



DATE: 27 January 2013

**I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
Corning Mobile Access**

Equipment under test:

QX Remote Unit

QX CELL-PCS AC

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.



Measurement/Technical Report for Corning Mobile Access QX Remote Unit

FCC ID: OJFQXC85P19

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
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1. General Information

1.1 Administrative Information

Manufacturer:	Corning Mobile Access
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):	QX Remote Unit
Equipment Model No.:	QX CELL-PCS AC
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	02.12.12
Start of Test:	02.12.12
End of Test:	15.01.13
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 71100
Test Specifications:	FCC Parts 22, 24, 27



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by/registered with 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. 861911.
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-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-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**

MobileAccess2000 QX (QX) is a member of the MobileAccess2000 family. It is a compact, modular, cellular indoor coverage remote unit supporting up to four services (currently, CELL/PCS, LTE and AWS).

All services are received from the head-end, over a single optic fiber and reconverted to RF for convergence and distribution over a common DAS antenna infrastructure.

Service support can be quickly added as needed by inserting card like modules into the chassis without any downtime or additional cabling. In addition, two QX units can be cascaded to provide various combinations of SISO and MIMO services distributed over the same antenna infrastructure.

MA2000 QX is managed by opening a Web session to the SC-450 Controller. MA2000 QX operates along with an SCU-F unit, which converges the services from one or more MA2000 QX units and provides the interface to the DAS infrastructure.

The following benefits are achieved with the QX platform:

- Multi-Service Platform - Supports up to four services. Currently supported: CELL, PCS, AWS, 700 MHz LTE

- Multi-Operator Optimized Platform - Services from a number of operators can be supported by the same chassis or by different units and distributed over a common DAS antenna infrastructure.

- Optic Fiber savings - All services routed to a QX unit are routed over a single optic fiber

- Modular Design - Seamless service upgrades – simply add a card in the QX (and the parallel service conditioning module at the head end)

- Scalable MIMO Upgrades - Upgrade any or all services from SISO to MIMO by cascading another QX unit

- Small Footprint - 3 U height rack

- Simple maintenance - All connections and monitoring LEDs located on front panel, Modular, hot-swap, field replaceable service modules, including fan modules

- Web Management - Web management via the SC-450 controller

System Architecture

The QX and SCU-F are located at the floor level remote end. QX receives RF over optic service signals from the head end, reconverts the signals to RF over copper, adjusts them to the required level and outputs each service to dedicated interfaces. The signals are combined by the SCU-F (along with services from other QX units) and distributed over a common DAS (Distributed Antenna System) infrastructure.

In the uplink, cellular service signals received at the DAS are separated by the SCU-F and routed to their dedicated QX ports. The signals are then converted to optic and forwarded to the head-end for reversion to RF and distribution to the relevant BTS or BDA system

Headend:

At the headend CMA elements provide interface to the wireless service provider's network, condition the signals and convert them to optical signals for transportation over fiber optics towards the remote ends.



Radio Interface Unit (RIU) - the RIU conditions and custom tunes the RF Downlink (DL) signals from an operator's signal source (BTS or BDA) to ensure a constant RF level. In the Uplink (UL), the signal (at the required level) is routed back to the operator's signal source.

RF to Optic converter unit – this can either be a **Base Unit (BU)** or an **Optical Control Head End Unit (OCH)**, where the OCH is QX model specific. These are wideband units that convert the RF Downlink (DL) signals from the RIU into optical signals for routing over single or multi-mode fiber optic cabling (SMF/MMF) to/from the QX units located at the remote locations up to 2Km away.

System Controller (SC-450) - the system controller enables centralized remote management and control of MobileAccess elements. This unit connects directly to the RIU and BU and/or OCH and allows management of these as well as their hosted elements (e.g. QX) via a controller Web session.

Remote End:

At the remote end, the optical signal is reconverted to RF, filtered, amplified to the appropriate level, combined with other signals and distributed over the broadband antenna infrastructure.

The QX unit is installed, along with the Four Port Service Combiner Unit (SCU-F). The QX system remote end consists of the following elements:

QX - each QX unit provides coverage for four RF services (e.g. CELL, PCS, 700LTE and AWS) via two types of service dedicated internal modules (RHU and AO). Each of these modules is monitored via the Controller as an independent unit.

Service Combiner Unit (SCU-F): a passive module that combines and distributes the UL and DL signals from one or more QX units to (up to) four broadband antennas.

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 in Lod, Israel. This site is a FCC listed test laboratory (FCC Registration No. 861911, date of listing June 30, 2010).

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):

± 4.98 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.

The EUT consists of the BU (Base Unit) and the QX (Remote Unit).

The RF source is injected into the BU, converted onto optical signal, transmitted over fiber cable to the QX, converted back to RF and transmitted to antenna ports.

The RF source signals are represented in the setup by appropriate signal generators.

An “Exercise” SW on the computer was used to enable / disable transmission of the RHU, while the EUT output was connected to the spectrum analyzer.

The E.U.T. is available in both AC and DC versions.

To select the worst case version 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, 1 meter 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 (dB μ V/m)	DC Configuration (dB μ V/m)
129.7	46.1	45.5
345.0	42.6	41.6
414.0	43.9	42.7
483.0	41.2	41.3

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 NMS ver. 5.3 build 00 used for commands delivery.

These commands are used to enable / disable of QX transmission.

QX Embedded SW version 4.7 build 00 (for AddOn) and 7.6 build 00 (for RHU).

BU Embedded SW version 5.2 build 00

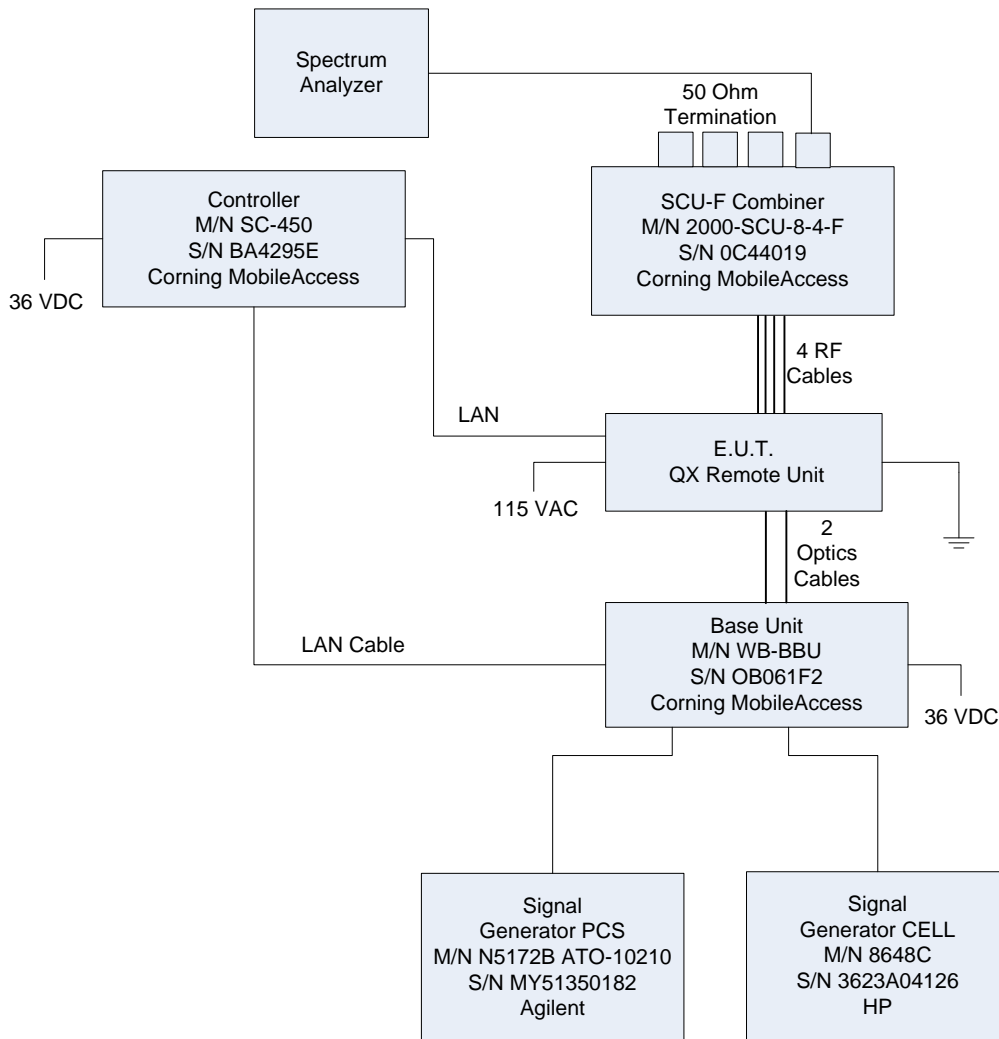
2.3 Special Accessories

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



Notes:

1. For peak Output Power, Occupied Bandwidth, and Band Edge Spectrum tests, spectrum analyzer, M/N FSL6, S/N 100194, manufactured by rohde & Schwarz was used.
2. For Out of Band Emission at Antenna Ports test, spectrum analyzer M.N 8564E, S/N 3442A00275, manufactured by HP was used.
3. Two signal generators were used for the intermodulation tests. For all other tests only signal generator M/N N5172B ATO-10210, S/N MY51350182, manufactured by Agilent, was used to provide all modulations.

Figure 1. Tests Set-up

3. Conducted and Radiated Measurement Test Set-ups Photo



Figure 2. Conducted Emission From Antenna Ports Tests



Figure 3. Radiated Emission Test



4. Peak Output Power CELL

4.1 Test Specification

FCC Part 22.913

4.2 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 and an appropriate coaxial cable (loss=31.35 dB). 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 100 kHz RBW. The output power level was measured at the low, mid and high channels of each modulation.

4.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE QPSK	874.0	23.26	57.00	-33.74
	881.5	23.72	57.00	-33.28
	889.0	23.22	57.00	-33.78
LTE 16QAM	874.0	23.40	57.00	-33.60
	881.5	23.91	57.00	-33.09
	889.0	23.28	57.00	-33.72
LTE 64QAM	874.0	24.42	57.00	-32.58
	881.5	24.17	57.00	-32.83
	889.0	23.88	57.00	-33.12
GSM	870.2	23.38	57.00	-33.62
	881.0	24.07	57.00	-32.93
	892.8	21.53	57.00	-35.47
W-CDMA	871.5	24.20	57.00	-32.80
	881.0	24.86	57.00	-32.14
	891.5	23.69	57.00	-33.31

Figure 4 Peak Output Power CELL

See additional information in Figure 11 to Figure 19.

JUDGEMENT: Passed by 32.14 dB

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: A. Sharabi



LTE QPSK :

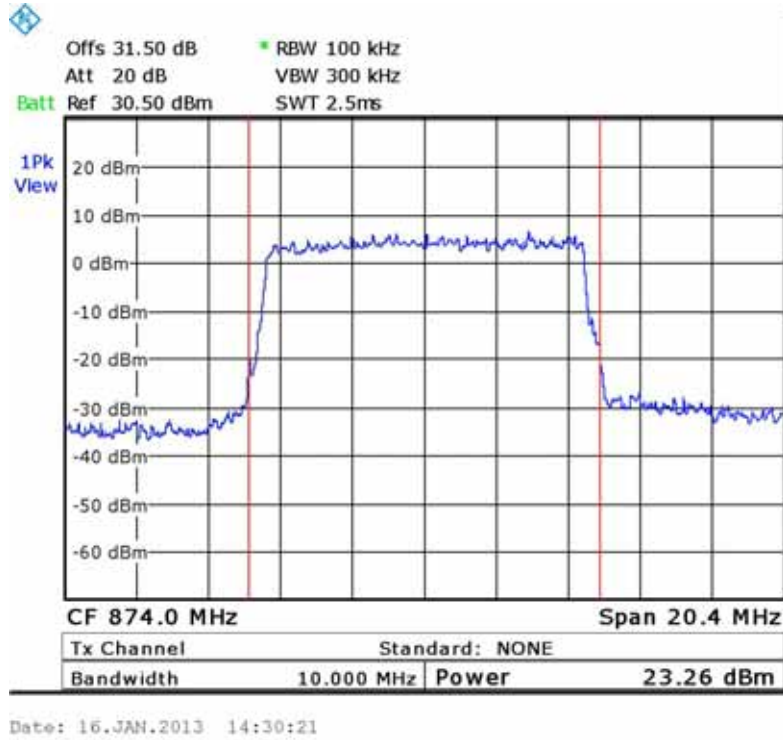


Figure 5.— 874.00 MHz

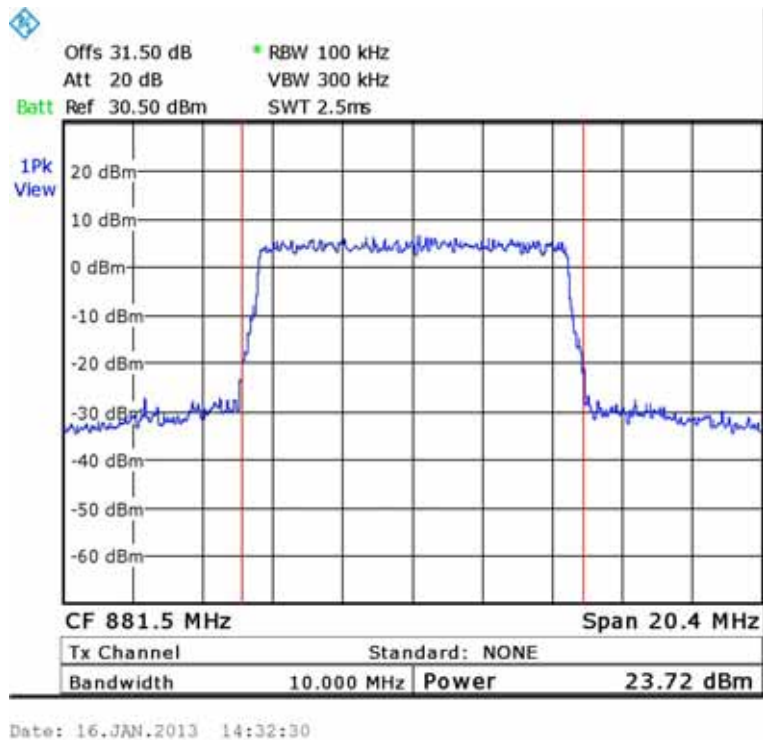
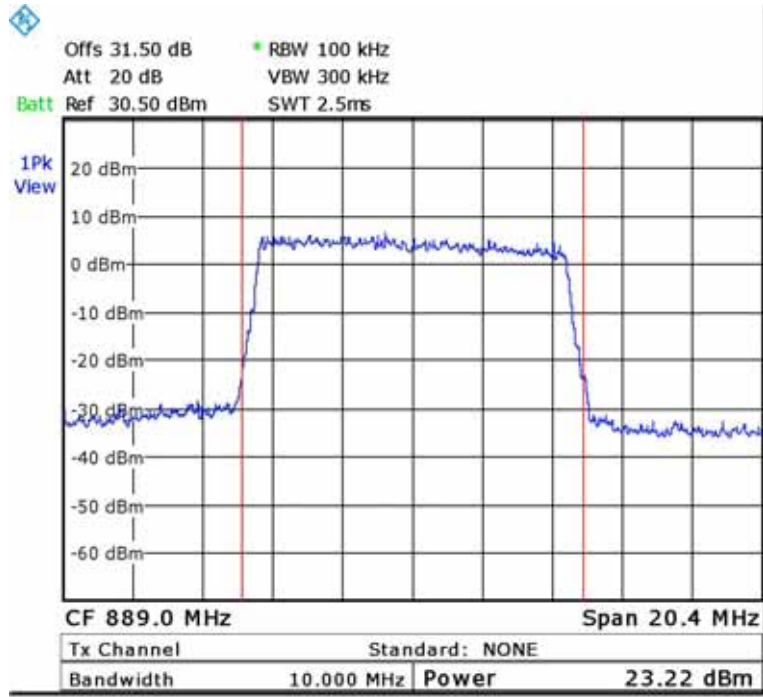


