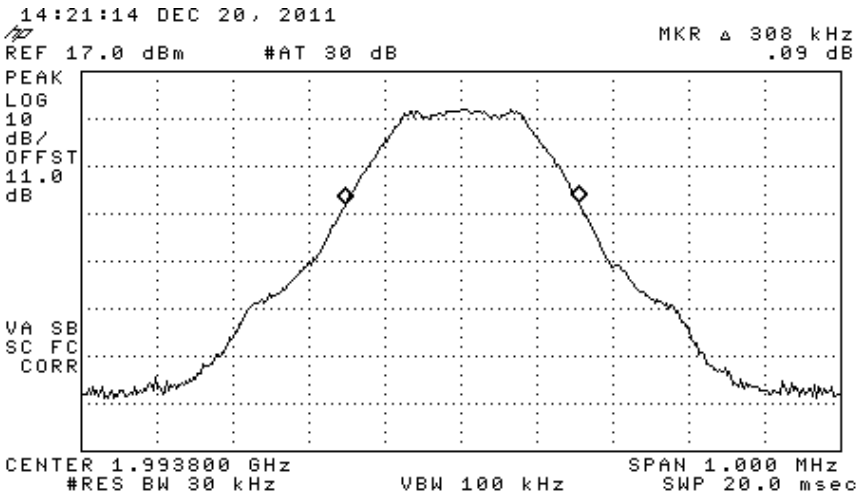

Figure 126.— Input 1993.80 MHz

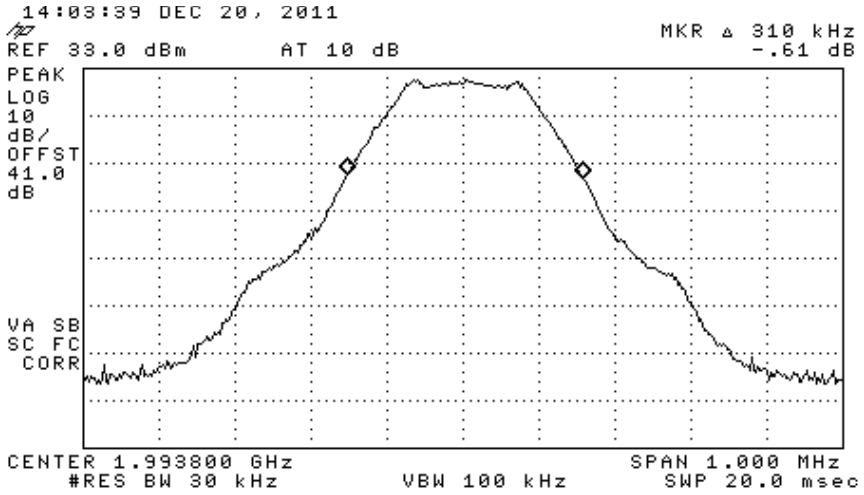

Figure 127.— Output 1993.80 MHz

W-CDMA:

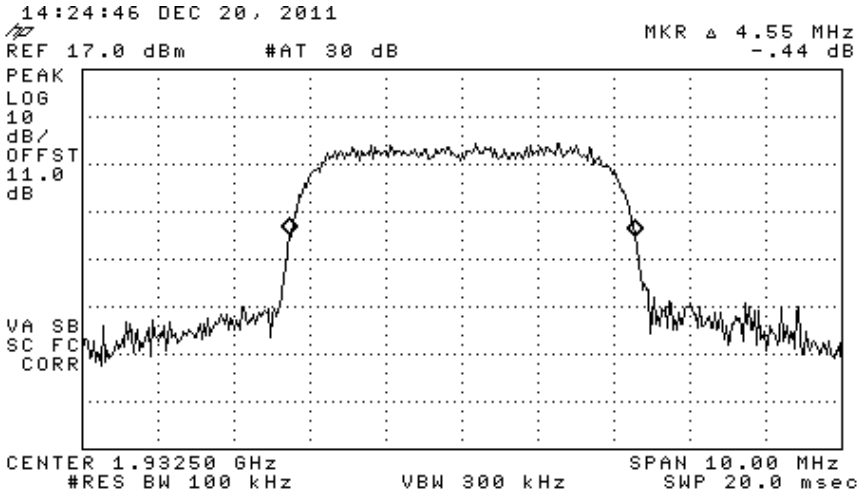

Figure 128.— Input 1932.50 MHz

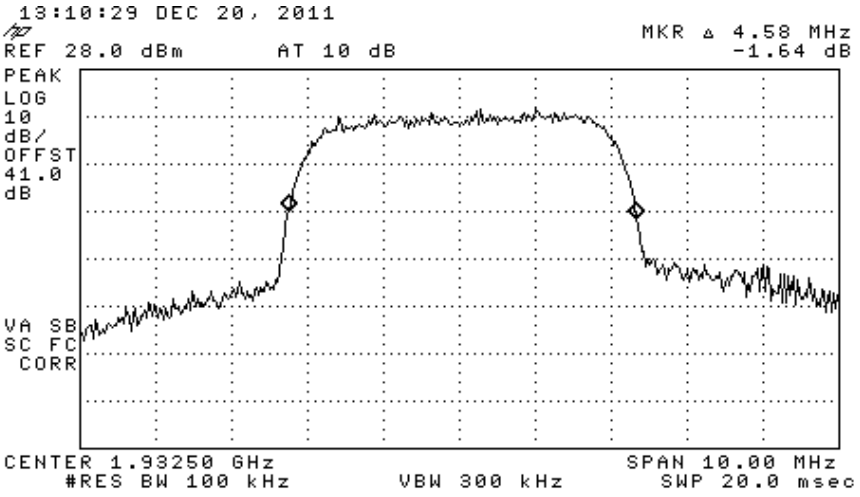

Figure 129.— Output 1932.50 MHz

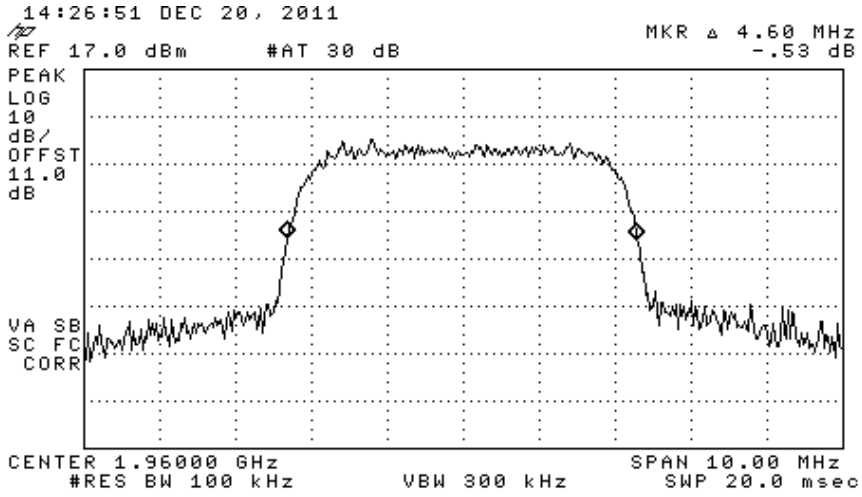

Figure 130.— Input 1960.00 MHz

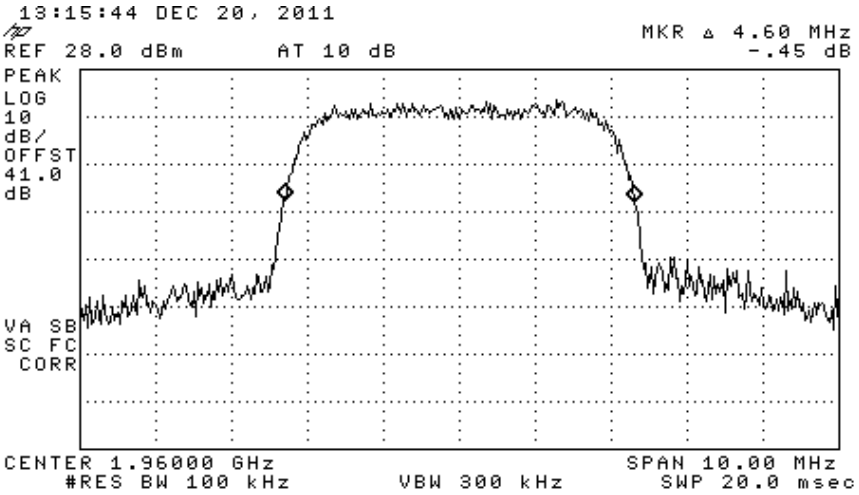

Figure 131.— Output 1960.00 MHz

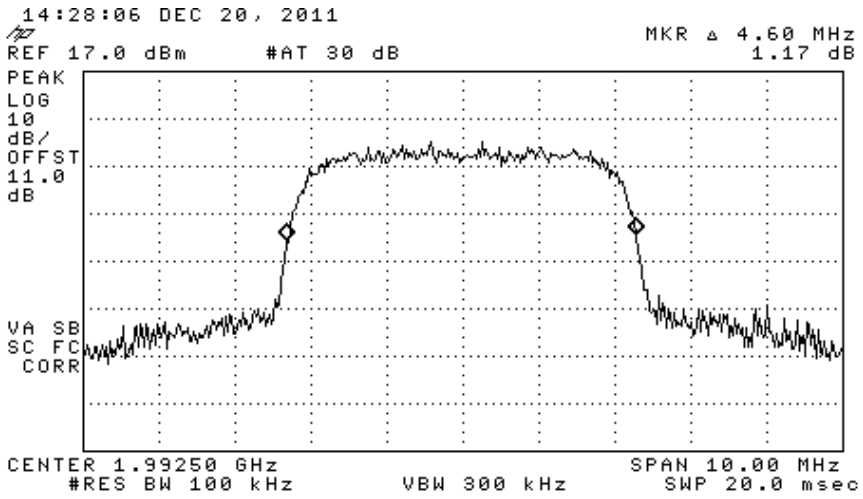

Figure 132.— Input 1992.50 MHz

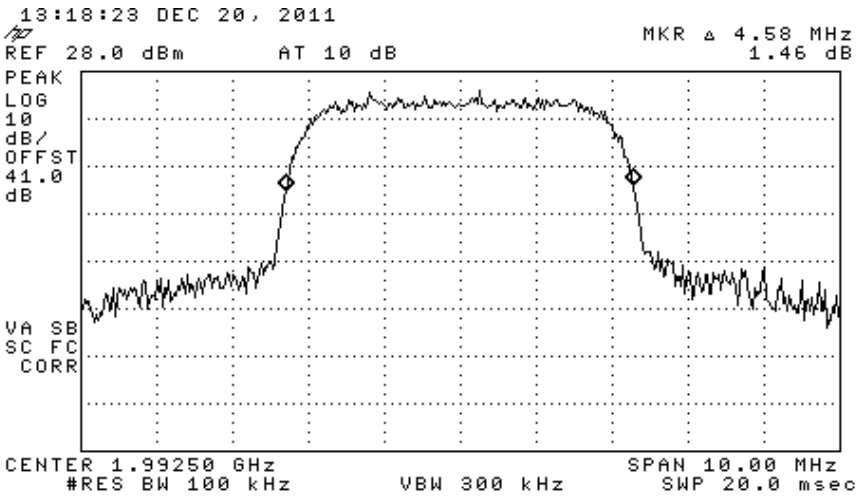

Figure 133.— Output 1992.50 MHz

11.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 2, Section 1049

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	1931.20	1.500
	Output	1931.20	1.500
	Input	1960.00	1.513
	Output	1960.00	1.513
	Input	1993.80	1.500
	Output	1993.80	1.500
GSM	Input	1931.20	0.310
	Output	1931.20	0.315
	Input	1960.00	0.313
	Output	1960.00	0.313
	Input	1993.80	0.308
	Output	1993.80	0.310
W-CDMA	Input	1932.50	4.550
	Output	1932.50	4.580
	Input	1960.00	4.600
	Output	1960.00	4.600
	Input	1992.50	4.600
	Output	1992.50	4.5800

Figure 134 Occupied Bandwidth PCS

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

11.4 Test Equipment Used.

Occupied Bandwidth PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 135 Test Equipment Used

12. Out of Band Emissions at Antenna Terminals PCS

12.1 Test Specification

FCC Part 24, Subpart E, Section 238; FCC Part 2.1051

12.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (41 dB).
The spectrum analyzer was set to 100 kHz R.B.W.
Signal power was +10 dBm to EUT.

CDMA:

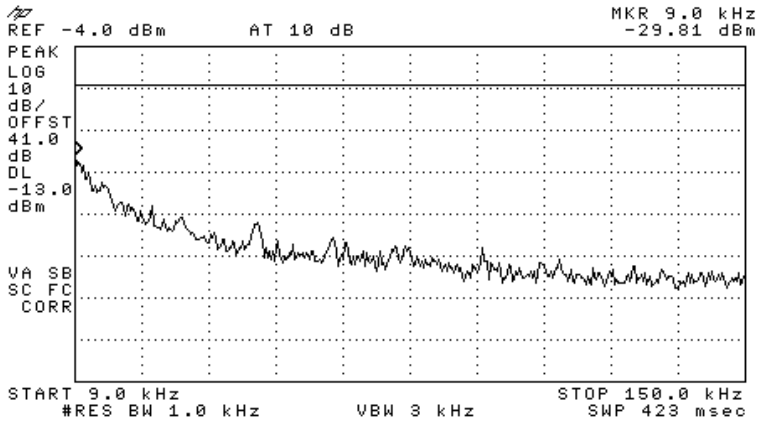

Figure 136.— 1931.20 MHz

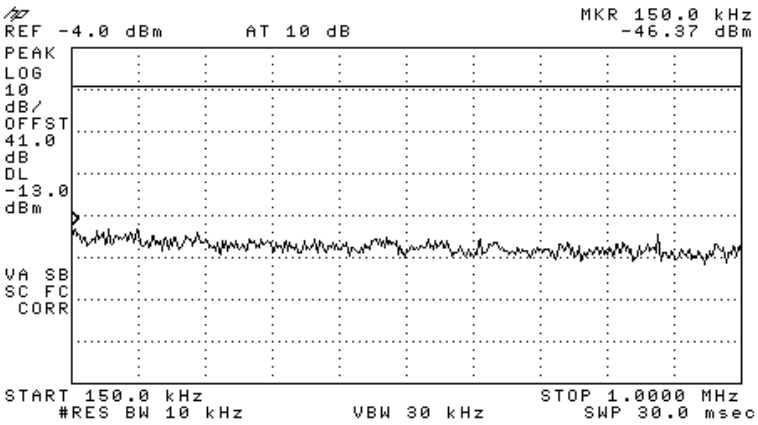

Figure 137.— 1931.20 MHz

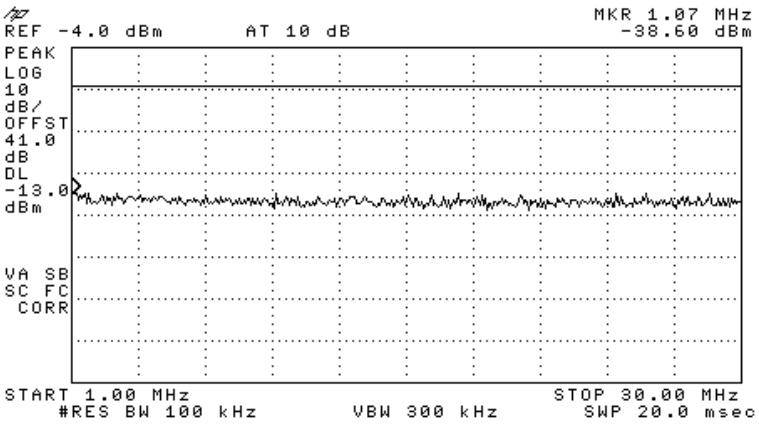

Figure 138.— 1931.20 MHz

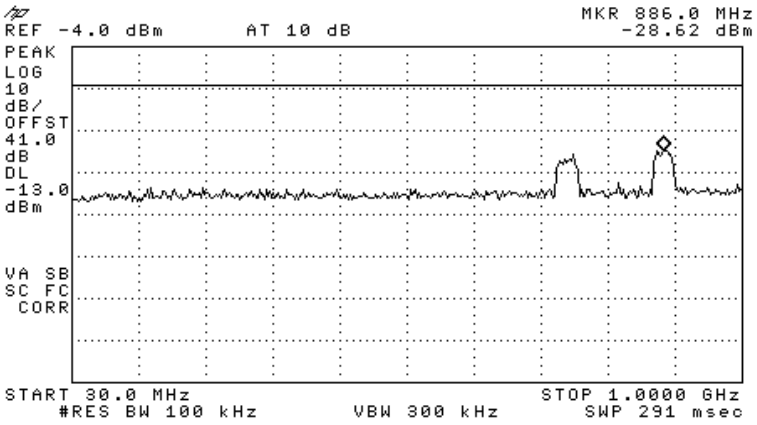

Figure 139.— 1931.20 MHz

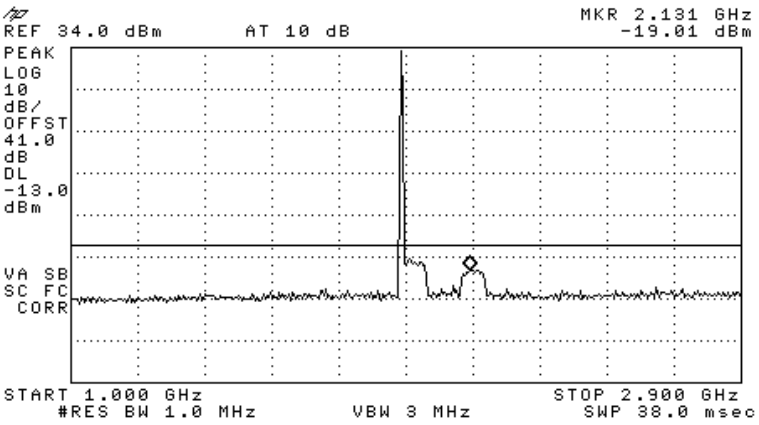

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Figure 140.— 1931.20 MHz

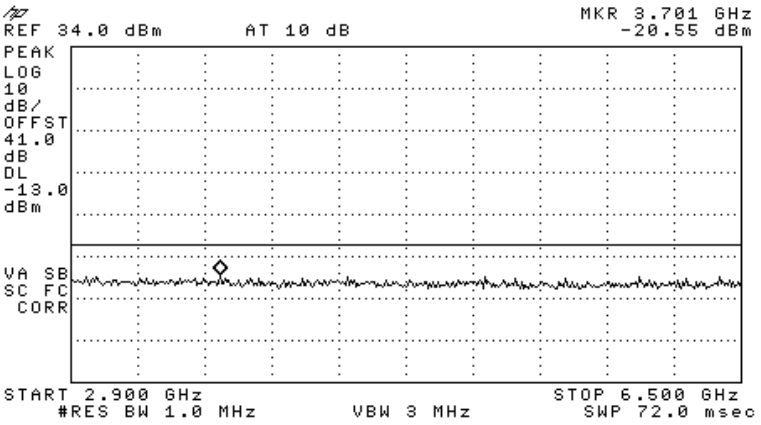

Figure 141.— 1931.20 MHz

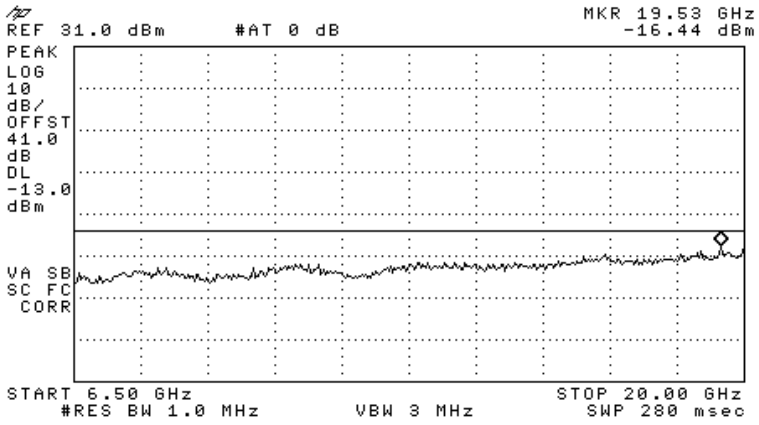

Figure 142.— 1931.20 MHz

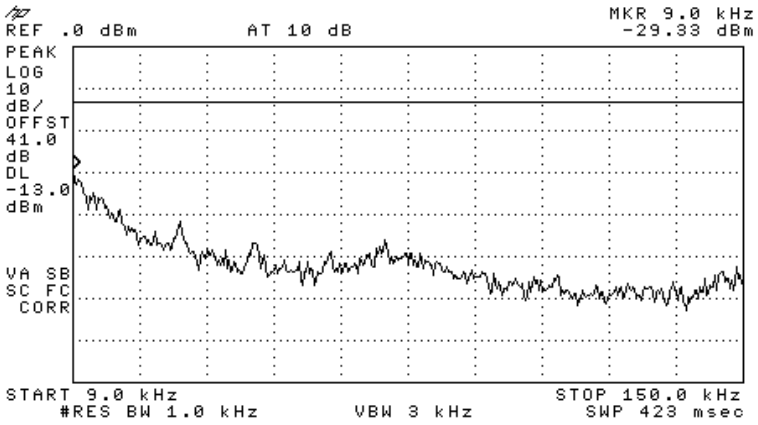

Figure 143.— 1960.00 MHz

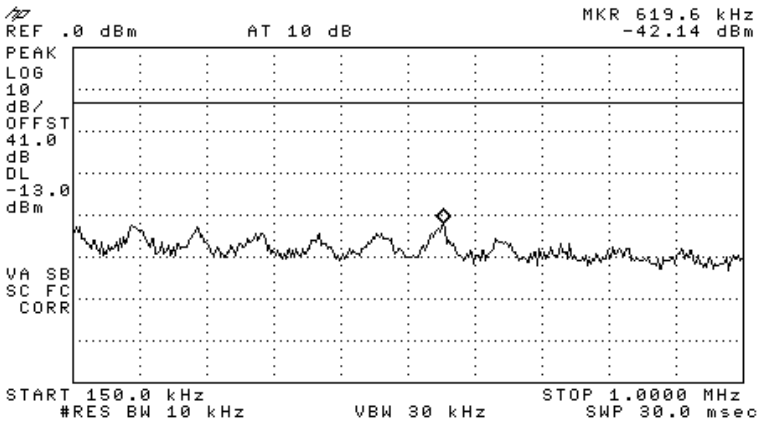

Figure 144.— 1960.00 MHz

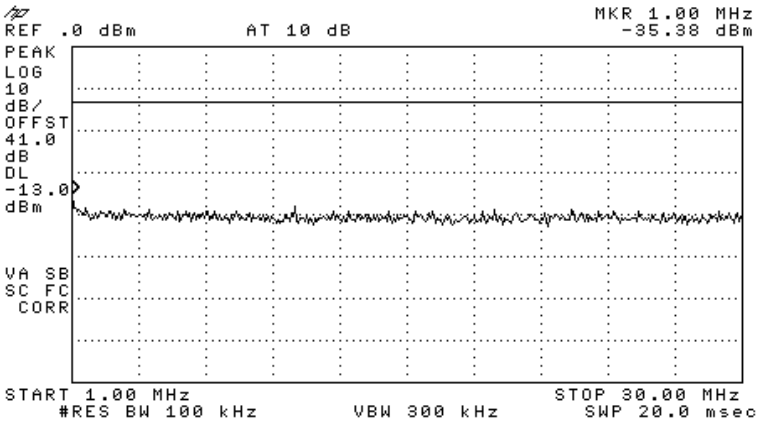

Figure 145.— 1960.00 MHz