Figure 6.— 881.50 MHz



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Figure 7.— 889.00 MHz

LTE 16QAM:

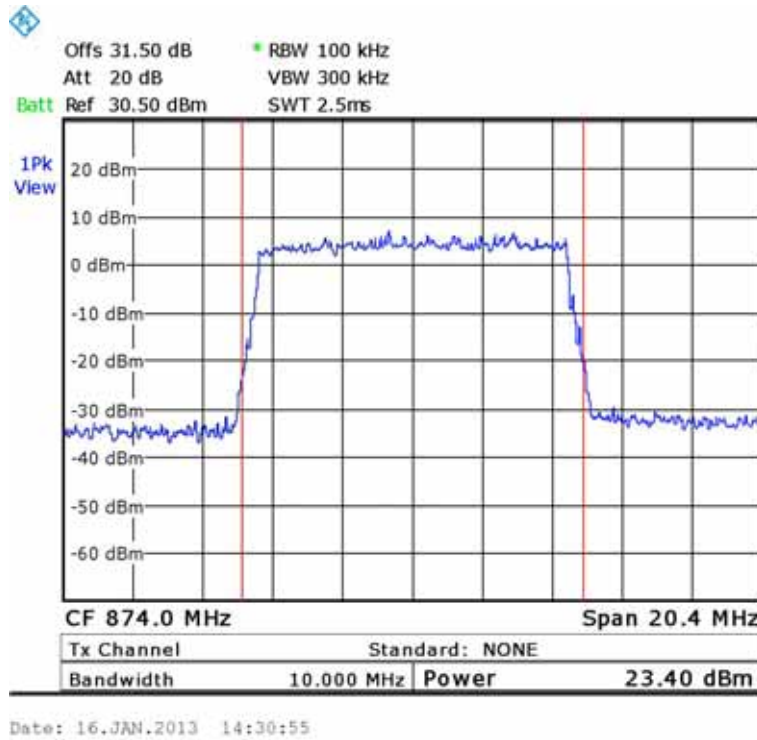


Figure 8.— 874.00 MHz

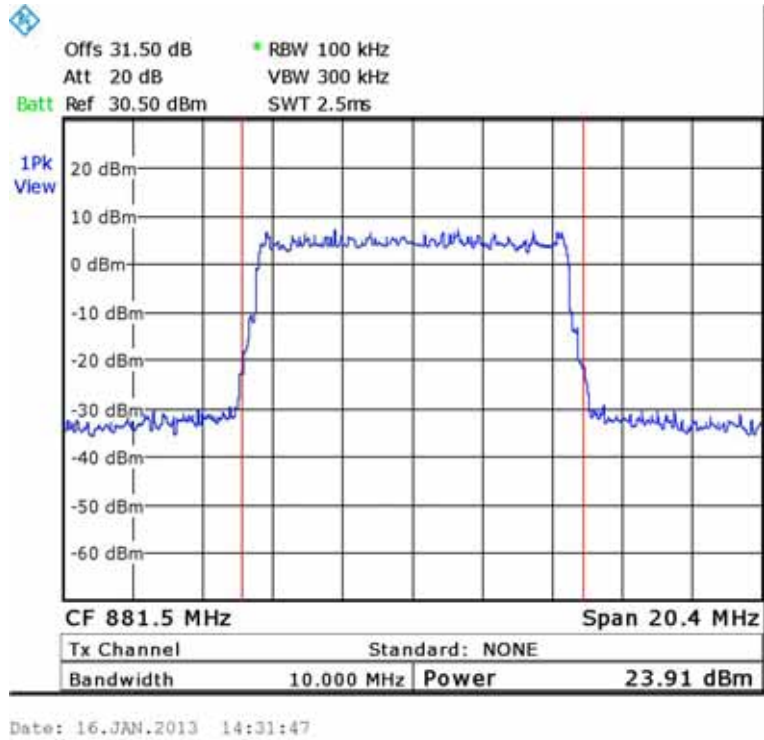


Figure 9.— 881.5 MHz

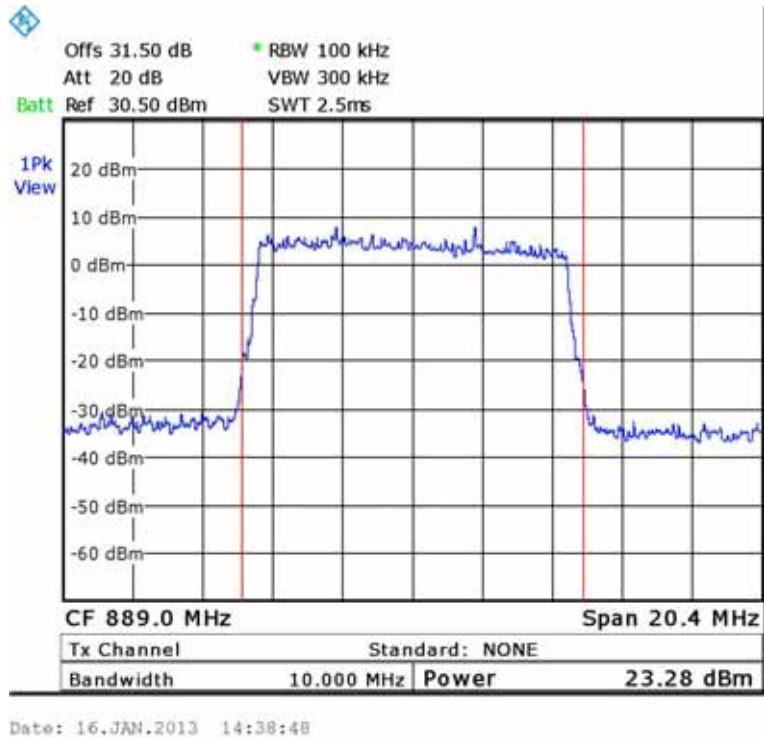


Figure 10.— 889.00 MHz

LTE 64QAM:

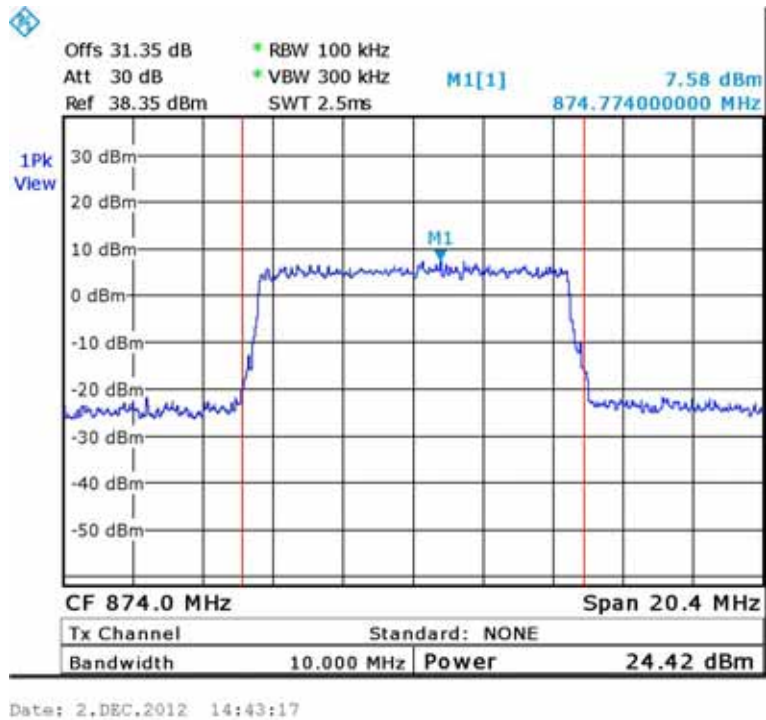


Figure 11.— 874.00 MHz

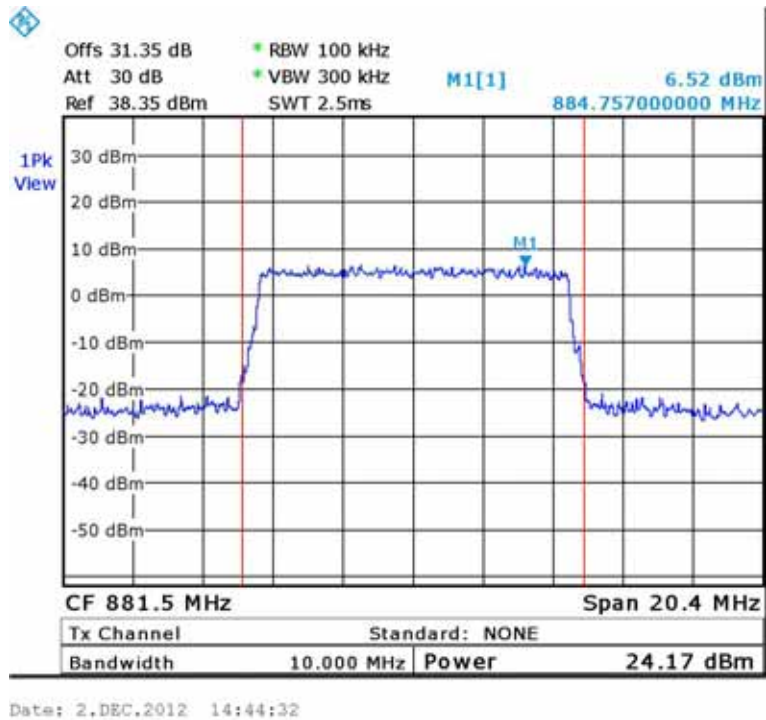
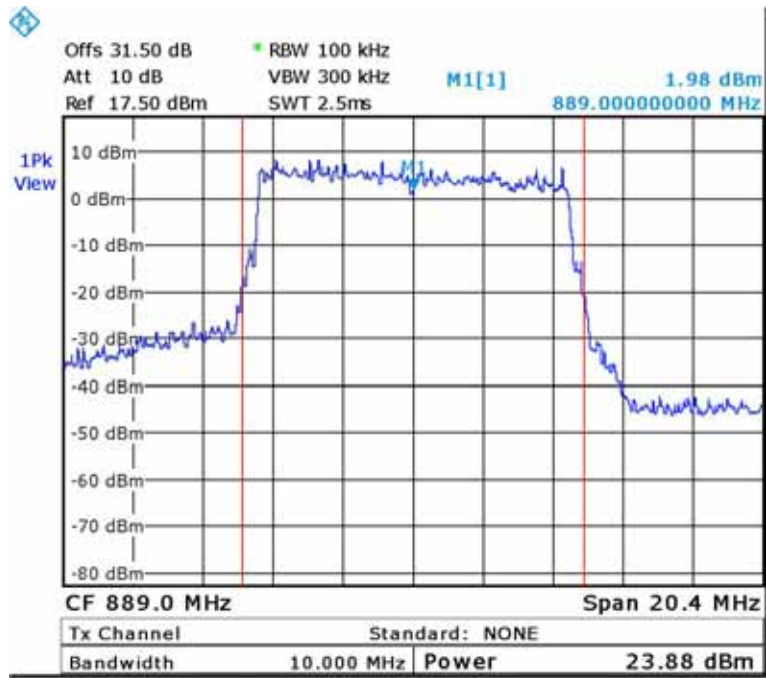


Figure 12.— 881.50 MHz



Date: 13.JAN.2013 10:28:32



Figure 13.— 889.0 MHz

GSM:

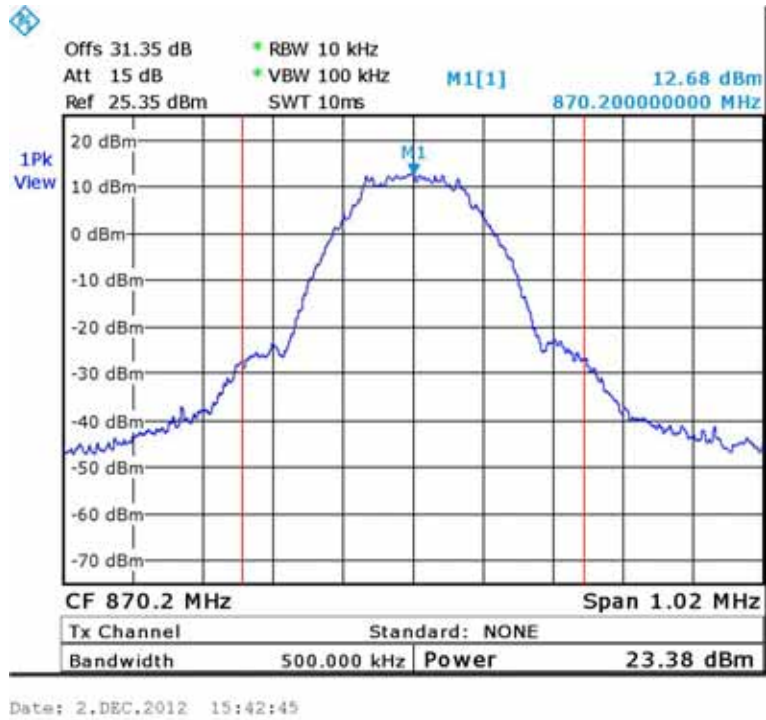


Figure 14.— 870.20 MHz

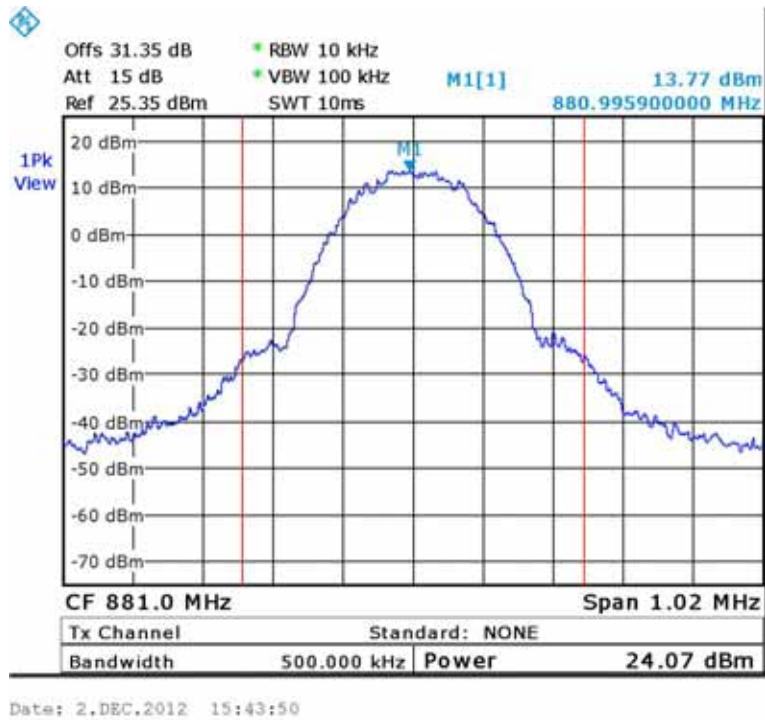


Figure 15.— 881.00 MHz

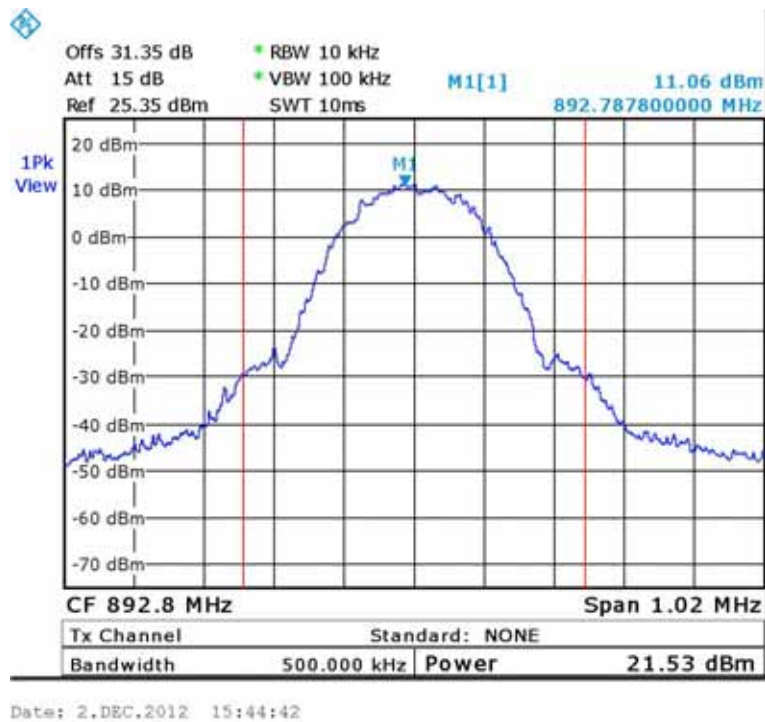
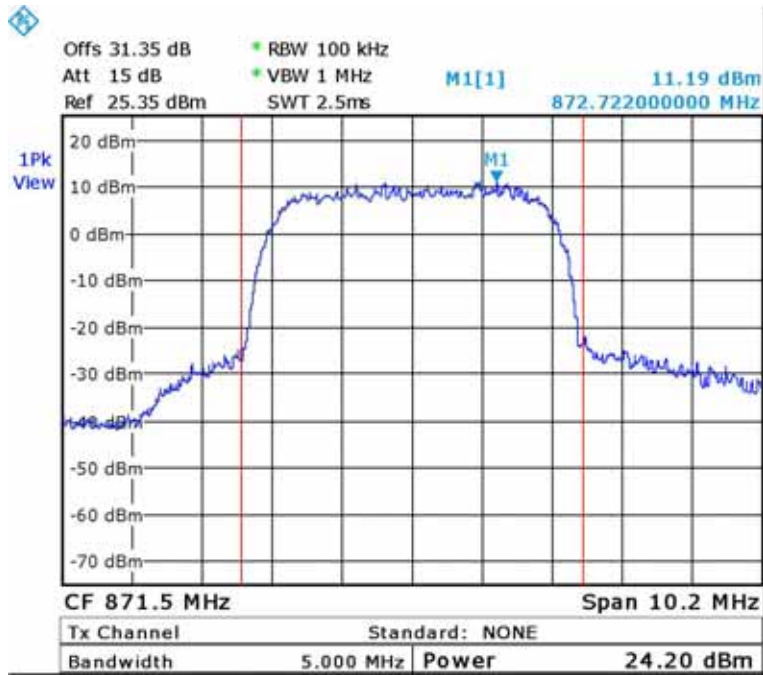


Figure 16.— 892.80 MHz

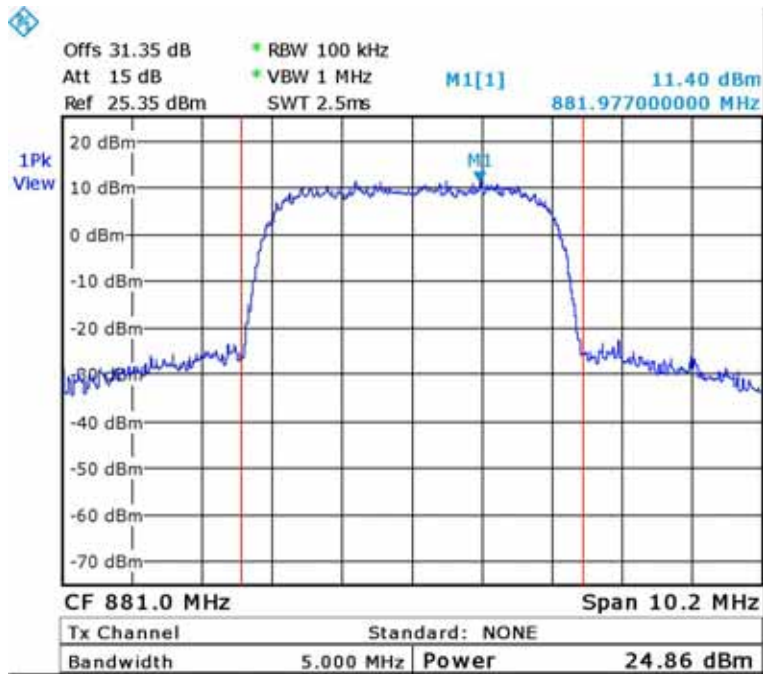


W-CDMA:



Date: 2.DEC.2012 15:57:58

Figure 17.— 871.50 MHz



Date: 2.DEC.2012 15:58:38

Figure 18.— 881.00 MHz

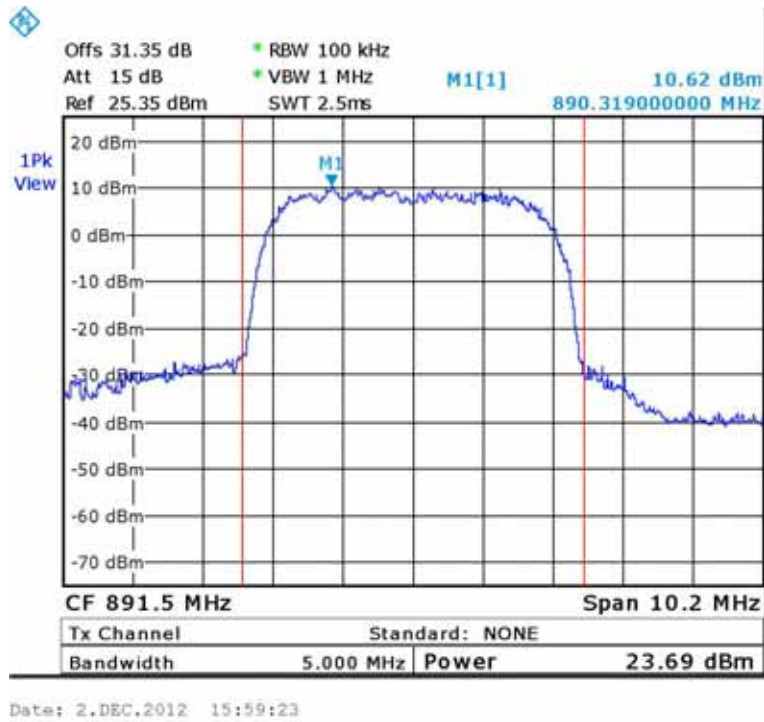


Figure 19.— 891.50 MHz

4.4 Test Equipment Used

Peak Output Power CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 20 Test Equipment Used



5. Occupied Bandwidth CELL

5.1 Test Specification

FCC Part 2, Section 1049

5.2 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.




5.3 Test Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	874.0	9.760
LTE 64QAM	Output	874.0	9.521
LTE 64QAM	Input	881.0	9.677
LTE 64QAM	Output	881.0	9.587
LTE 64QAM	Input	889.0	9.325
LTE 64QAM	Output	889.0	9.365
LTE 16QAM	Input	874.0	9.301
LTE 16QAM	Output	874.0	9.391
LTE 16QAM	Input	881.0	9.421
LTE 16QAM	Output	881.0	9.581
LTE 16QAM	Input	889.0	9.421
LTE 16QAM	Output	889.0	9.381
LTE QPSK	Input	874.0	9.261
LTE QPSK	Output	874.0	9.391
LTE QPSK	Input	881.0	9.461
LTE QPSK	Output	881.0	9.261
LTE QPSK	Input	889.0	9.510
LTE QPSK	Output	889.0	9.301
GSM	Input	870.2	0.299
GSM	Output	870.2	0.293
GSM	Input	881.0	0.293
GSM	Output	881.0	0.295
GSM	Input	890.0	0.293
GSM	Output	890.0	0.295
W-CDMA	Input	871.5	4.601
W-CDMA	Output	871.5	4.581
W-CDMA	Input	881.0	4.601
W-CDMA	Output	881.0	4.581
W-CDMA	Input	891.5	4.642
W-CDMA	Output	891.5	4.560

Figure 21 Occupied Bandwidth CELL

See additional information in Figure 22 to Figure 51.

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: A. Sharabi



LTE:

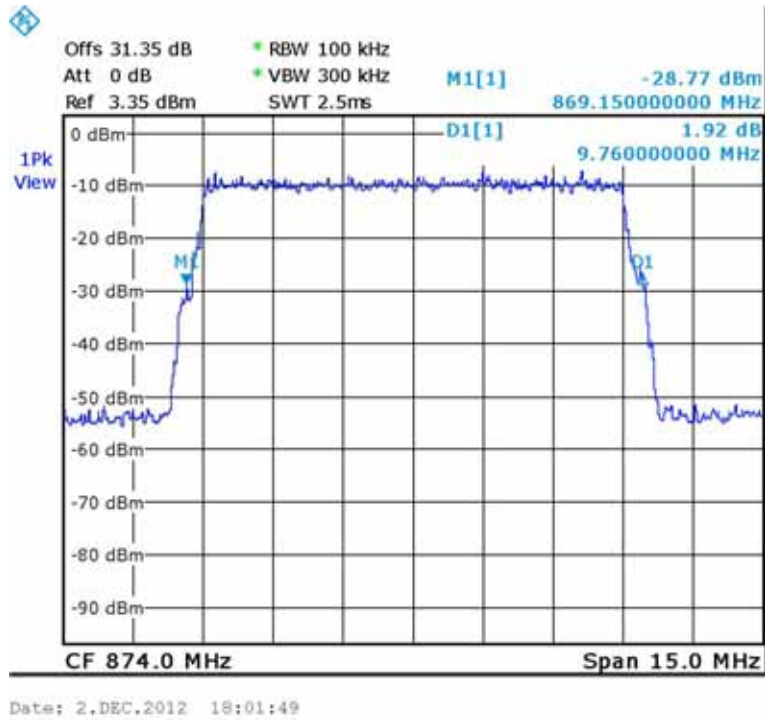


Figure 22.— 64QAM Input 874.00

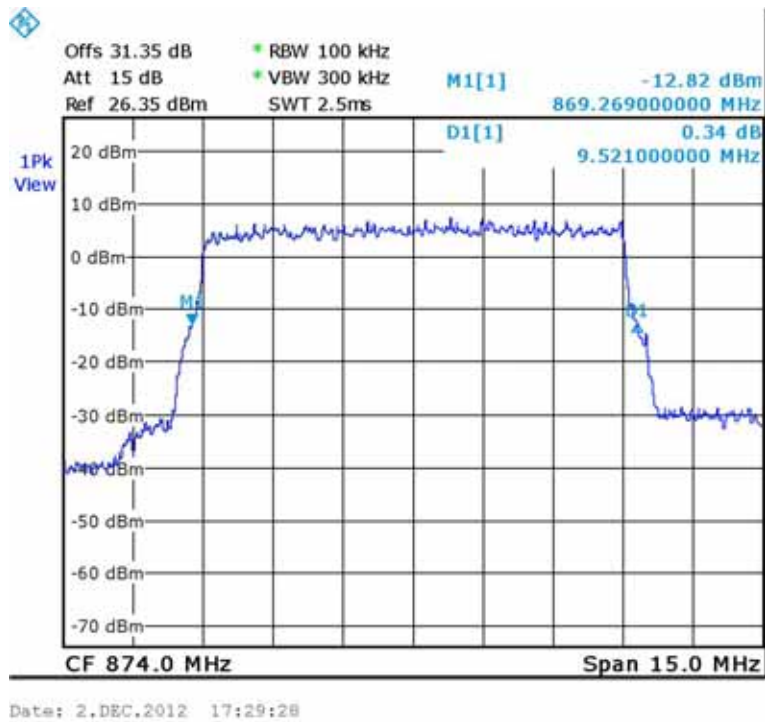


Figure 23.— 64QAM Output 874.00

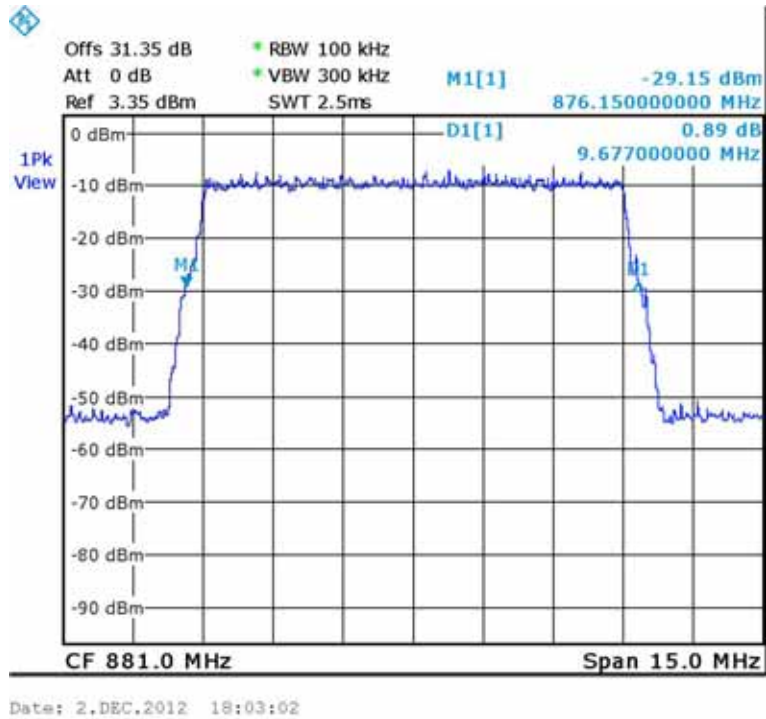


Figure 24.— 64QAM Input 881.0 MHz.