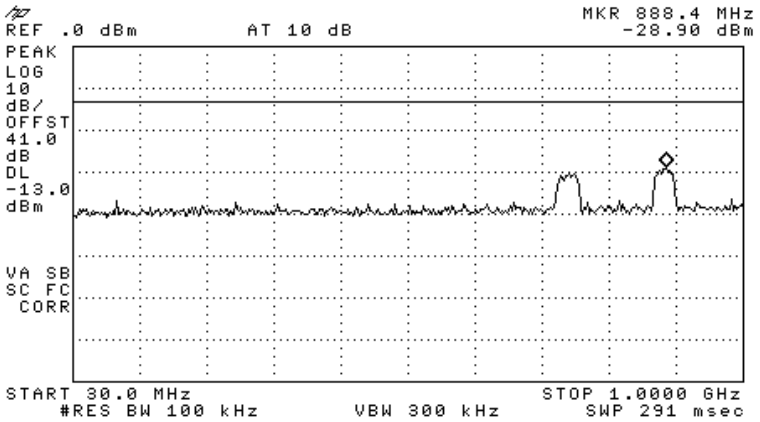

Figure 146.— 1960.00 MHz

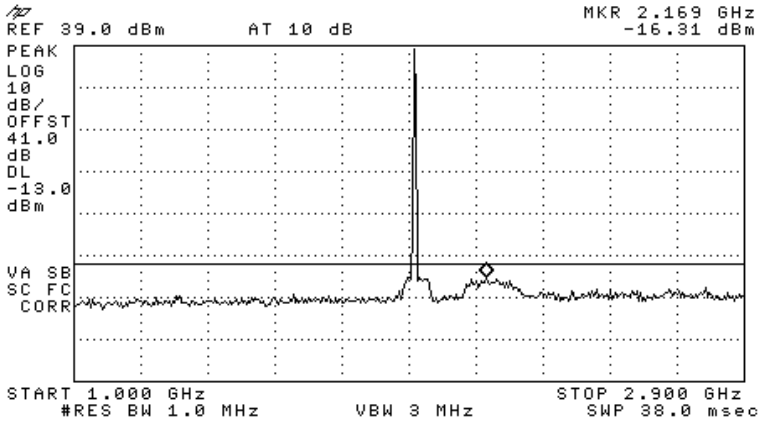

Figure 147.— 1960.00 MHz

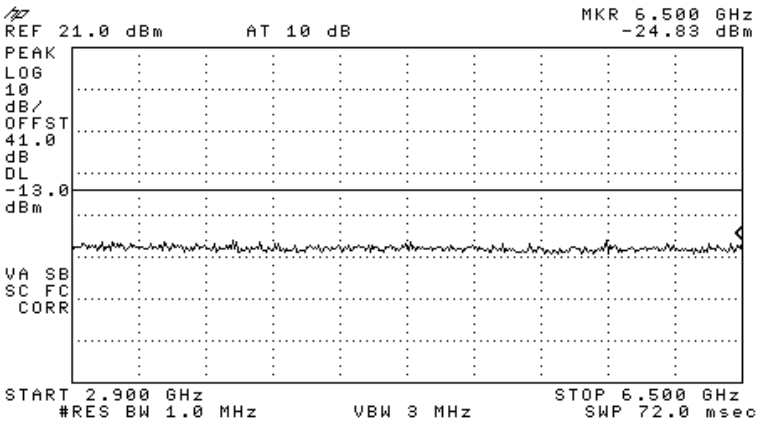

Figure 148.— 1960.00 MHz

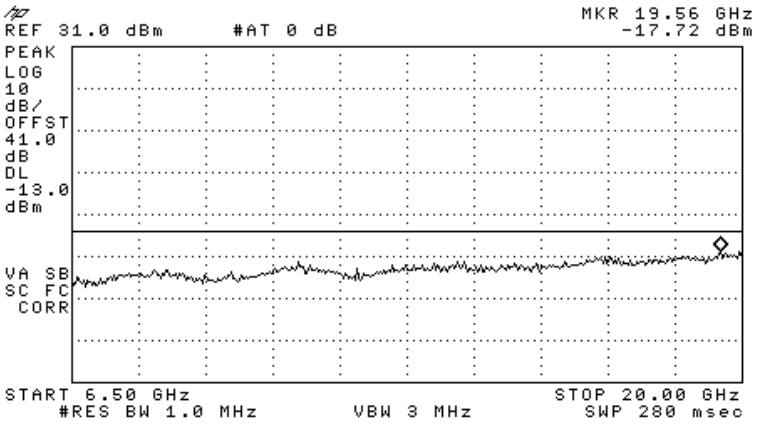

Figure 149.— 1960.00 MHz

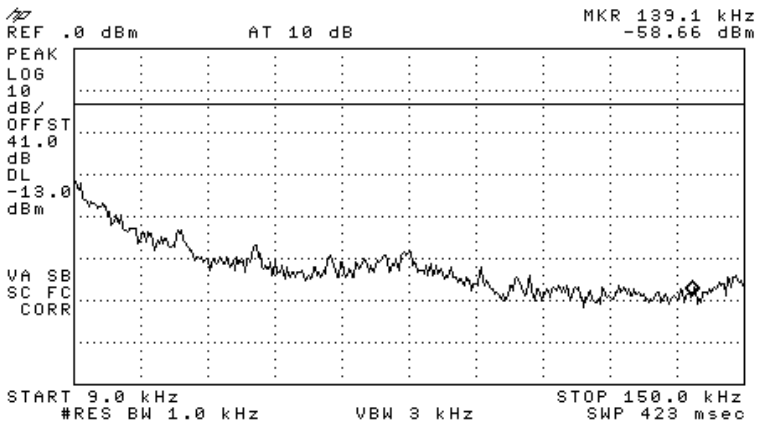

Figure 150.— 1993.80 MHz

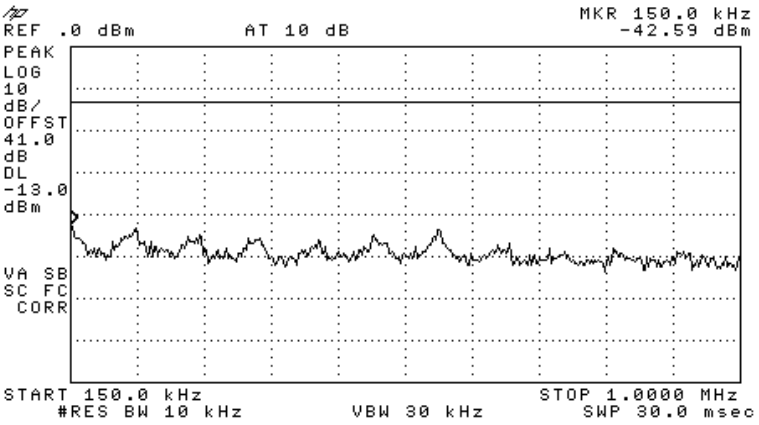

Figure 151.— 1993.80 MHz

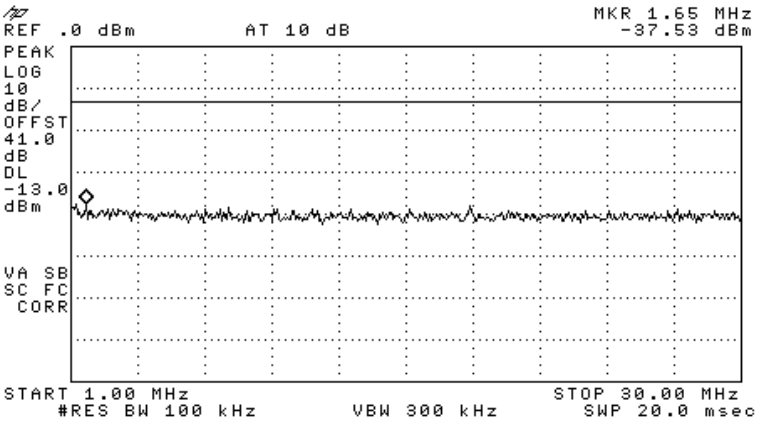

Figure 152.— 1993.80 MHz

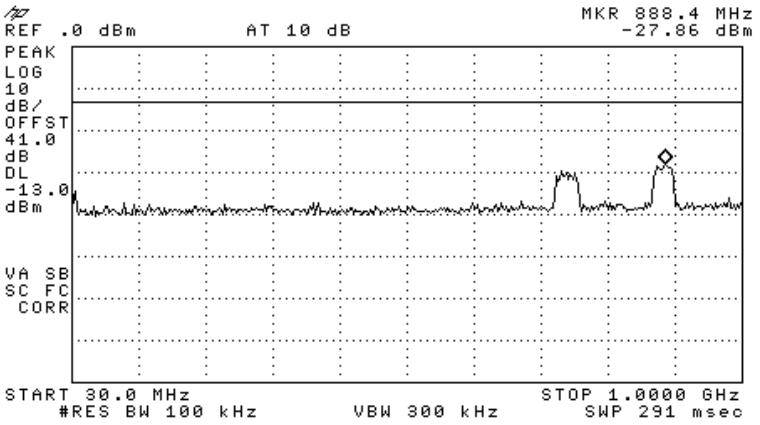

Figure 153.— 1993.80 MHz

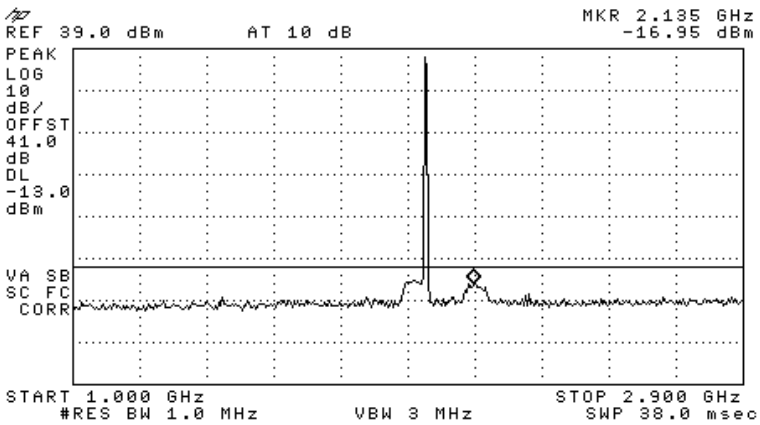

Figure 154.— 1993.80 MHz

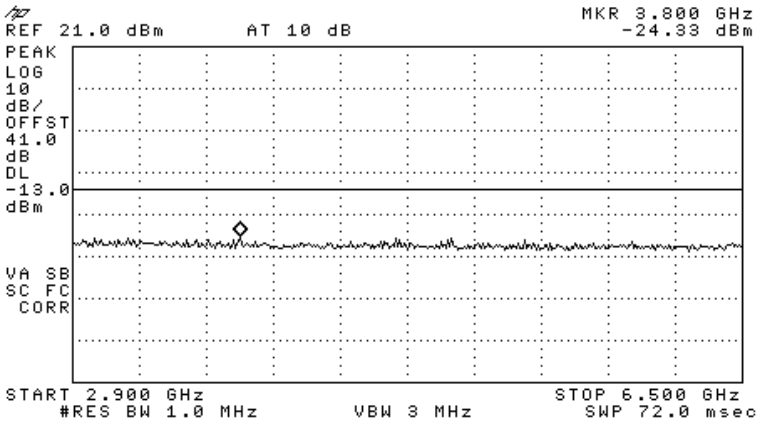

Figure 155.— 1993.80 MHz

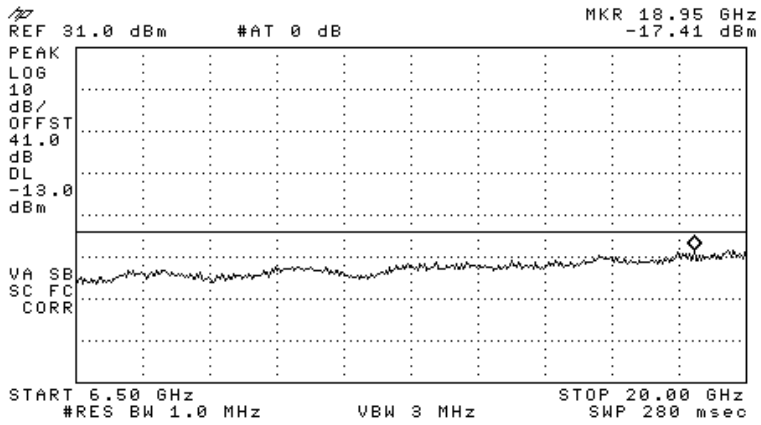

Figure 156.— 1993.80 MHz

GSM:

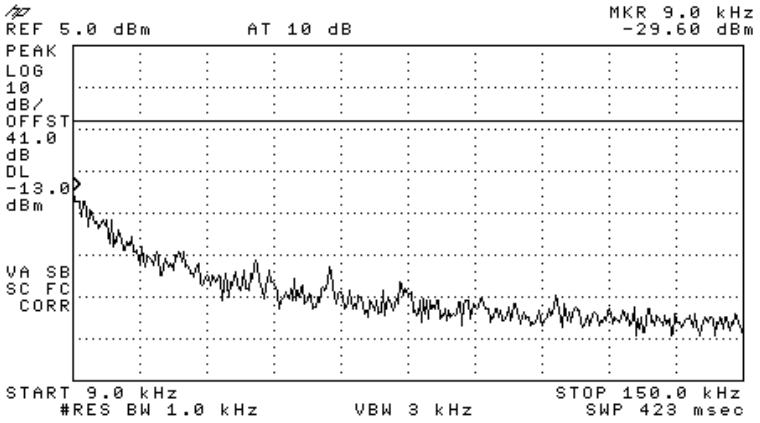

Figure 157.— 1931.20 MHz

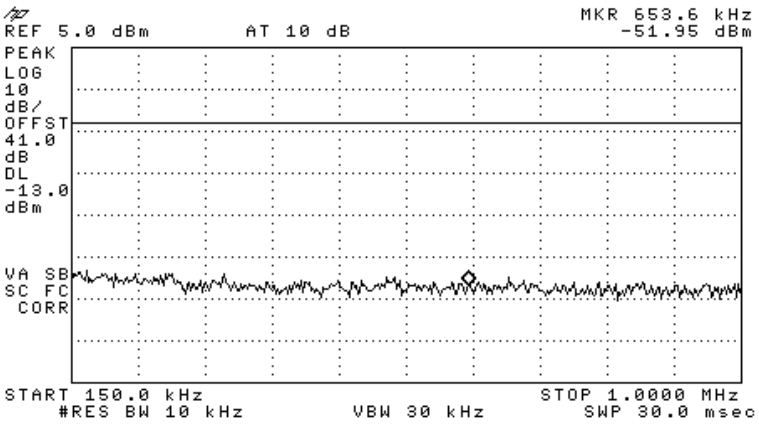

Figure 158.— 1931.20 MHz

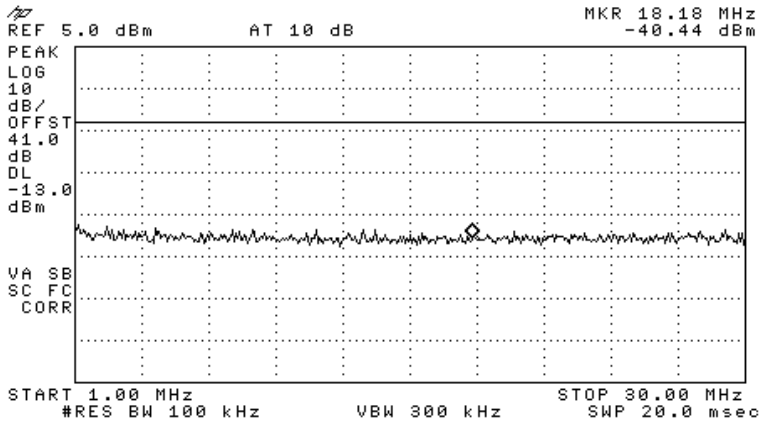

Figure 159.— 1931.20 MHz

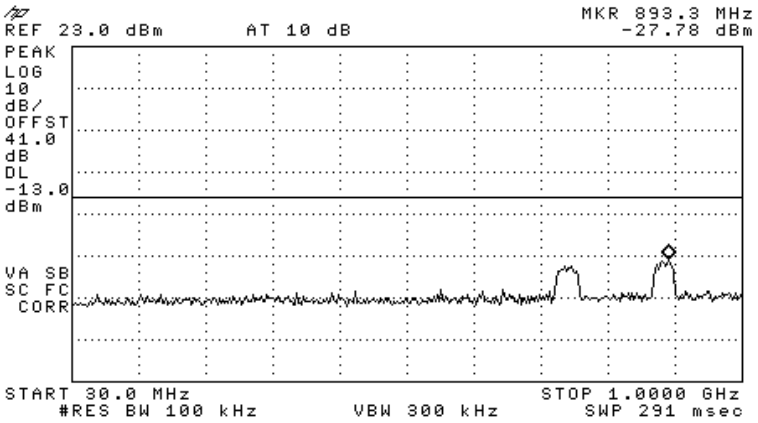

Figure 160.— 1931.20 MHz

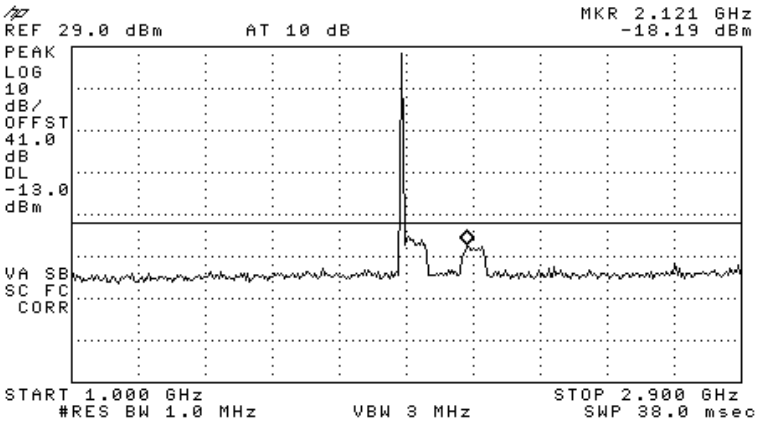

Figure 161.— 1931.20 MHz

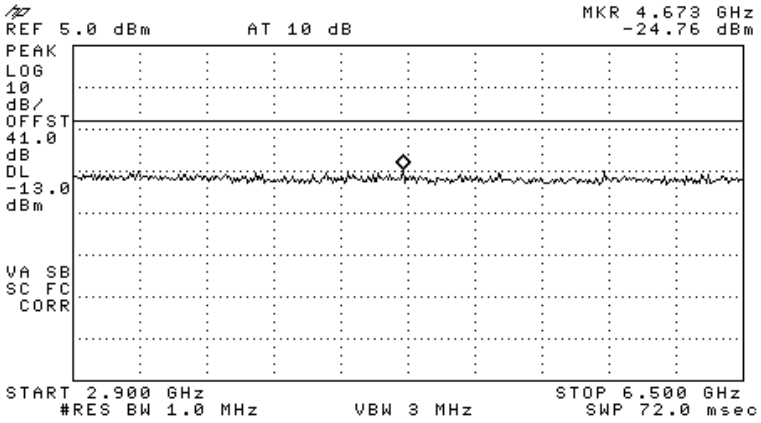

Figure 162.— 1931.20 MHz

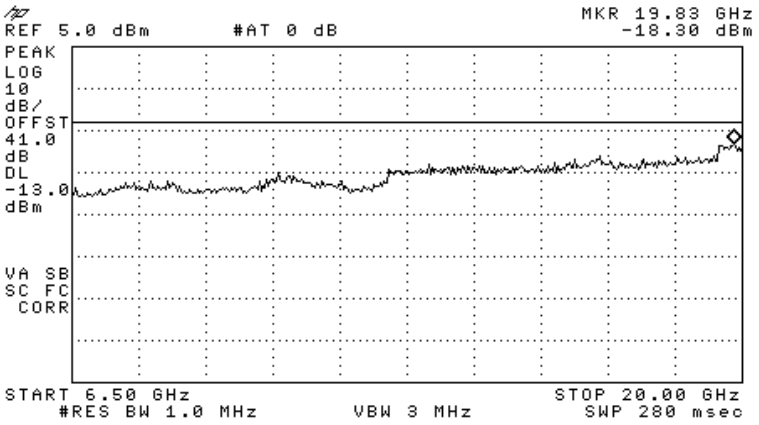

Figure 163.— 1931.20 MHz

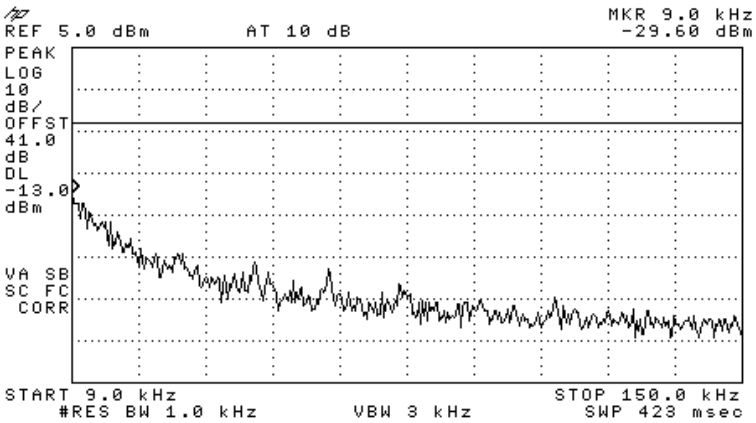

Figure 164.— 1960.00 MHz

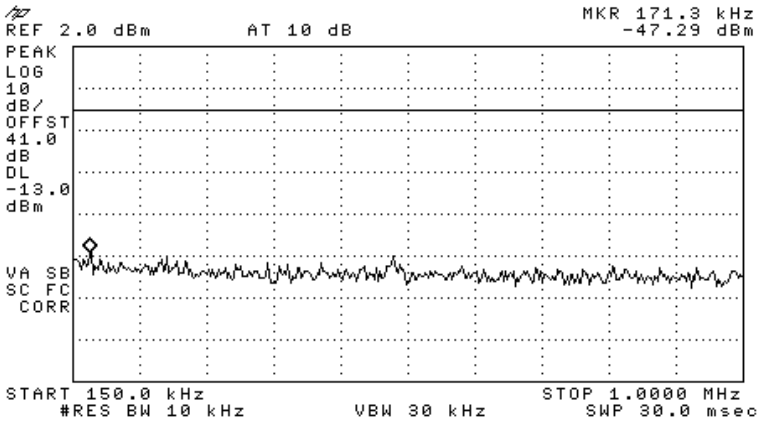

Figure 165.— 1960.00 MHz

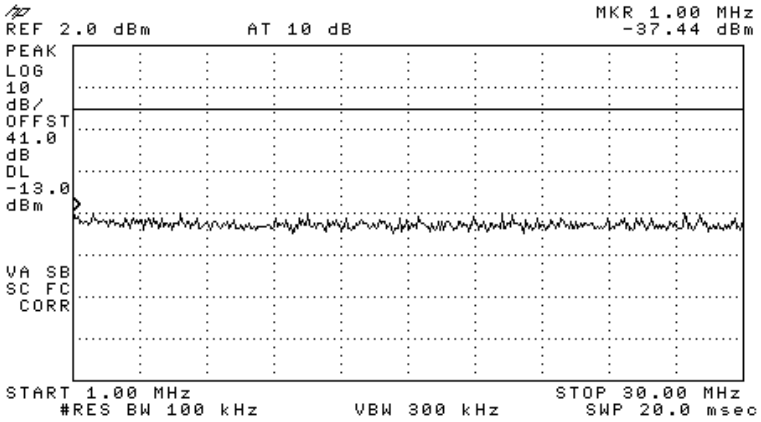

Figure 166.— 1960.00 MHz

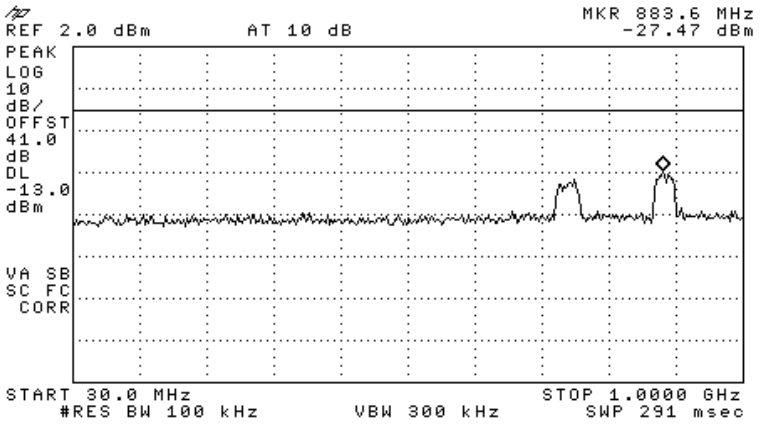