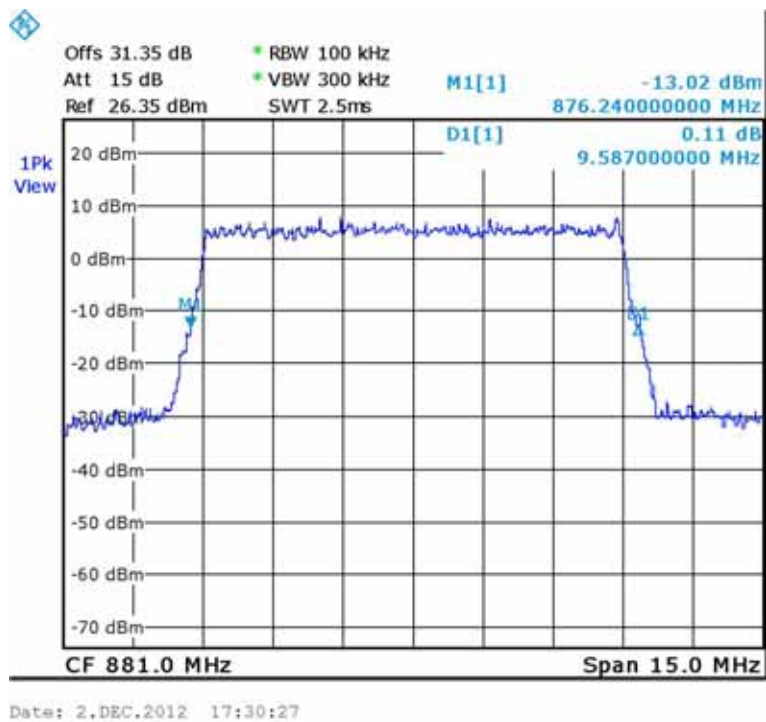
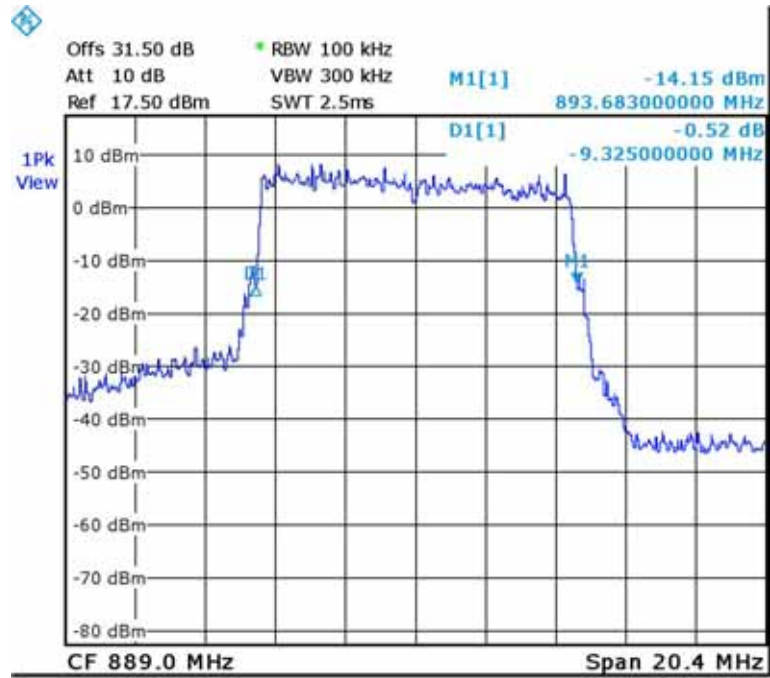
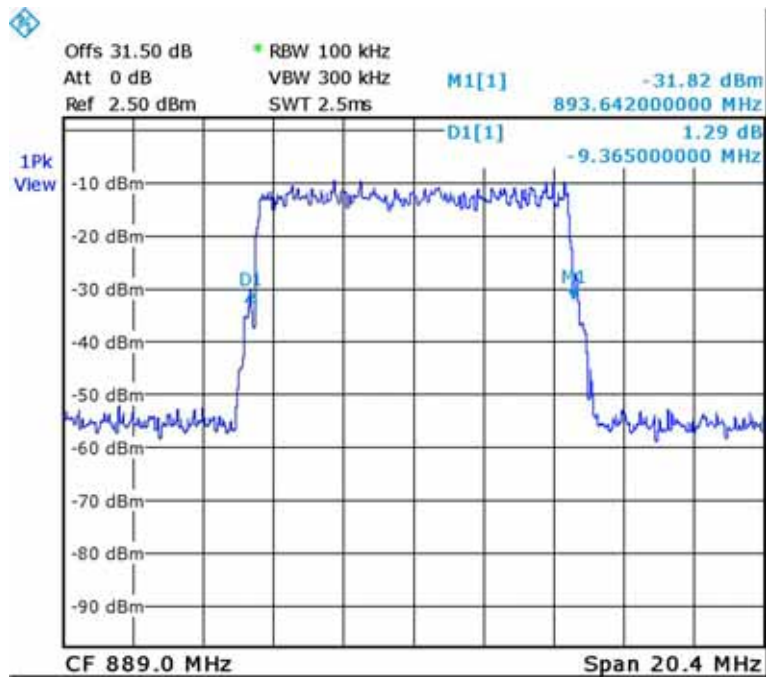


Figure 25.— 64QAM Output 881.0Hz.



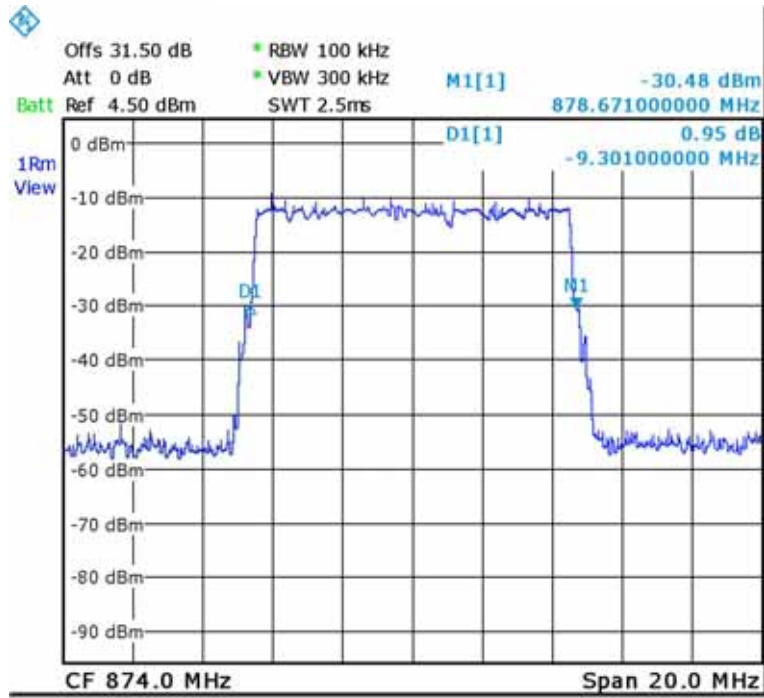
Date: 13.JAN.2013 10:31:19

Figure 26.— 64QAM Input 889.00 MHz.



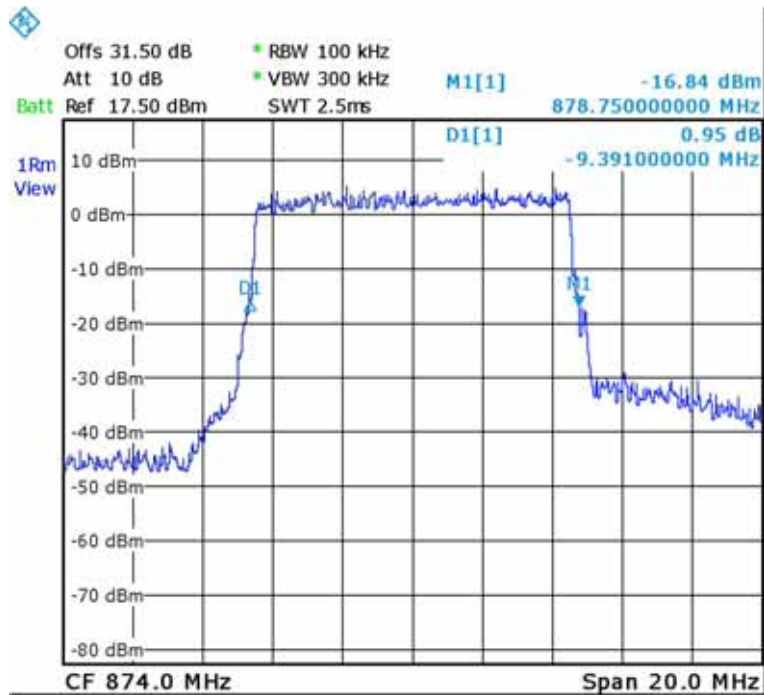
Date: 13.JAN.2013 10:32:28

Figure 27.— 64QAM Output 889.00 MHz.



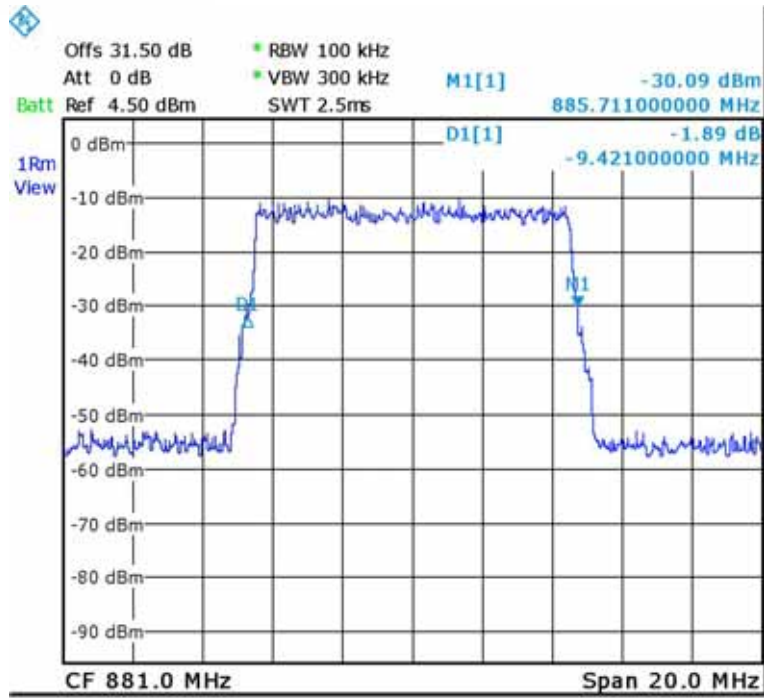
Date: 16.JAN.2013 16:40:43

Figure 28.— 16QAM Input 874.00 MHz.



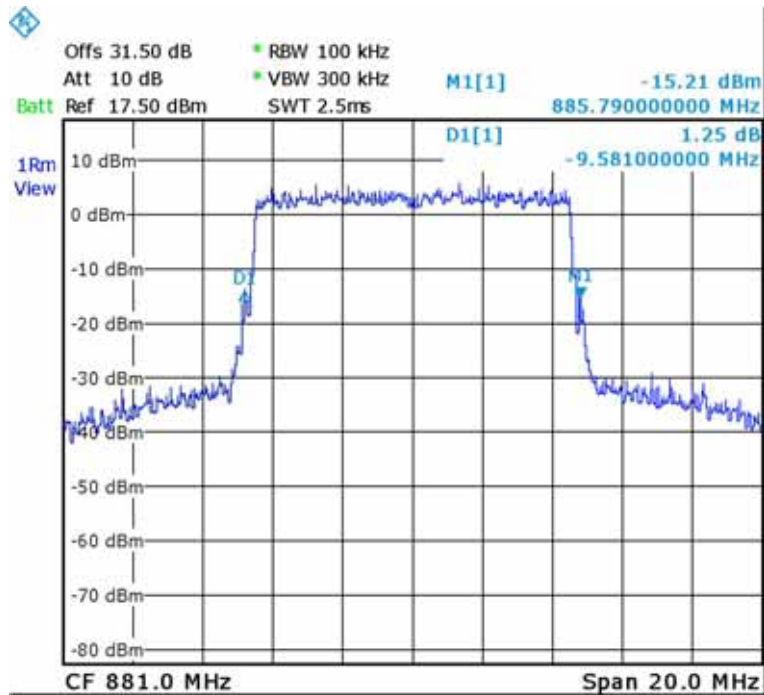
Date: 16.JAN.2013 15:27:11

Figure 29.— 16QAM Output 874.00 MHz.



Date: 16.JAN.2013 16:43:24

Figure 30.— 16QAM Input 881.00 MHz.



Date: 16.JAN.2013 15:27:57

Figure 31.— 16QAM Output 881.00 MHz.

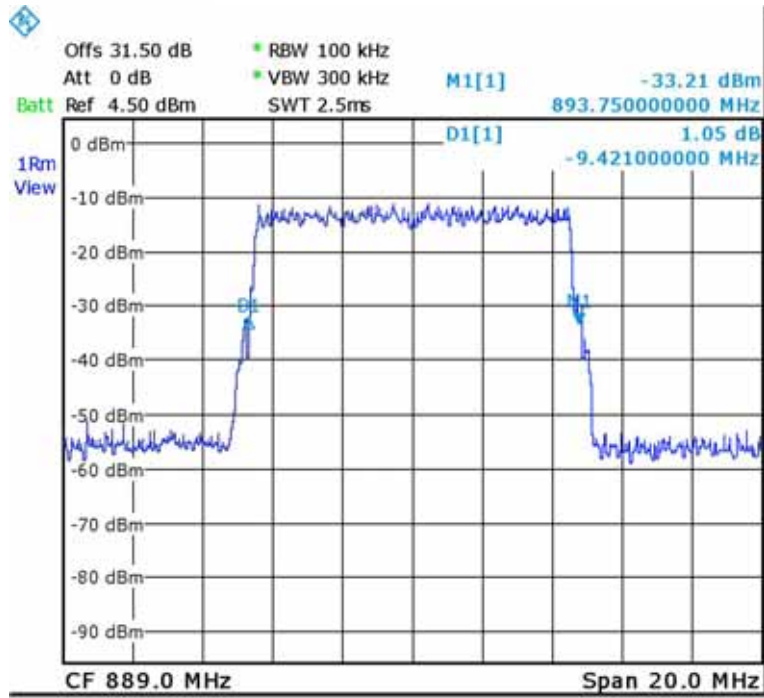


Figure 32.— 16QAM Input 889.00 MHz.

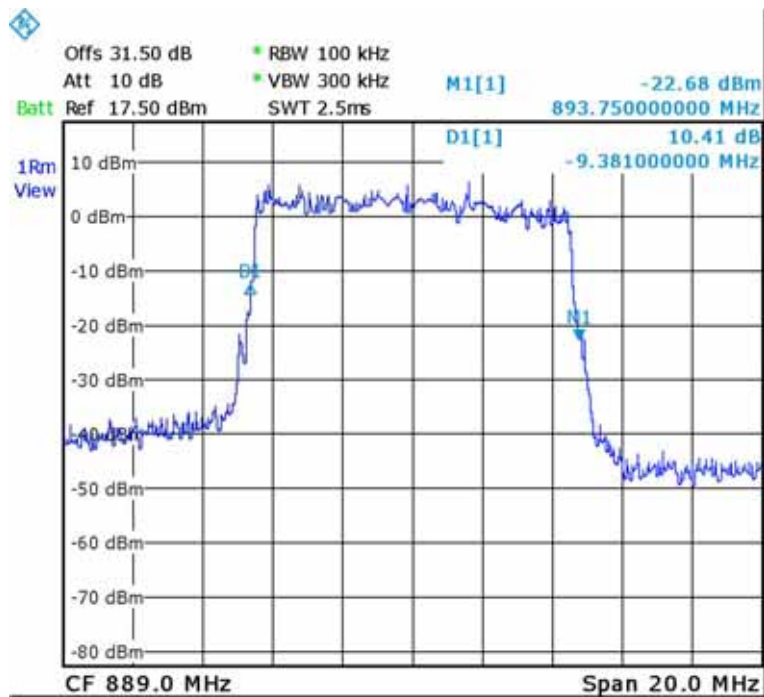
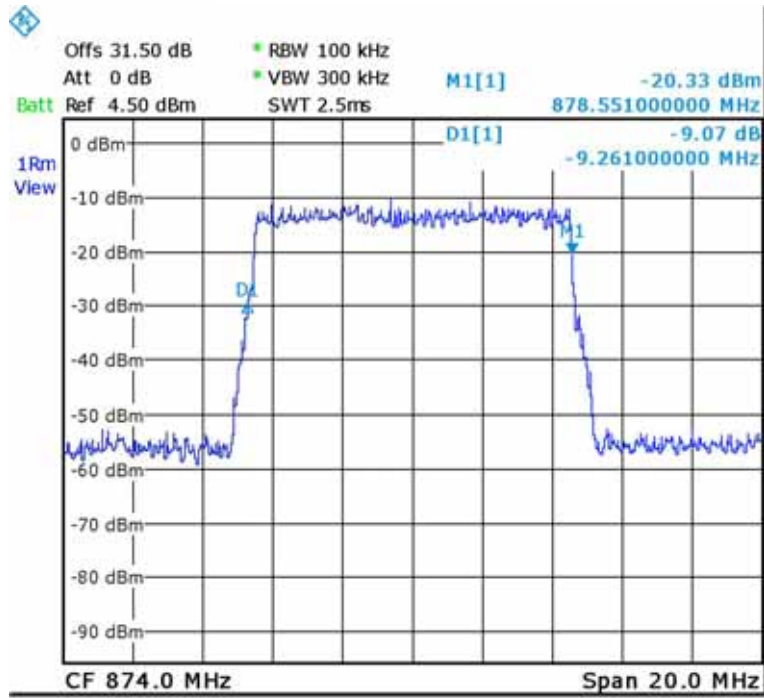
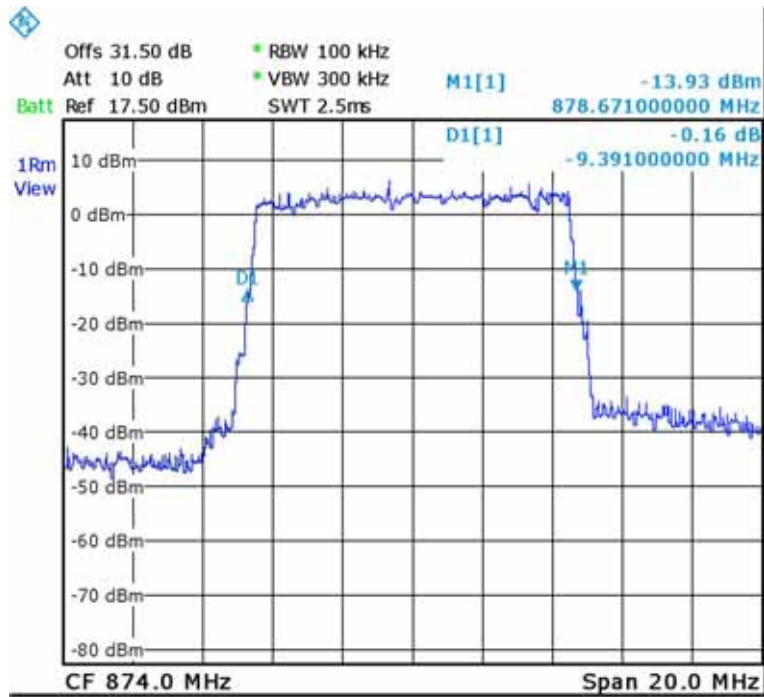


Figure 33.— 16QAM Output 889.00 MHz.



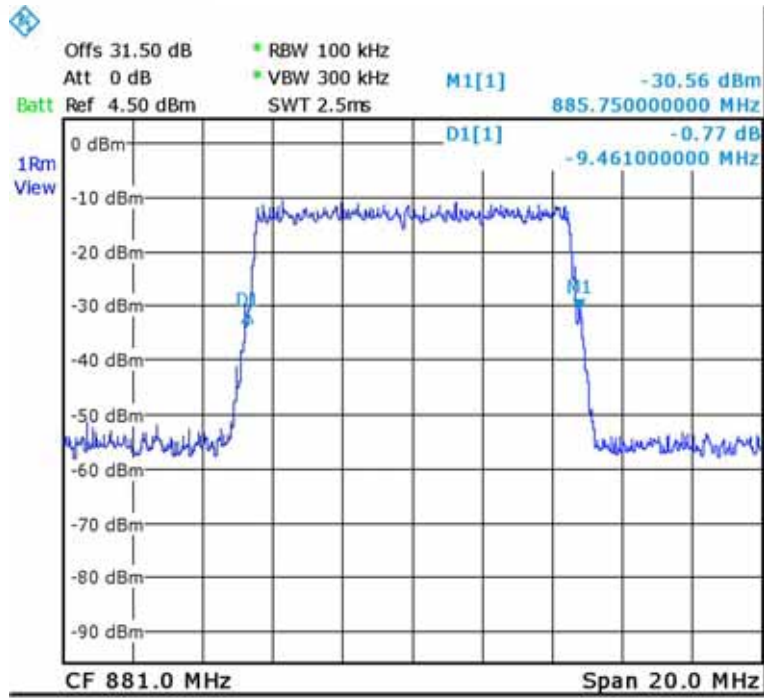
Date: 16.JAN.2013 16:42:36

Figure 34.— QPSK Input 874.00 MHz.



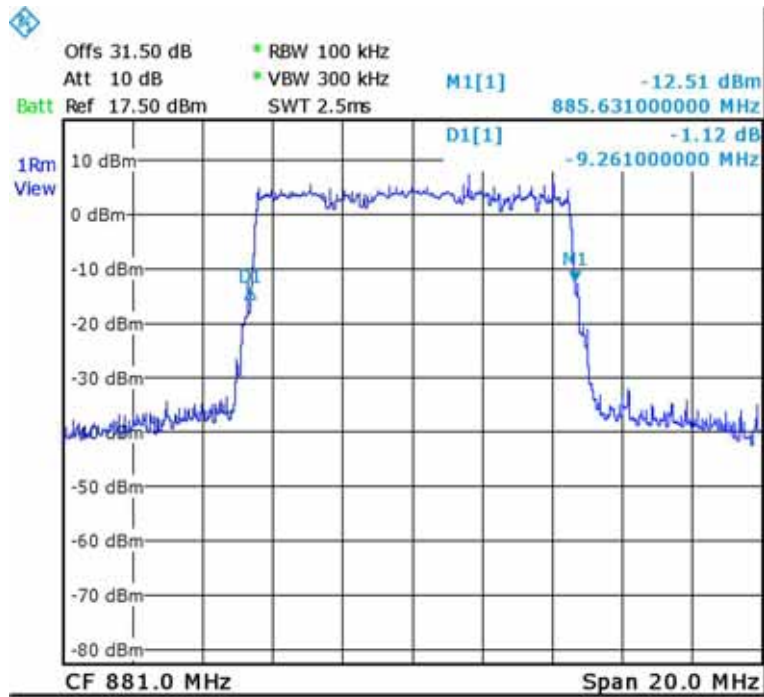
Date: 16.JAN.2013 15:26:08

Figure 35.— QPSK Output 874.00 MHz.



Date: 16.JAN.2013 16:44:10

Figure 36.— QPSK Input 881.00 MHz.



Date: 16.JAN.2013 15:28:33

Figure 37.— QPSK Output 881.00 MHz.



GSM:



Figure 40.— Input 870.20

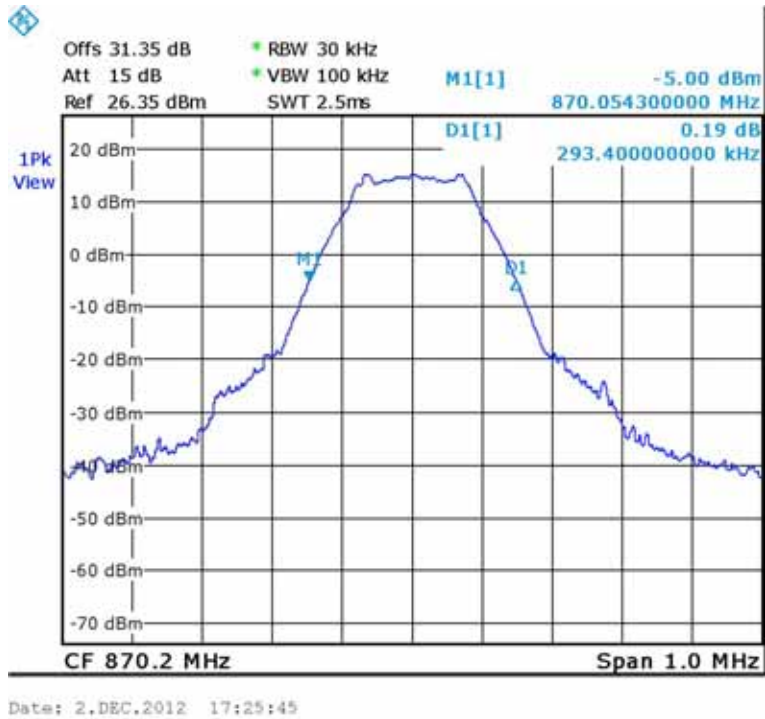
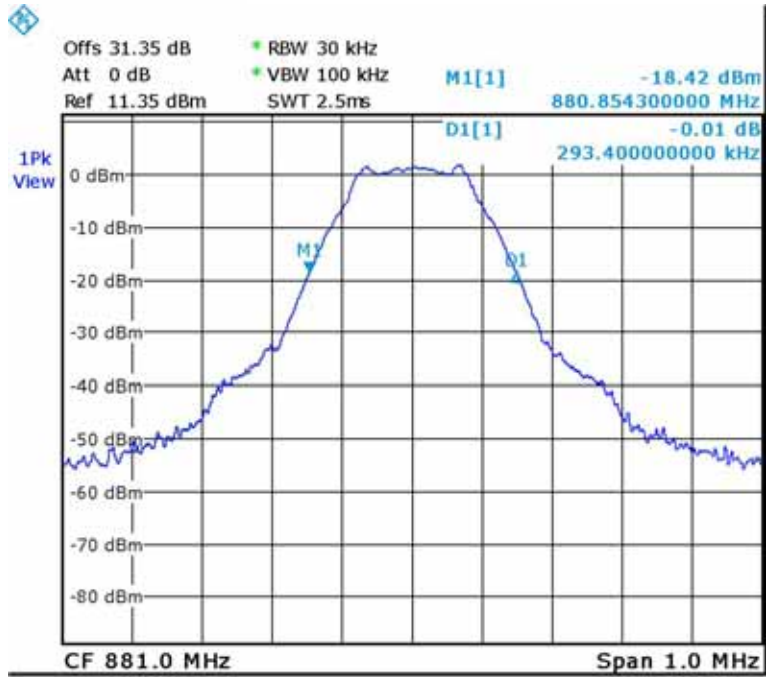
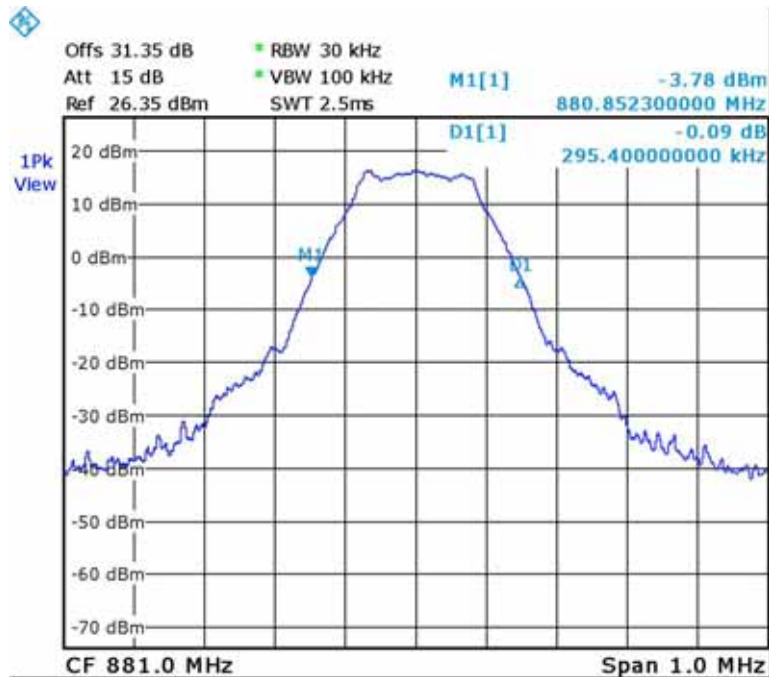


Figure 41.— Output 870.20



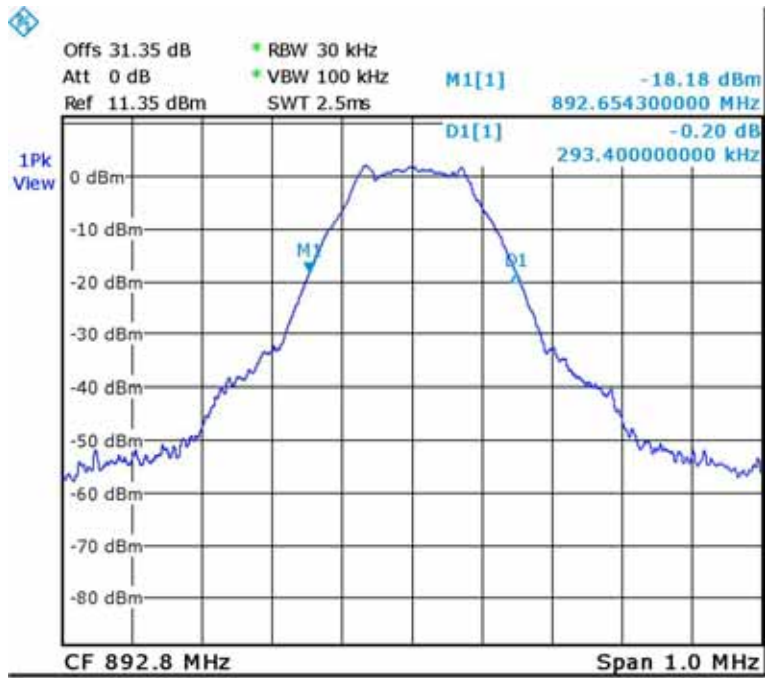
Date: 2.DEC.2012 17:02:00

Figure 42.— Input 881.0 MHz.



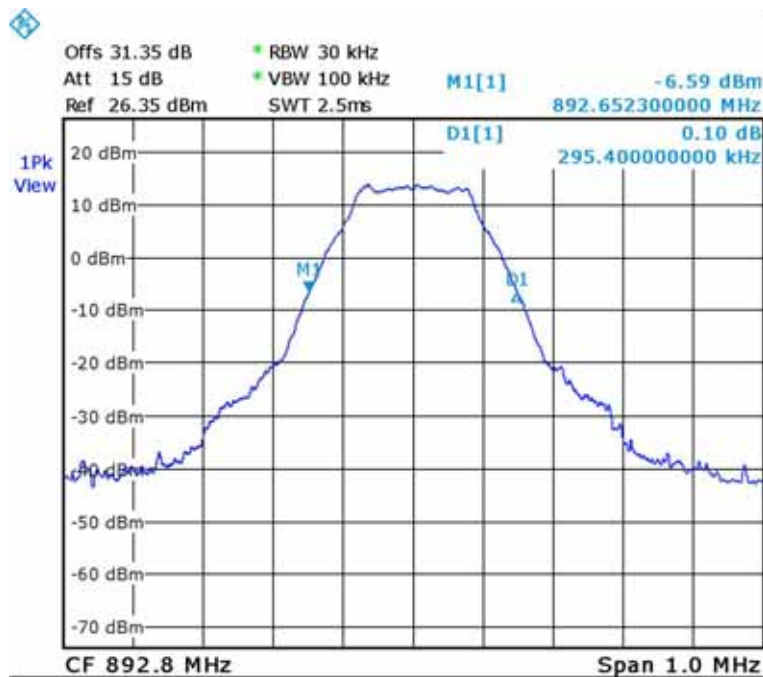
Date: 2.DEC.2012 17:24:13

Figure 43.—Output 881.0Hz.