Figure 167.— 1960.00 MHz

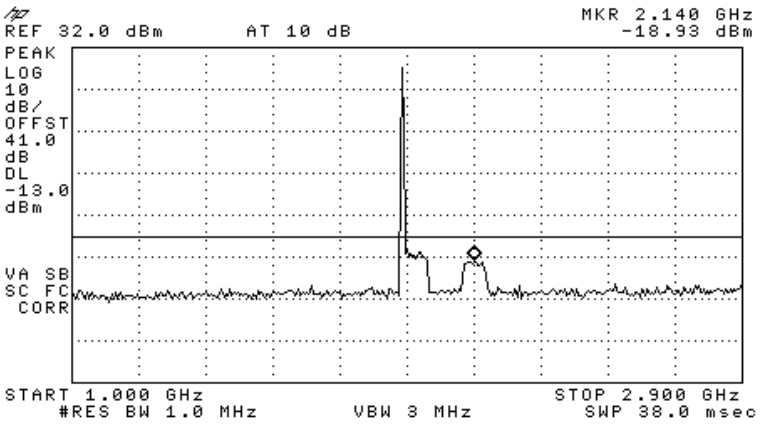

Figure 168.— 1960.00 MHz

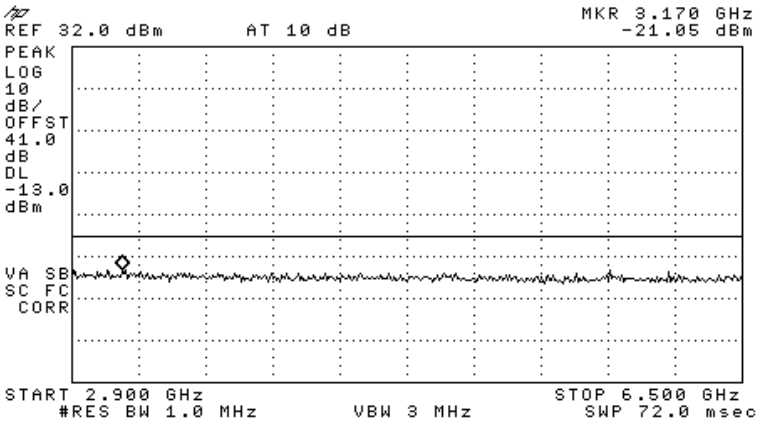

Figure 169.— 1960.00 MHz

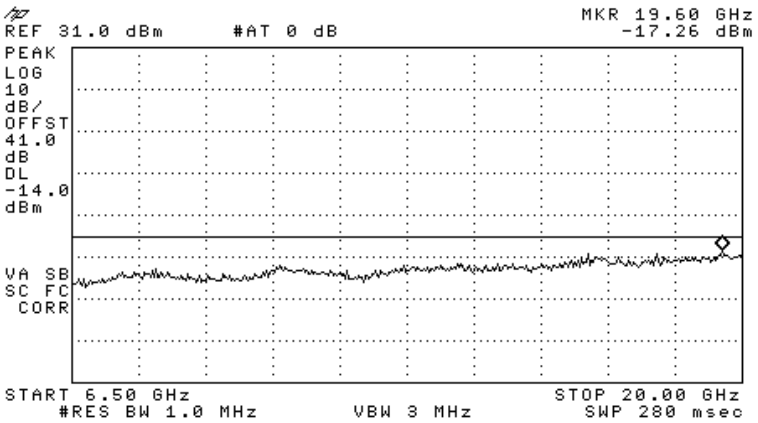

Figure 170.— 1960.00 MHz

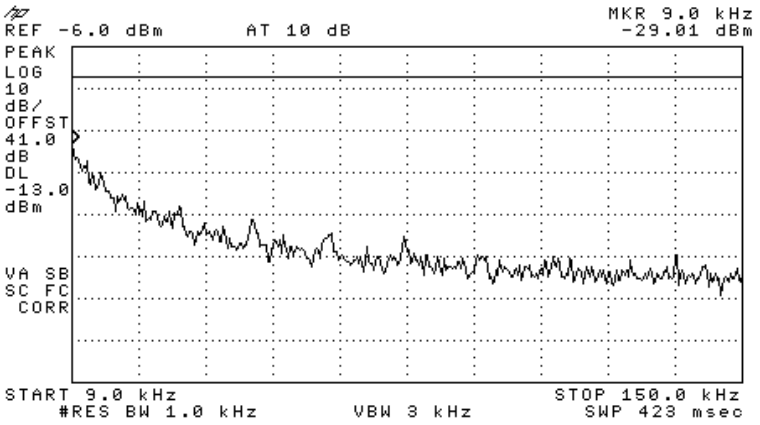

Figure 171.— 1993.80 MHz

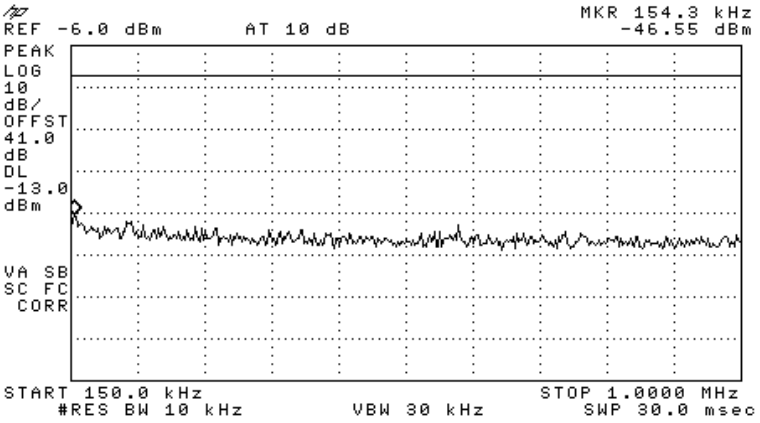

Figure 172.— 1993.80 MHz

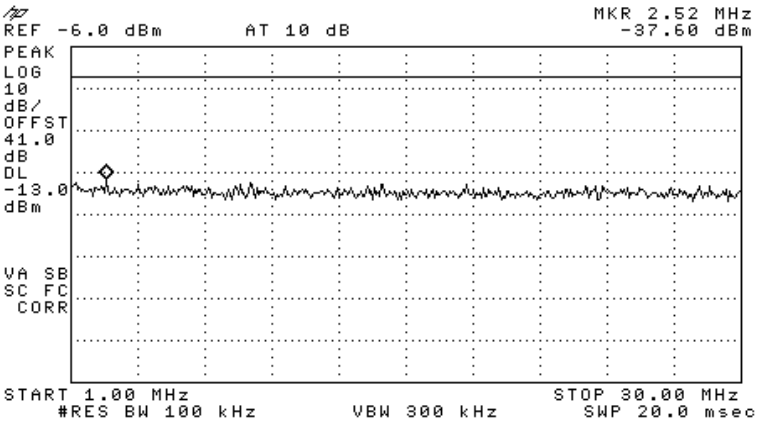

Figure 173.— 1993.80 MHz

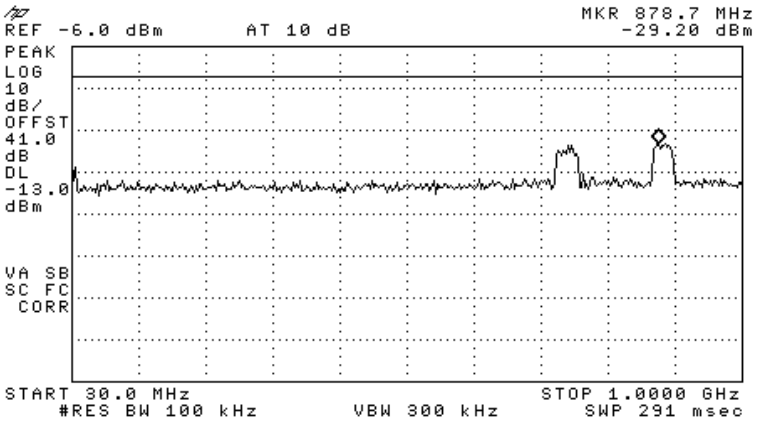

Figure 174.— 1993.80 MHz

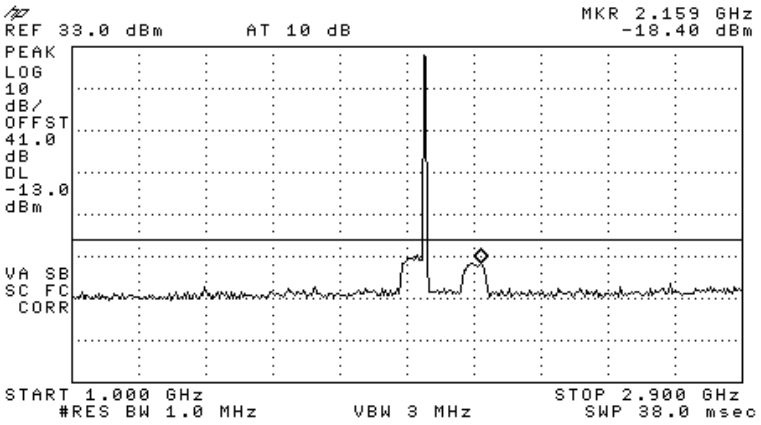

Figure 175.— 1993.80 MHz

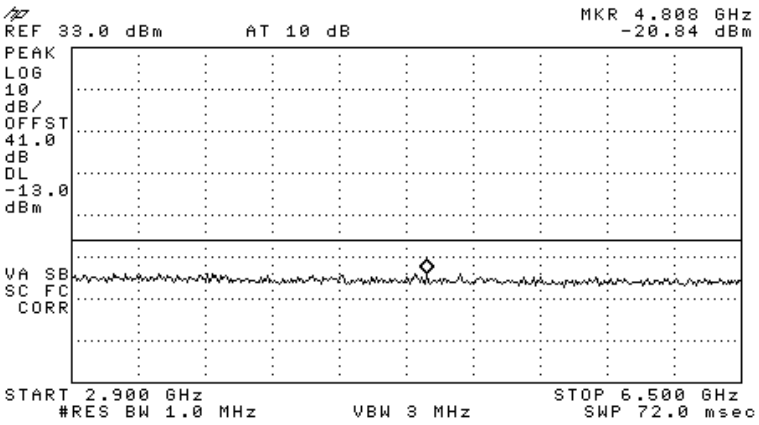

Figure 176.— 1993.80 MHz

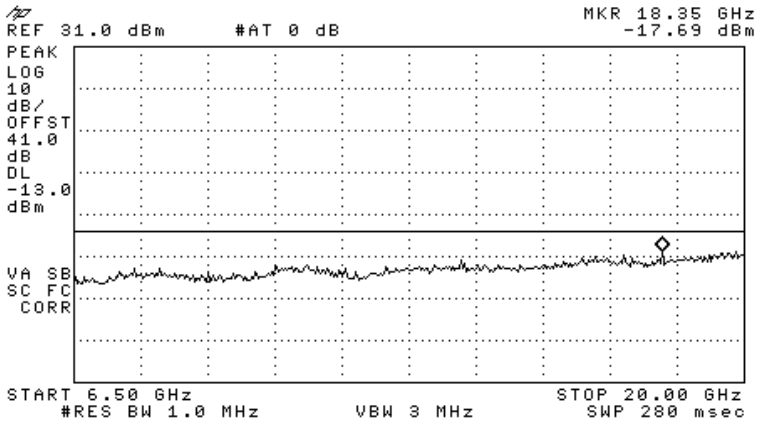

Figure 177.— 1993.80 MHz

W-CDMA:

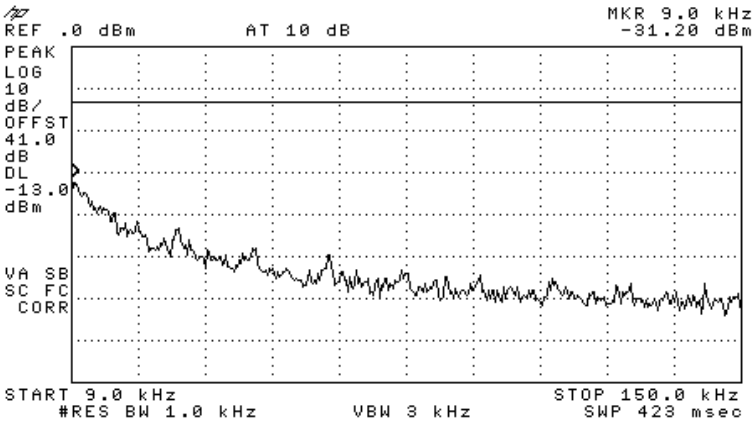

Figure 178.— 1932.50 MHz

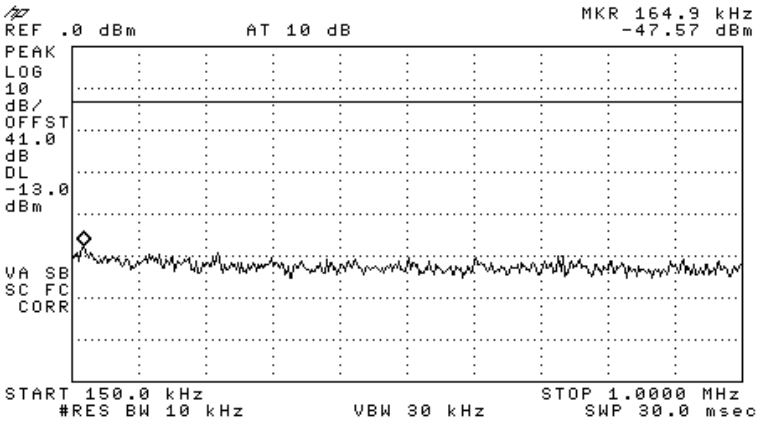

Figure 179.— 1932.50 MHz

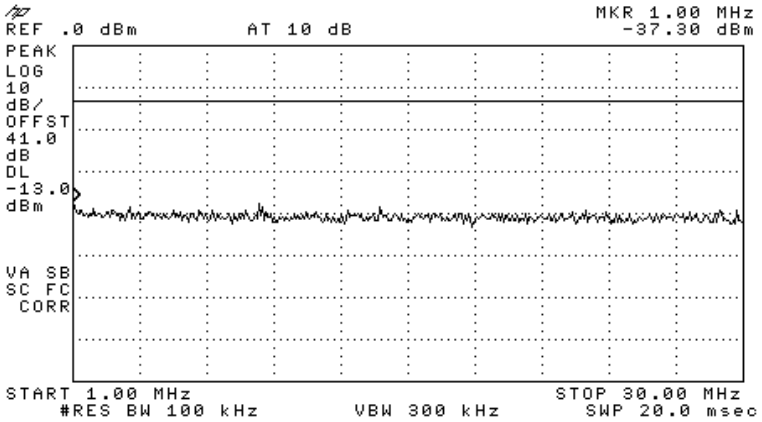

Figure 180.— 1932.50 MHz

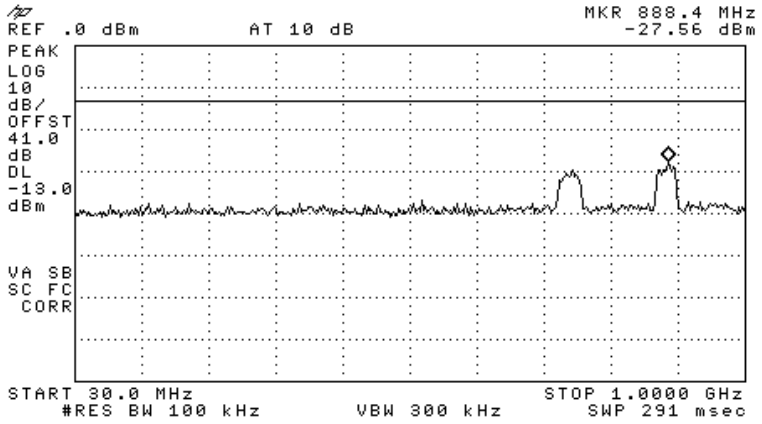

Figure 181.— 1932.50 MHz

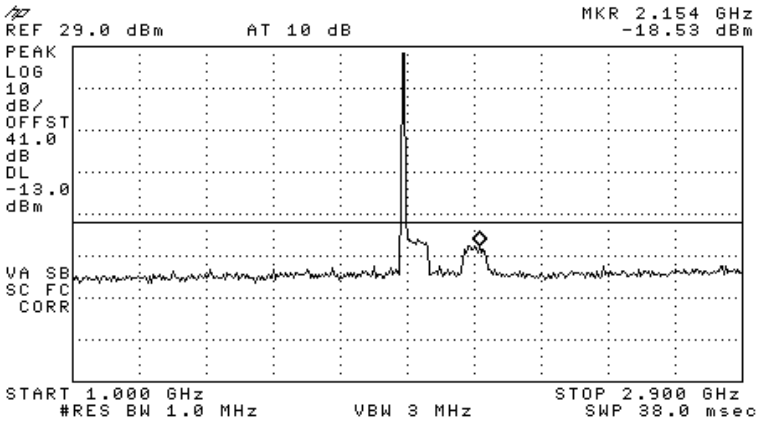

Figure 182.— 1932.50 MHz

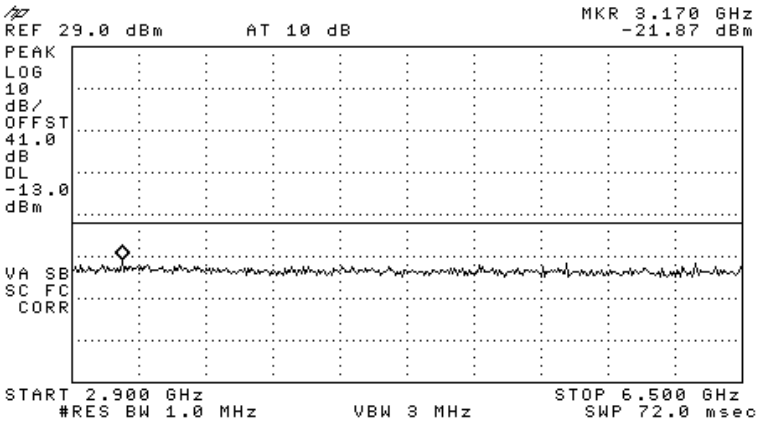

Figure 183.— 1932.50 MHz

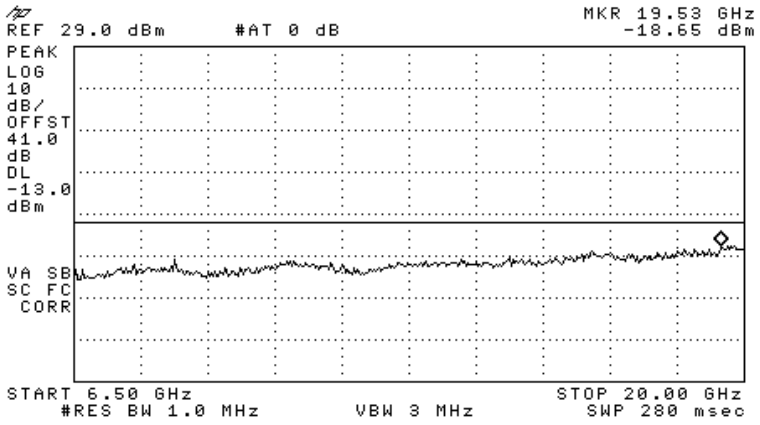

Figure 184.— 1932.50 MHz

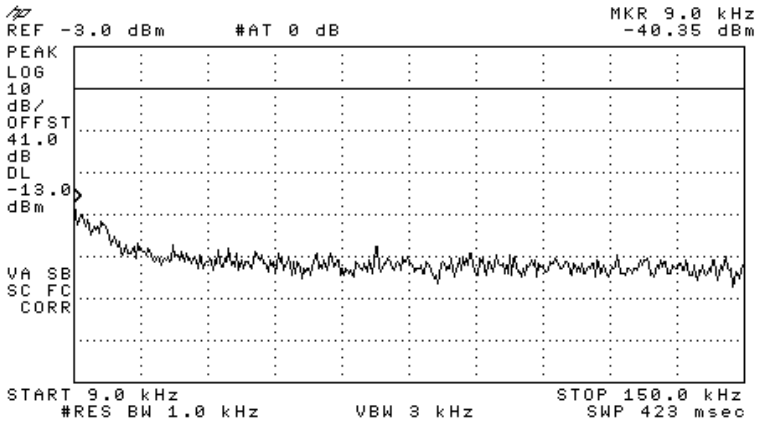

Figure 185.— 1960.00 MHz

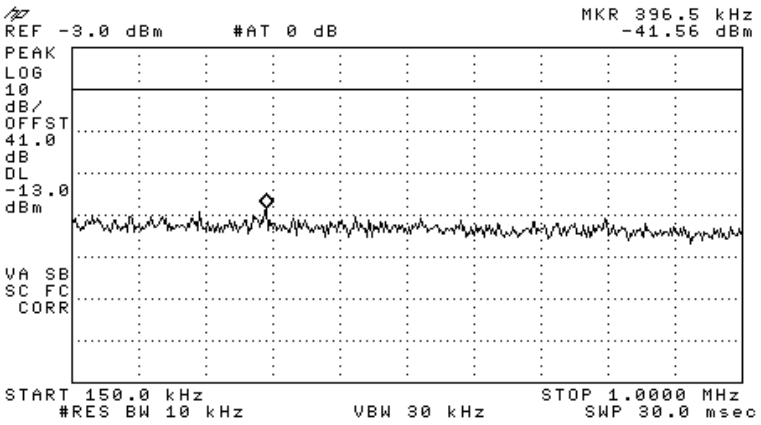

Figure 186.— 1960.00 MHz

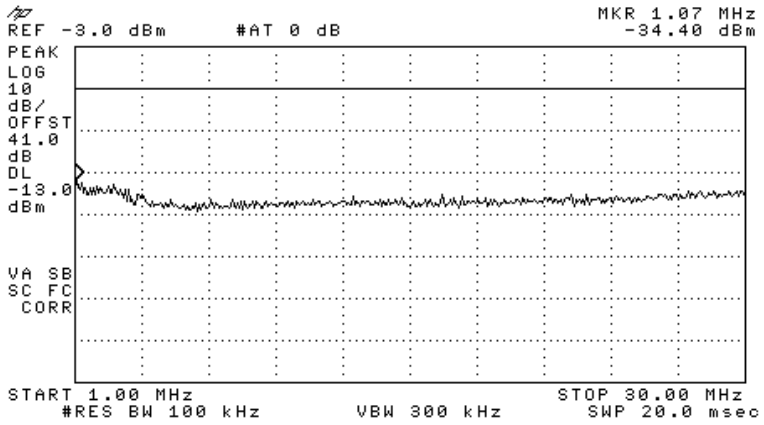

Figure 187.— 1960.00 MHz

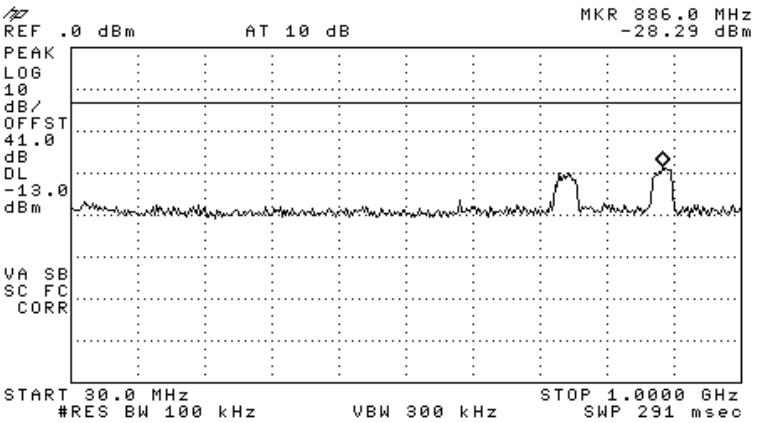

Figure 188.— 1960.00 MHz

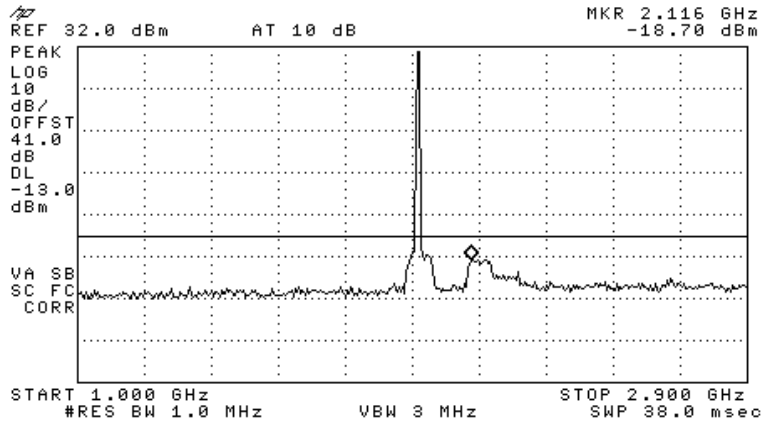

Figure 189.— 1960.00 MHz

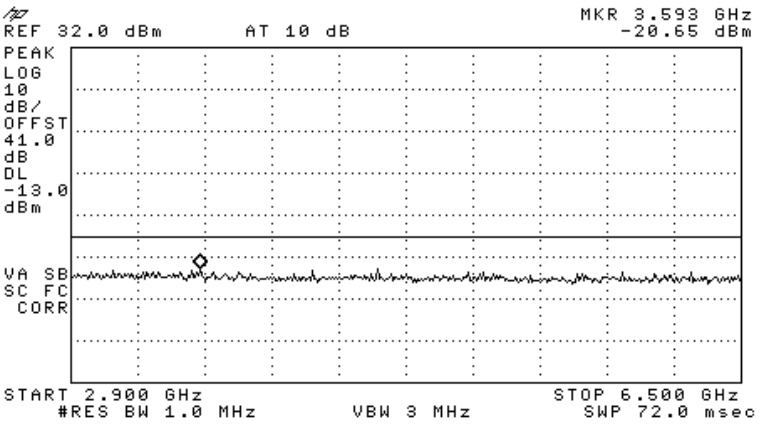

Figure 190.— 1960.00 MHz

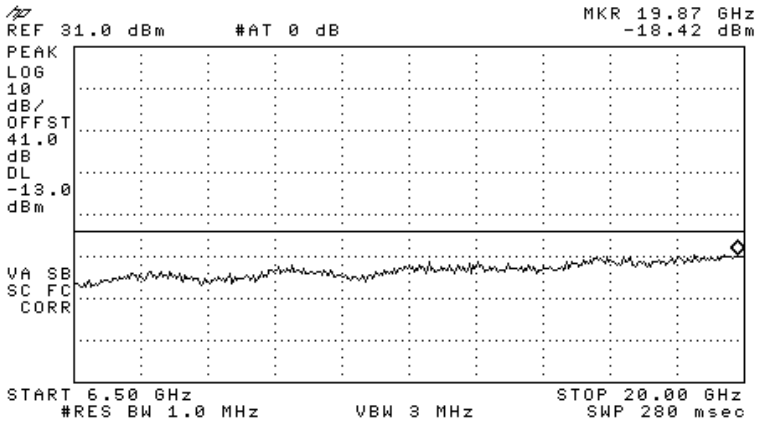

Figure 191.— 1960.00 MHz

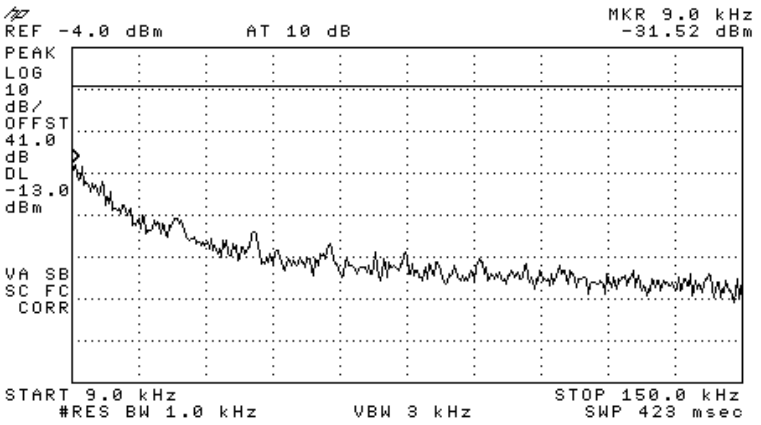

Figure 192.— 1992.50 MHz

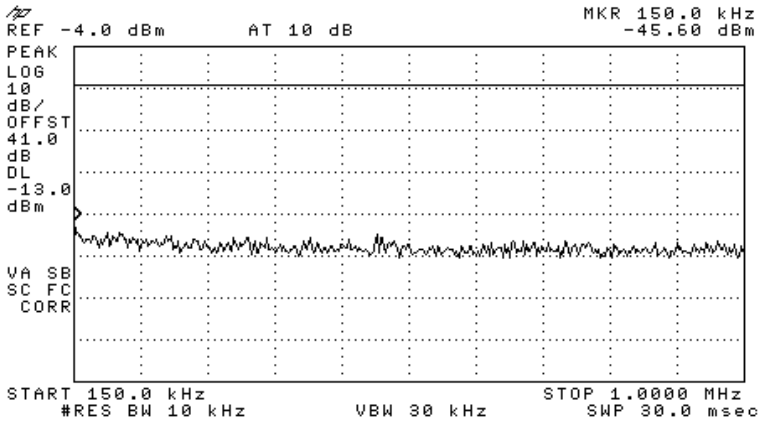

Figure 193.— 1992.50 MHz

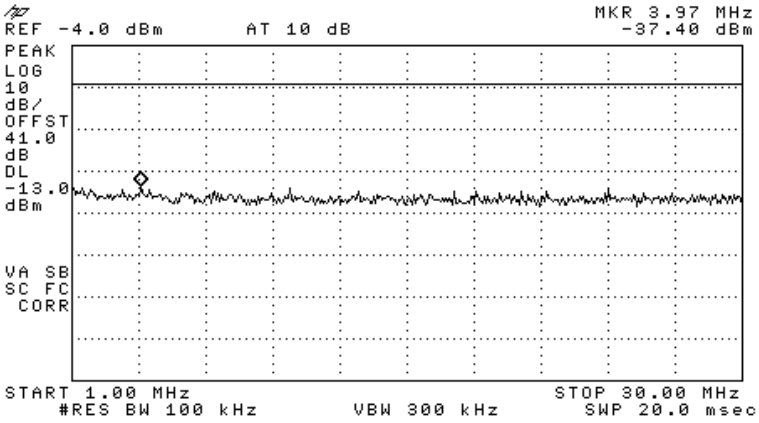

Figure 194.— 1992.50 MHz

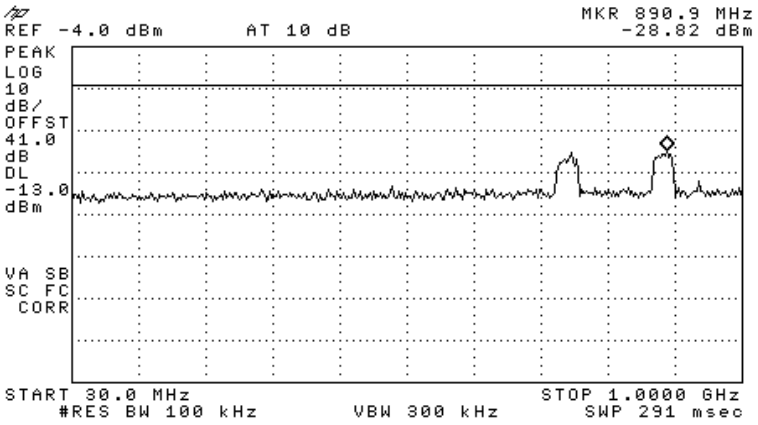

Figure 195.— 1992.50 MHz

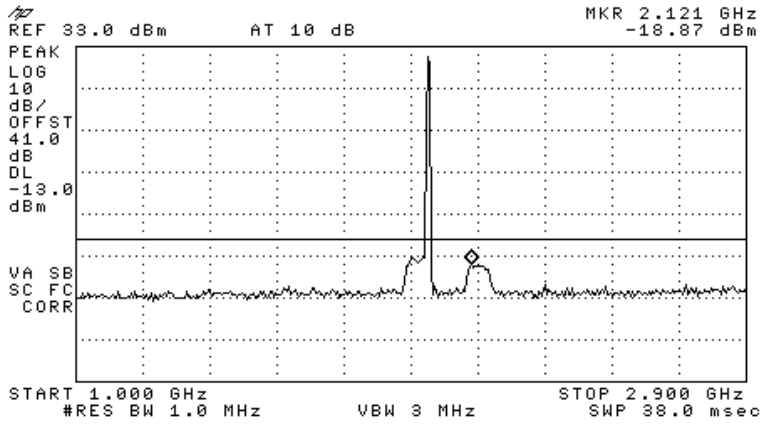

Figure 196.— 1992.50 MHz

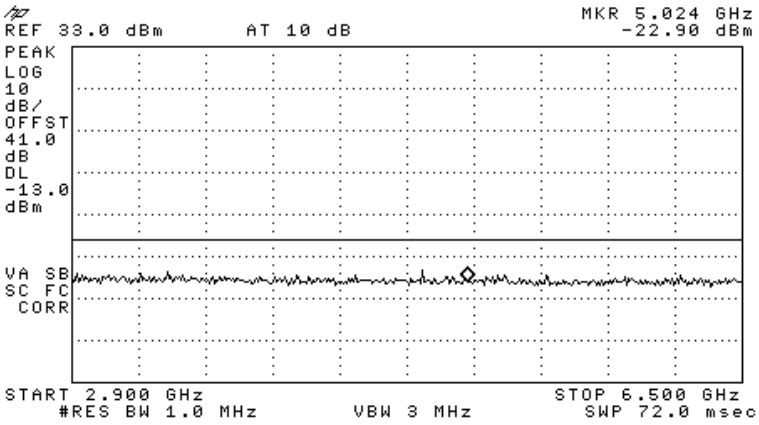

Figure 197.— 1992.50 MHz

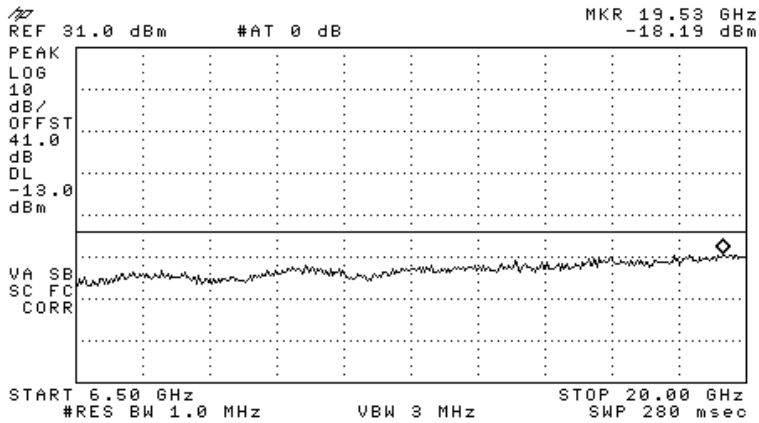

Figure 198.— 1992.50 MHz

12.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Frequency (GHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.20	19.53	-16.44	-13.0	-3.44
	1960.00	2.169	-16.31	-13.0	-3.31
	1993.80	2.135	-16.95	-13.0	-3.95
GSM	1931.20	19.83	-18.30	-13.0	-5.30
	1960.00	19.60	-17.26	-13.0	-4.26
	1993.80	18.35	-17.69	-13.0	-4.69
W-CDMA	1932.50	2.154	-18.53	-13.0	-5.53
	1960.00	19.87	-18.42	-13.0	-5.42
	1992.50	19.53	-18.19	-13.0	-5.19

Figure 199 Out of Band Emission Results PCS

JUDGEMENT: Passed by 3.31 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

12.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8529L	3826A01204	February 21, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28, 2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 200 Test Equipment Used

13. Band Edge Spectrum PCS

13.1 Test Specification

FCC Part 24, Subpart E, Section 238; FCC Part 2.1051

13.2 Test procedure

For CDMA and GSM:

Enclosed are spectrum analyzer plots for the lowest operation frequency (1931.2 MHz) and the highest operation frequency (1993.8 MHz) in which the E.U.T. is planned to be used.

For WCDMA:

Enclosed are spectrum analyzer plots for the lowest operation frequency (1932.5 MHz) and the highest operation frequency (1992.5 MHz) in which the E.U.T. is planned to be used.

The power of any emission outside of the authorized operating frequency ranges (1930.00-1990.00 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + log (P) dB, yielding –13dBm.
The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (21 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

CDMA:

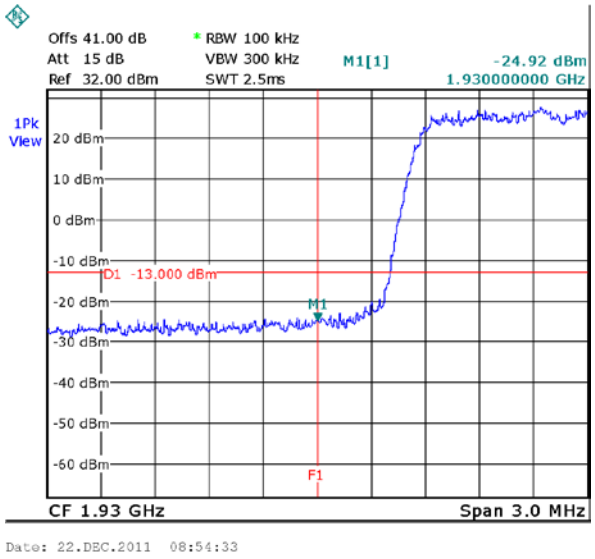

Figure 201.— 1931.20 MHz

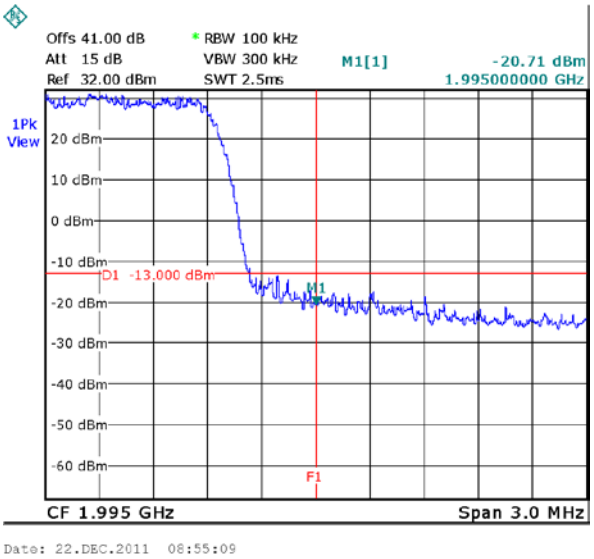

Figure 202.— 1993.80 MHz

GSM:

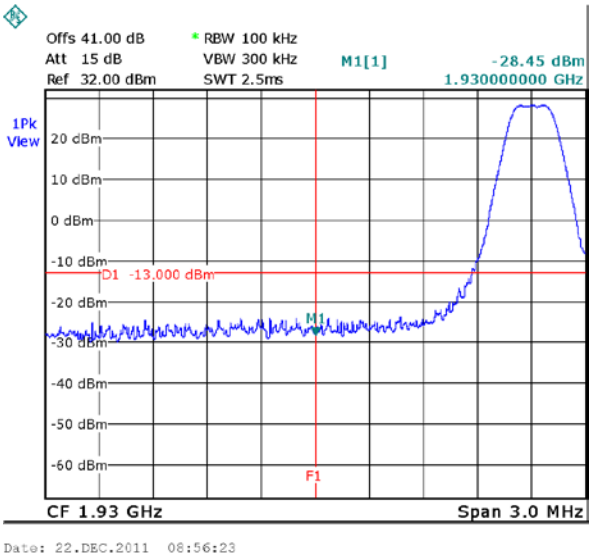

Figure 203.— 1931.20 MHz

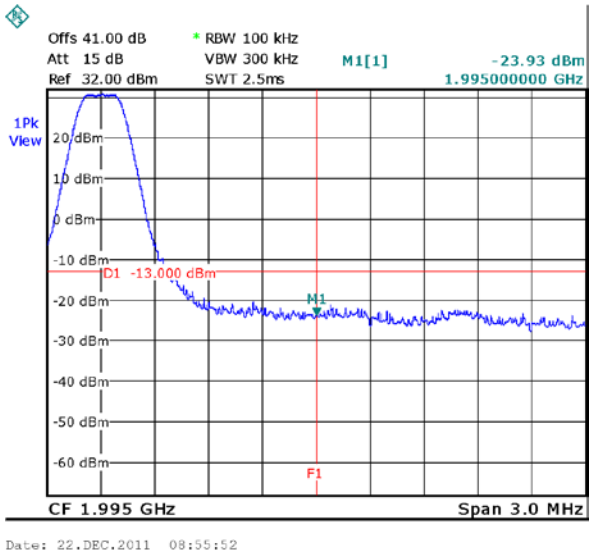

Figure 204.— 1993.80 MHz

W-CDMA:

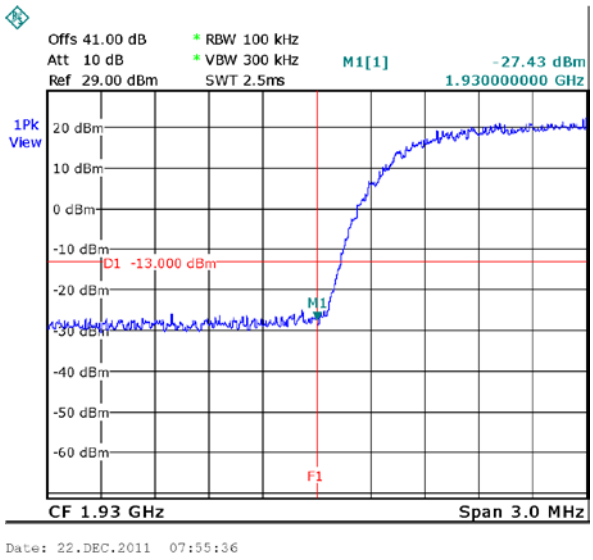

Figure 205.— 1932.50 MHz

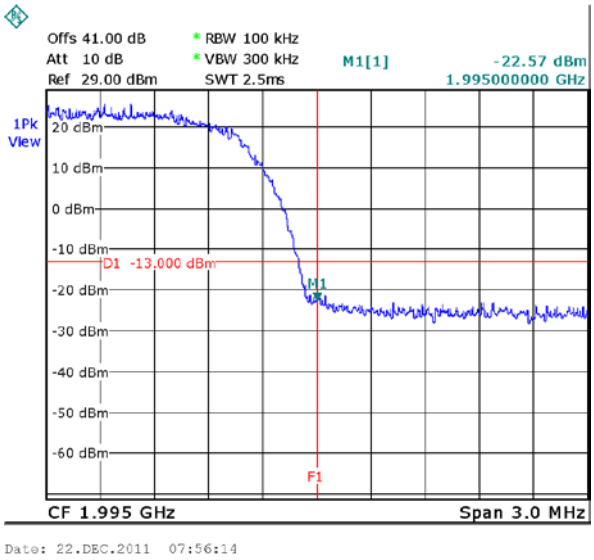

Figure 206.— 1992.50 MHz

13.3 Results Table

E.U.T. Description: Mobile AccessHX High-Power DAS Remote Unit MIMO
Model No.: HX-C85P19L70MA17M-AC-A
Serial Number: 0B422A0
Specification: FCC Part 24, Subpart E, Section 238; Part 2 Section 1051

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	1931.2	1930.0	-24.92	-13.0	-11.92
	1993.8	1995.0	-20.71	-13.0	-7.71
GSM	1931.2	1930.0	-28.45	-13.0	-15.45
	1993.8	1995.0	-23.93	-13.0	-10.93
W-CDMA	1932.5	1930.0	-27.43	-13.0	-14.43
	1992.5	1995.0	-22.57	-13.0	-9.57

Figure 207 Band Edge Spectrum Results PCS

JUDGEMENT: Passed by 7.71 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

13.4 Test Equipment Used.

Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	R&S	FSL6	10-300191865	October 30, 2011	1 year
Signal Generator	HP	E4438C ESG-	MY45091956	May 4, 2011	1 year
Signal Generator	HP	E4433B ESG-D	GB40050702	May 4, 2011	1 year
Attenuator	Narda	MOD 766-10	9409	August 28, 2011	1 year
Attenuator	Mini-Circuits	BW-S30W5	0533	August 28,2011	1 year
Cable	Mini-Circuits	30091		February 10, 2011	1 year

Figure 208 Test Equipment Used

14. Out of Band Emissions (Radiated) PCS

14.1 Test Specification

FCC, Part 24, Subpart E Section 238, FCC Part 2.1053

14.2 Test Procedure

The test method was based on ANSI/TIA-603-C: 2004, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
The power of any emission outside of the authorized operating frequency ranges (1930-1990 MHz) must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB, yielding –13dBm.

(a) The E.U.T. operation mode and test set-up are as described in Section 3. A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The configuration tested is shown in Figure 3.1.
The frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

(c) The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:
P_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

14.3 Results Table

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
1931.20	3862.4	V	45.8	-56.02	4.3	8.62	-51.7	-13.0	-38.70
1931.20	3862.4	H	45.4	-55.56	4.3	8.62	-51.24	-13.0	-38.24
1960.00	3920	V	44.2	-57.62	4.3	8.62	-53.3	-13.0	-40.30
1960.00	3920	H	46.4	-54.56	4.3	8.62	-50.24	-13.0	-37.24
1993.80	3987.6	V	45.3	-57	4.3	8.6	-52.7	-13.0	-39.70
1993.80	3987.6	H	44.9	-56.45	4.3	8.6	-52.15	-13.0	-39.15

Figure 209 Out of Band (Radiated) PCS

The E.U.T met the requirements of the FCC, Part 24, Subpart E, Section 238; FCC Part 2.1053 specifications.

JUDGEMENT: Passed by 37.24 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 13.02.12

Typed/Printed Name: I. Siboni

14.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	December 12, 2011	1 year
RF Section	HP	85420E	3705A00248	December 12, 2011	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2011	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	November 13, 2011	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 23, 2011	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2011	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 Year
Signal Generator	HP	E4432B ESG-D	GB40050702	May 4, 2011	1 year
Signal Generator	HP	E4438C ESG	MY45091956	May 4, 2011	1 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

15. APPENDIX A - CORRECTION FACTORS

15.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

15.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

15.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

15.4 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

15.5 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

15.6 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

15.7 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

15.8 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2