Date: 2.DEC.2012 17:04:35

Figure 44.— Input 892.8 MHz.



Date: 2.DEC.2012 17:23:25

Figure 45.— Output 892.8 MHz.



W-CDMA:

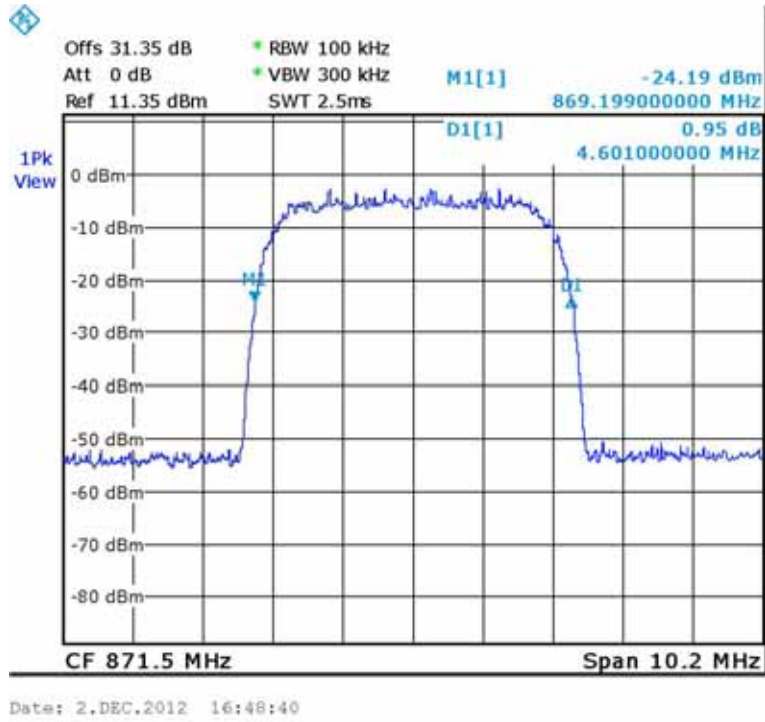


Figure 46.— Input 871.50

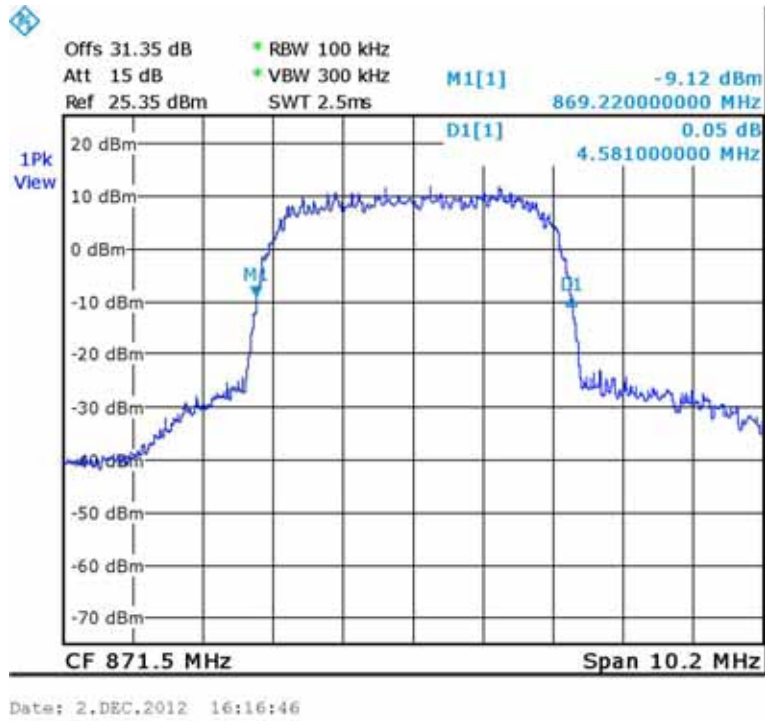


Figure 47.— Output 871.50

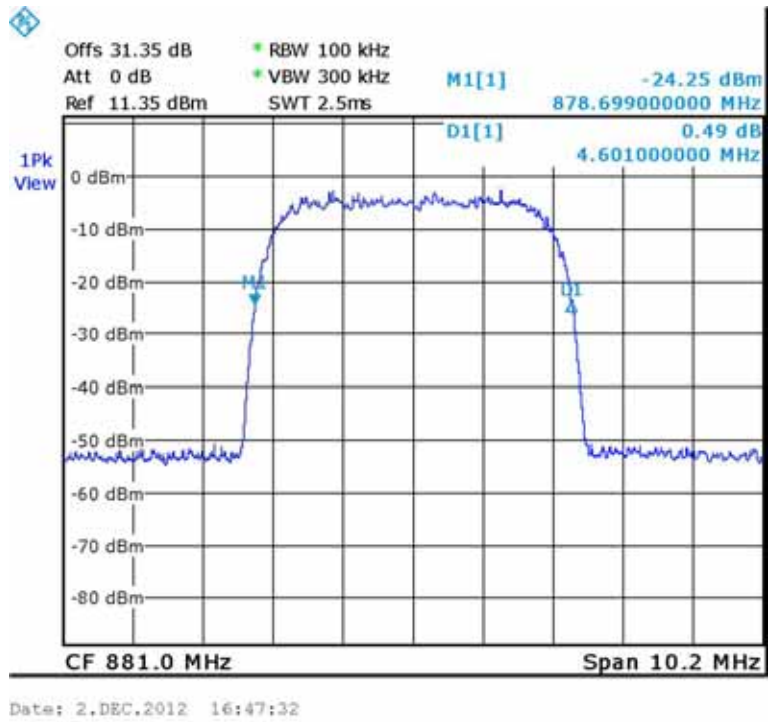


Figure 48.— Input 881.0 MHz.

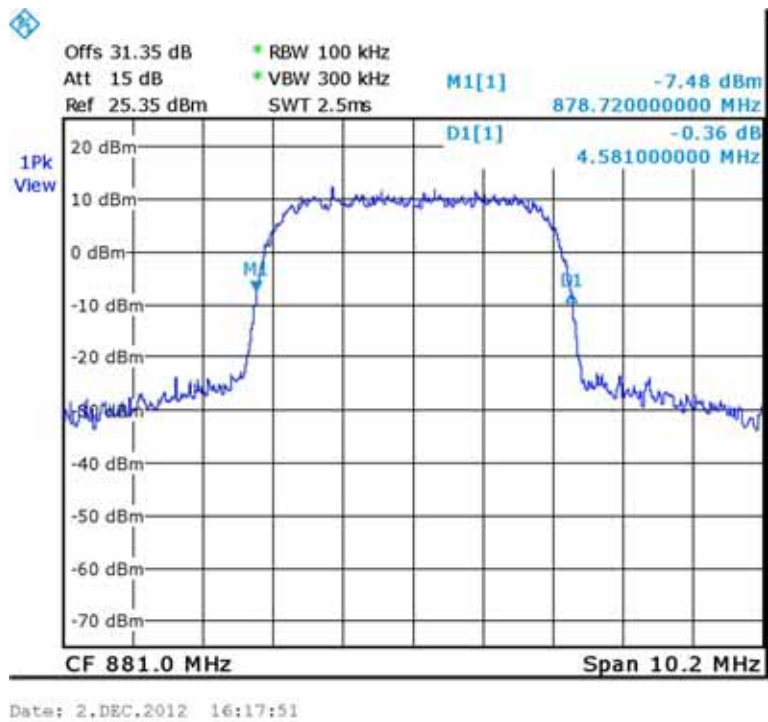
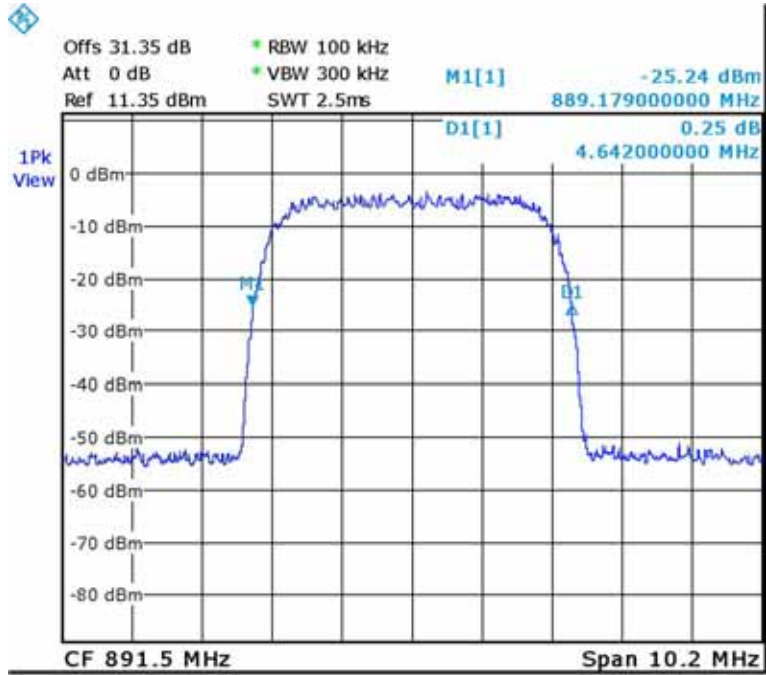
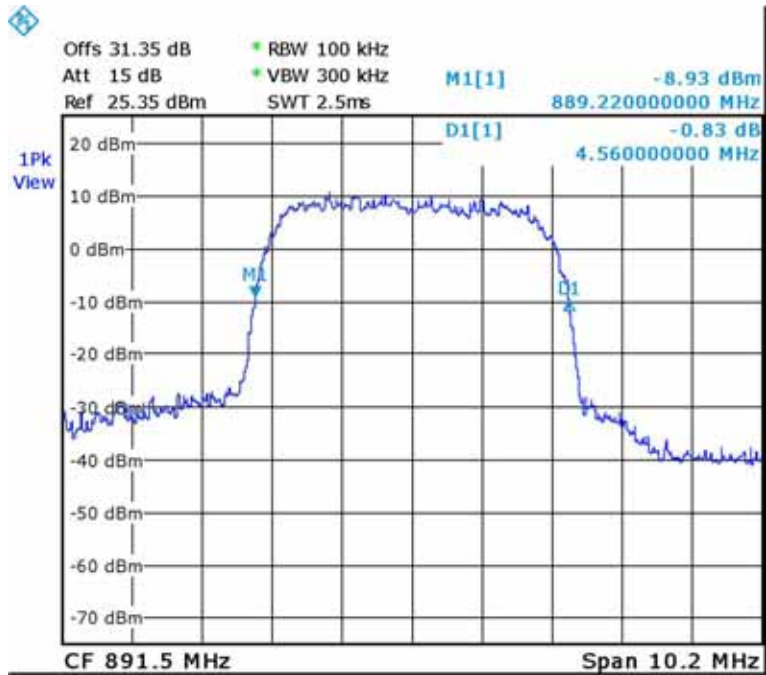


Figure 49.—Output 881.0Hz.



Date: 2.DEC.2012 16:46:35

Figure 50.— Input 891.50 MHz.



Date: 2.DEC.2012 16:19:45

Figure 51.— Output 891.50 MHz.



5.4 Test Equipment Used

Occupied Bandwidth CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 52 Test Equipment Used



6. Out of Band Emissions at Antenna Terminals CELL

6.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1051

6.2 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 (31.35 dB).

The spectrum analyzer was set to 1 kHz R.B.W. for the frequency range of 9 kHz – 1 MHz, 100 kHz for the frequency range of 1 – 30 MHz, and 1 MHz for the frequency range of 30 MHz – 10 GHz.

6.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE	874.00	-17.65	-13.0	-4.65
	881.00	-18.15	-13.0	-5.15
	890.00	-14.98	-13.0	-1.98
GSM	870.20	-15.15	-13.0	-2.15
	881.00	-16.98	-13.0	-3.98
	892.80	-18.48	-13.0	-5.48
W-CDMA	871.50	-16.65	-13.0	-3.65
	881.00	-15.82	-13.0	-2.82
	891.50	-16.82	-13.0	-3.82

Figure 53 Out of Band Emission Results CELL

See additional information in Figure 54 to Figure 109.

JUDGEMENT: Passed by 1.98 dB

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: I. Siboni



LTE:

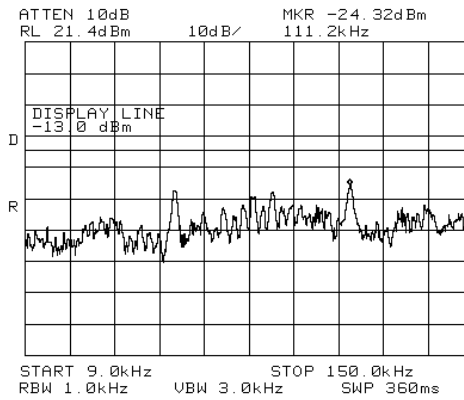


Figure 54.— 874.00 MHz

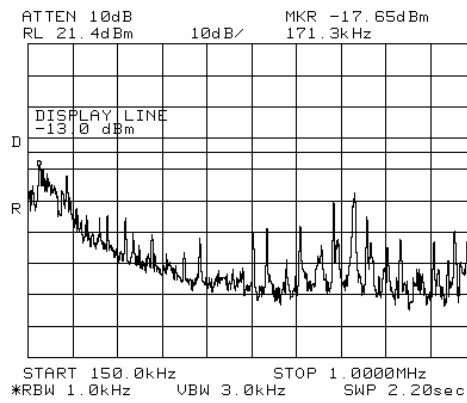


Figure 55.— 874.00 MHz

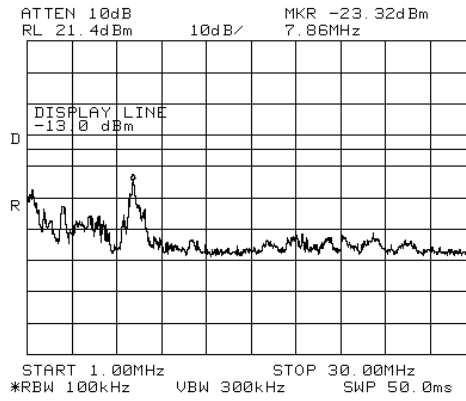


Figure 56.— 874.00 MHz

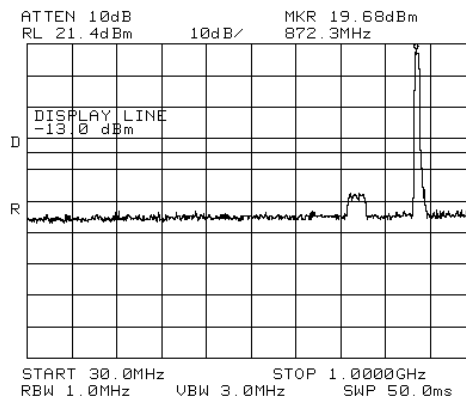


Figure 57.— 874.00 MHz

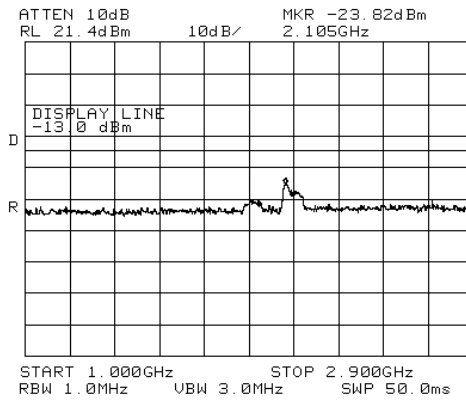


Figure 58.— 874.00 MHz

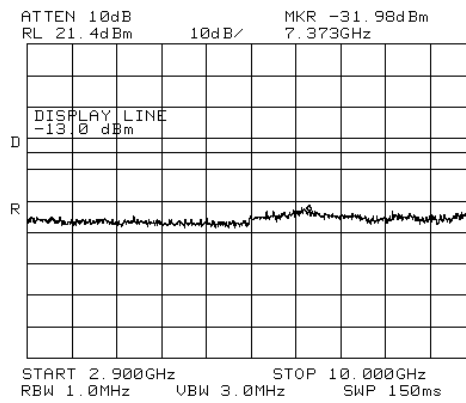


Figure 59.— 874.00 MHz

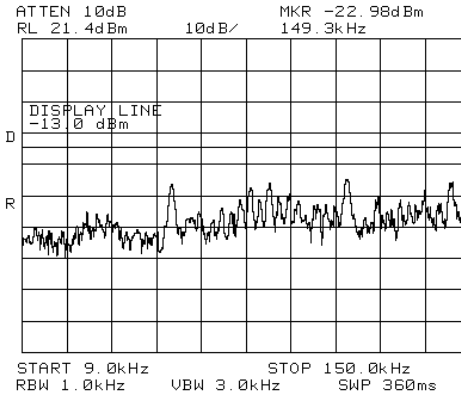


Figure 60.— 881.00 MHz

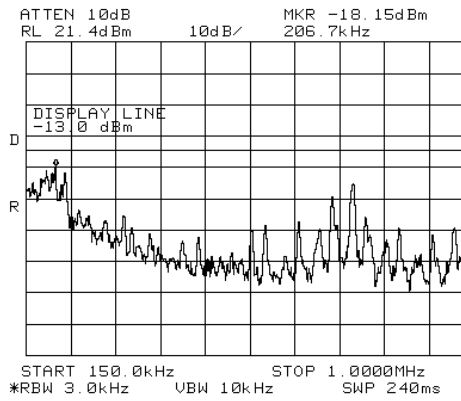


Figure 61.— 881.00 MHz

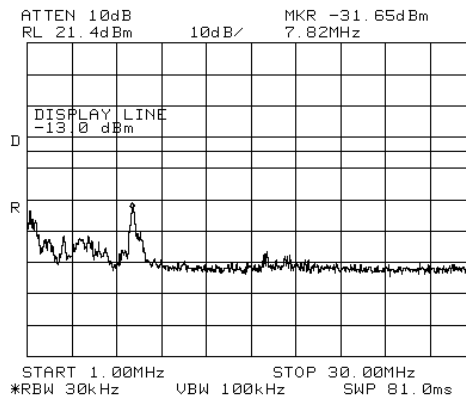


Figure 62.— 881.00 MHz

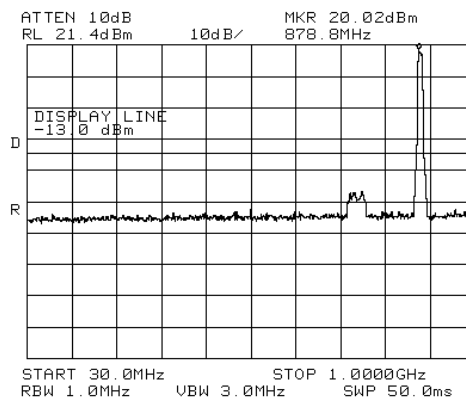


Figure 63.— 881.00 MHz

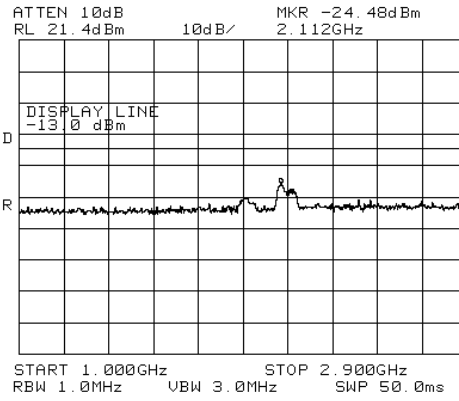


Figure 64.— 881.00 MHz

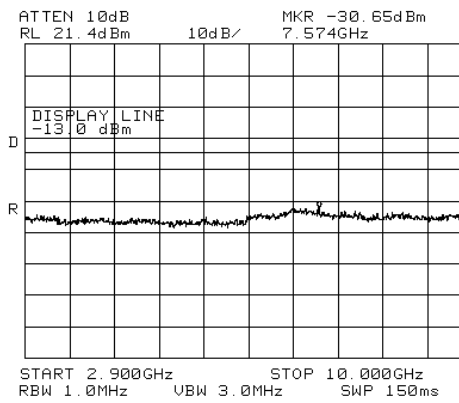


Figure 65.— 881.00 MHz

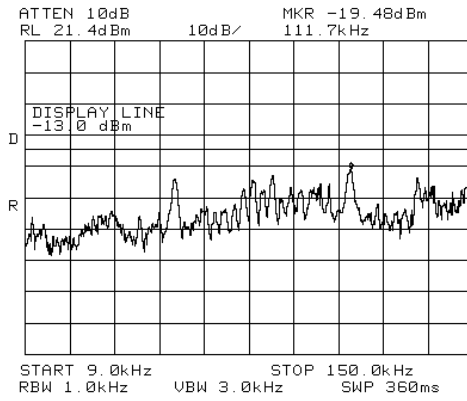


Figure 66.— 890.00 MHz

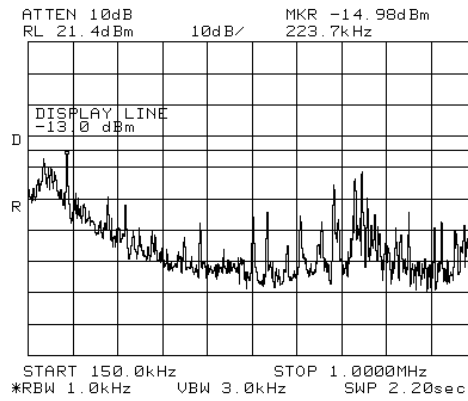


Figure 67.— 890.00 MHz

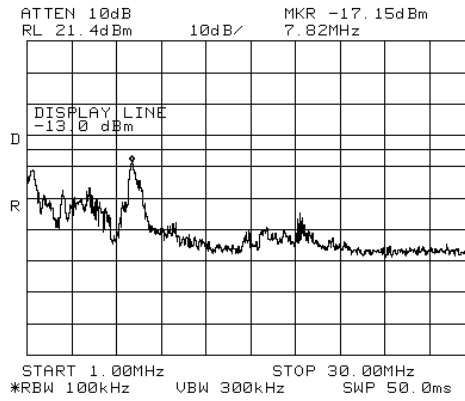


Figure 68.— 890.00 MHz

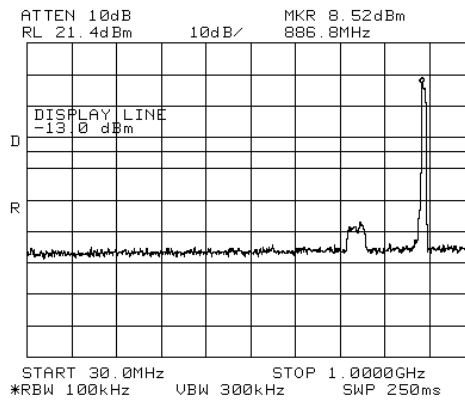


Figure 69.— 890.00 MHz

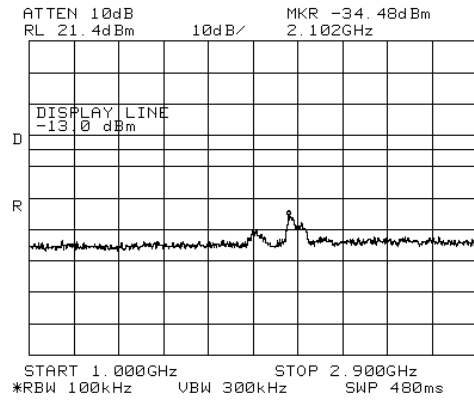


Figure 70.— 890.00 MHz

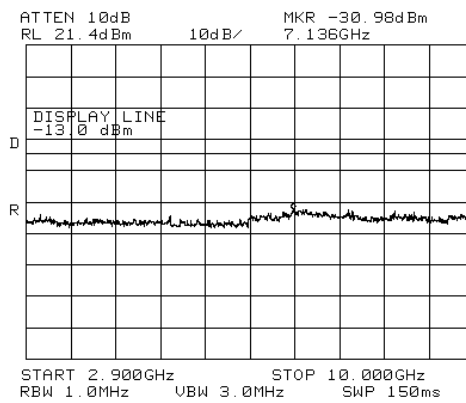


Figure 71.— 890.00 MHz



GSM:

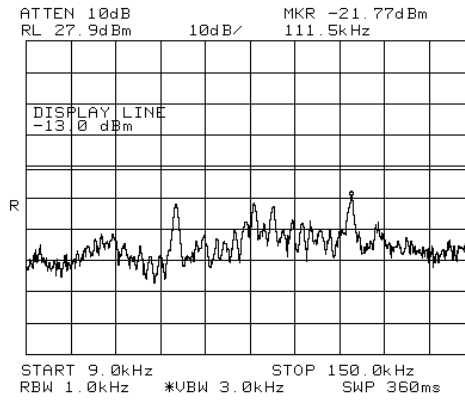


Figure 72.— 870.20 MHz

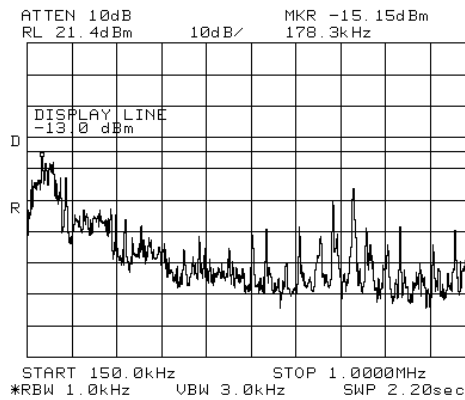


Figure 73.— 870.20 MHz

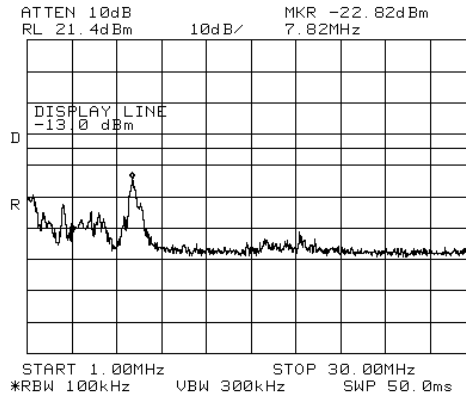


Figure 74.— 870.20 MHz

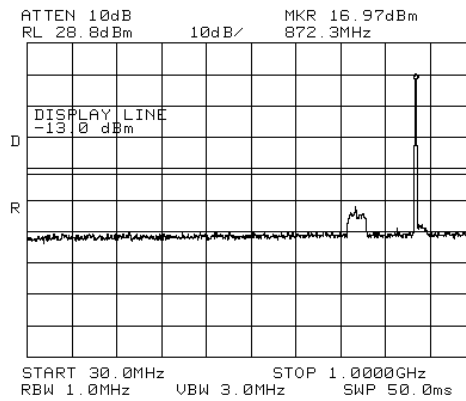


Figure 75.— 870.20 MHz

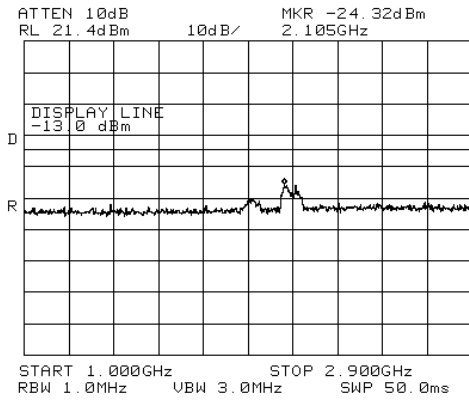


Figure 76.— 870.20 MHz

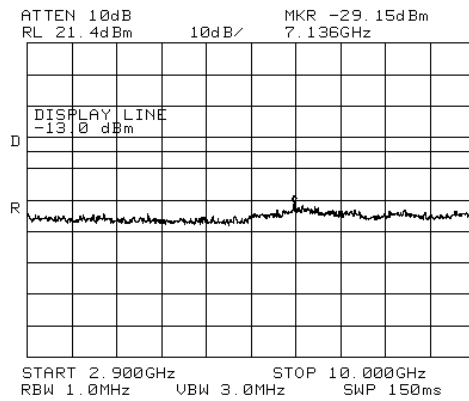


Figure 77.— 870.20 MHz

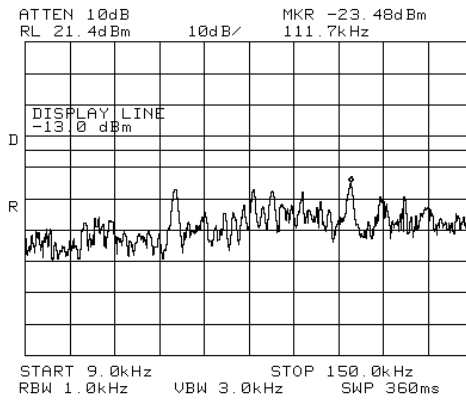


Figure 78.— 881.00 MHz

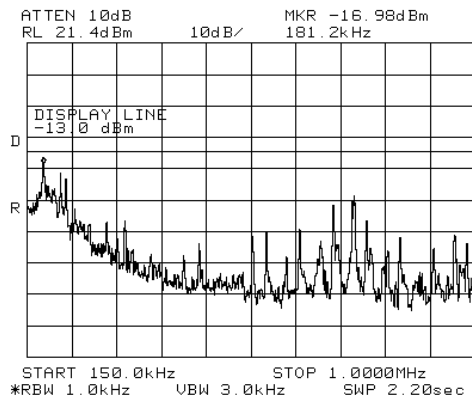


Figure 79.— 881.00 MHz

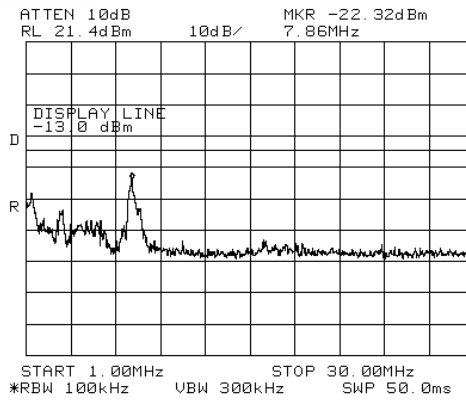


Figure 80.— 881.00 MHz

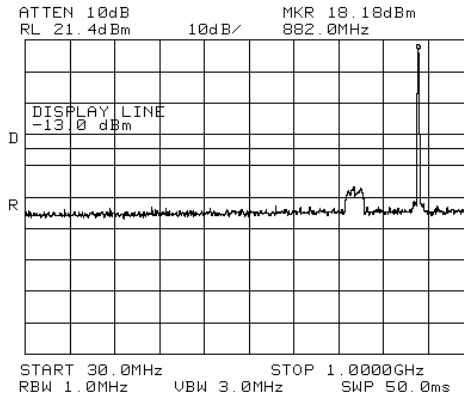


Figure 81.— 881.00 MHz

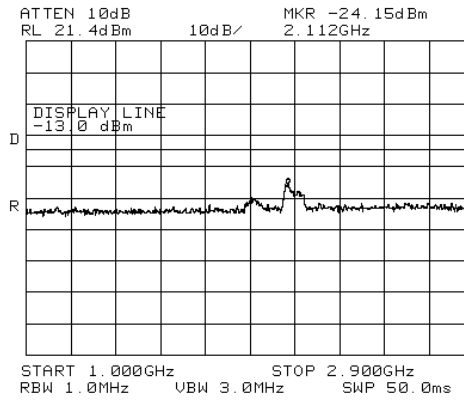


Figure 82.— 881.00 MHz

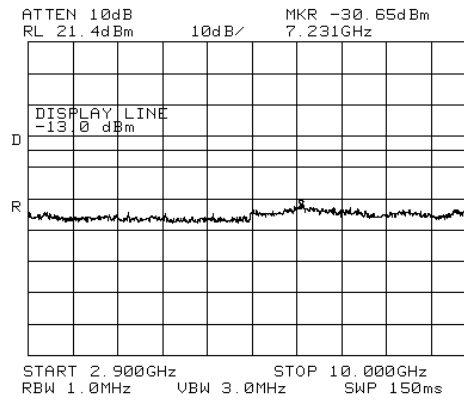


Figure 83.— 881.00 MHz

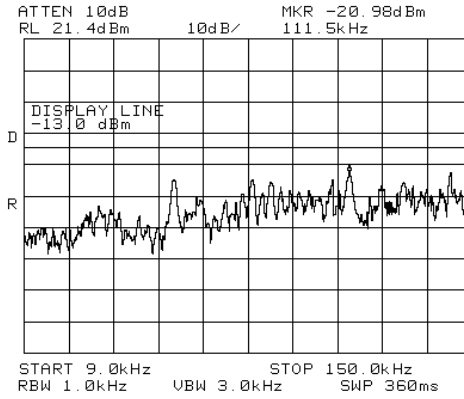


Figure 84.— 892.80 MHz

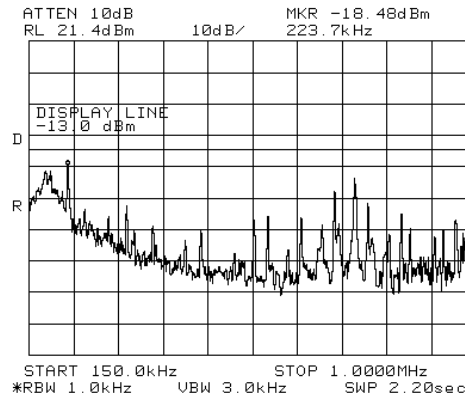


Figure 85.— 892.80 MHz

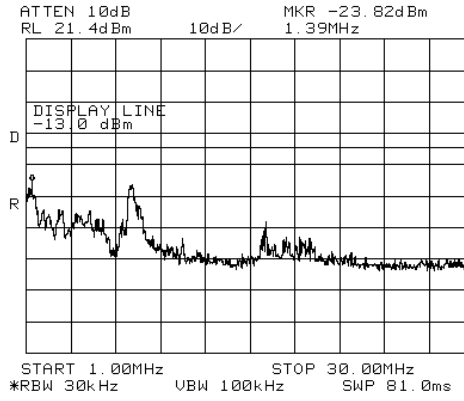


Figure 86.— 892.80 MHz

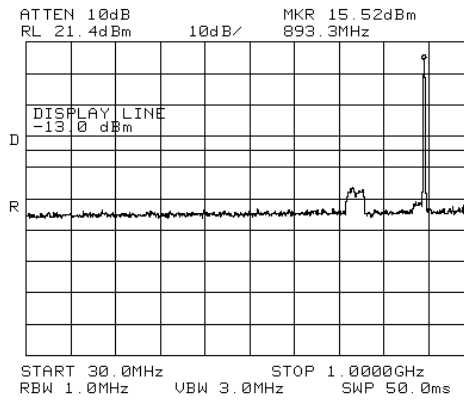


Figure 87.— 892.80 MHz

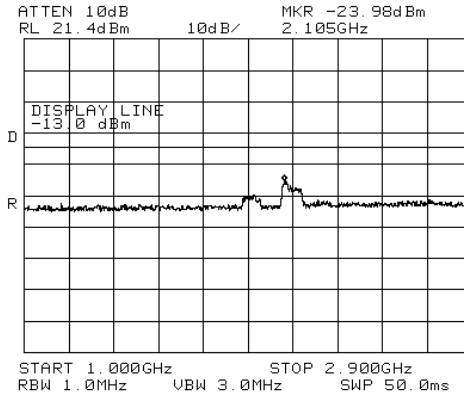


Figure 88.— 892.80 MHz

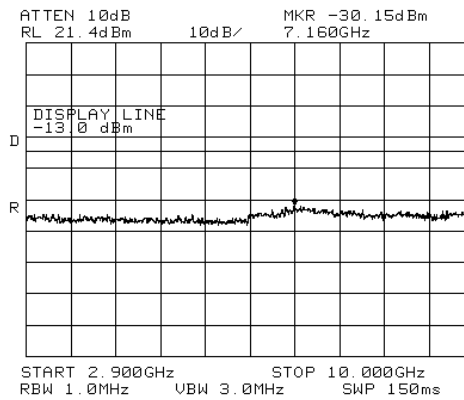


Figure 89.— 892.80 MHz



W-CDMA:

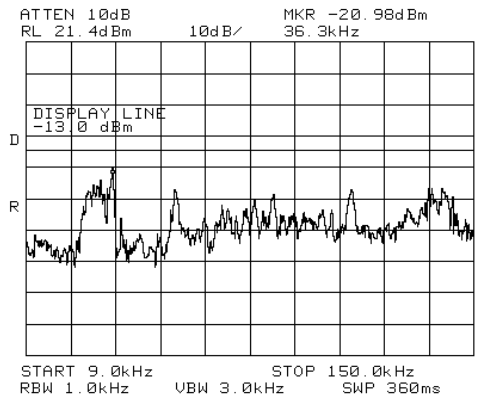


Figure 90.— 871.50 MHz

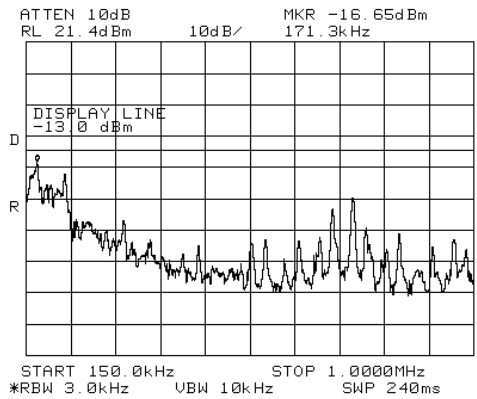


Figure 91.— 871.50 MHz

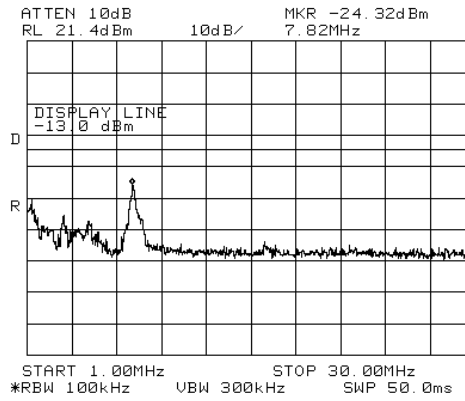


Figure 92.— 871.50 MHz

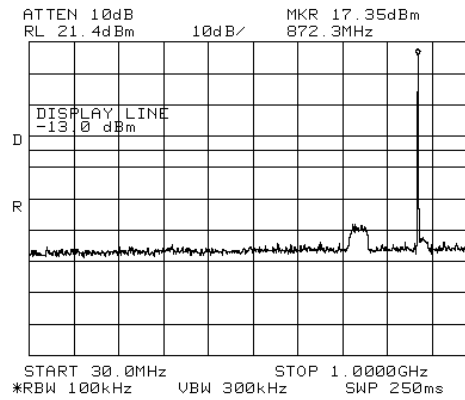


Figure 93.— 871.50 MHz

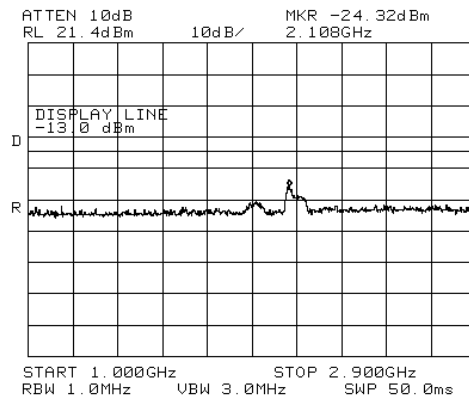


Figure 94.— 871.50 MHz

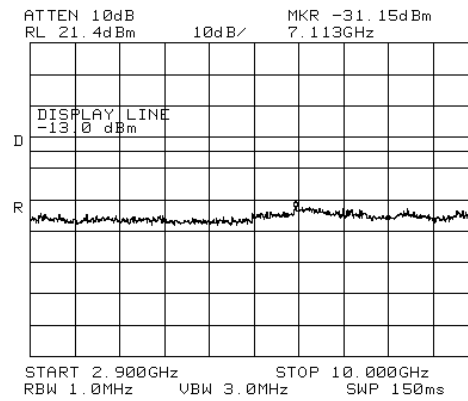


Figure 95.— 871.50 MHz

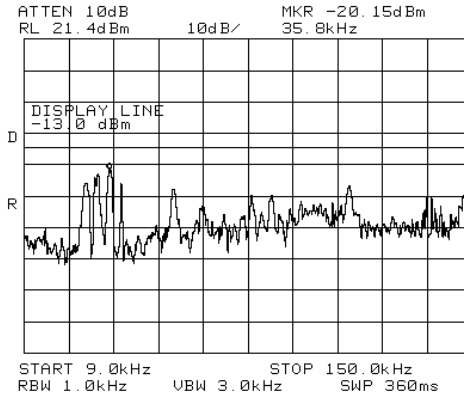


Figure 96.— 881.00 MHz

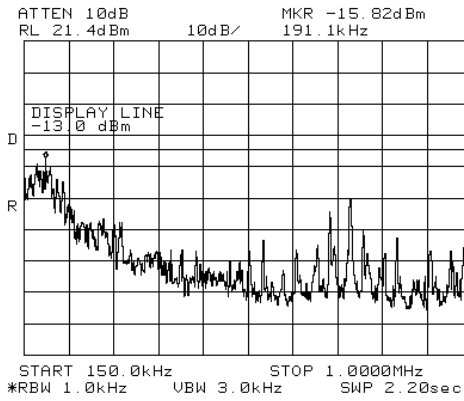


Figure 97.— 881.00 MHz

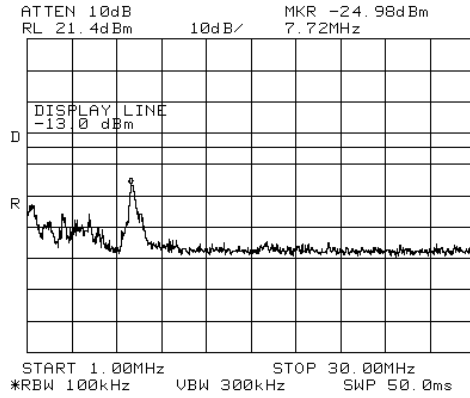


Figure 98.— 881.00 MHz

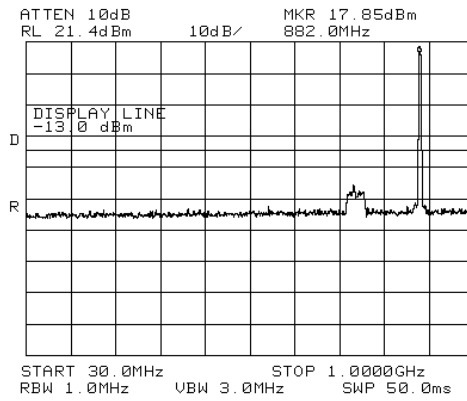


Figure 99.— 881.00 MHz

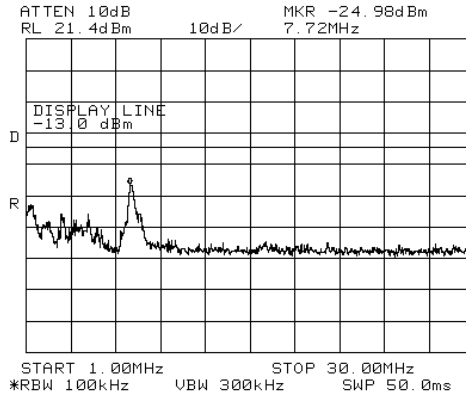


Figure 100.— 881.00 MHz

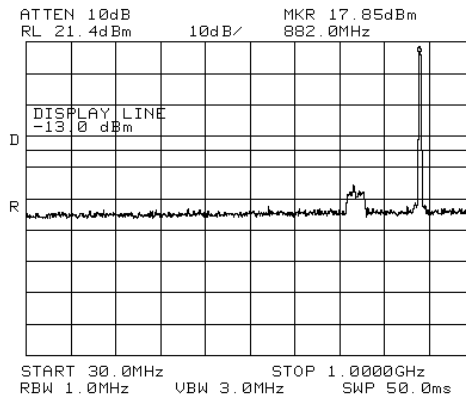


Figure 101.— 881.00 MHz

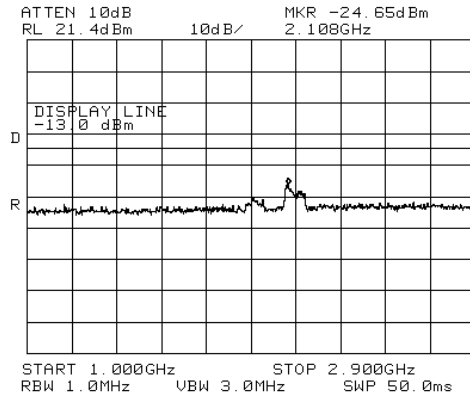


Figure 102.— 881.00 MHz

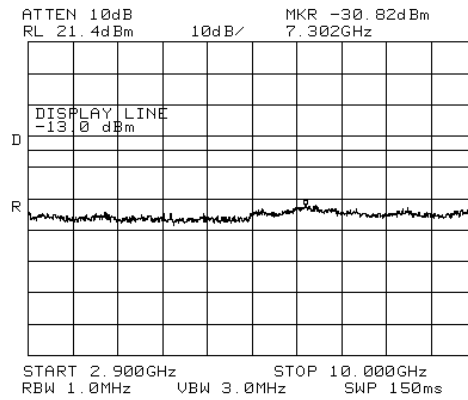


Figure 103.— 881.00 MHz

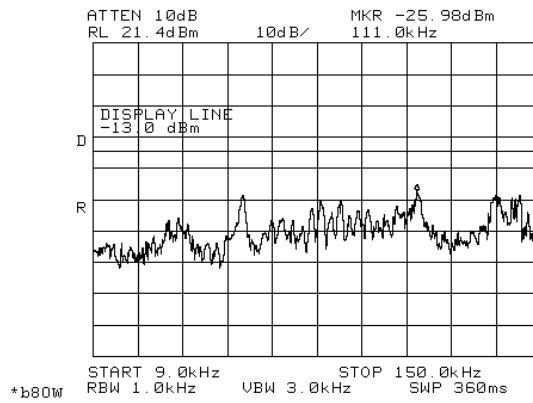


Figure 104.— 891.50 MHz

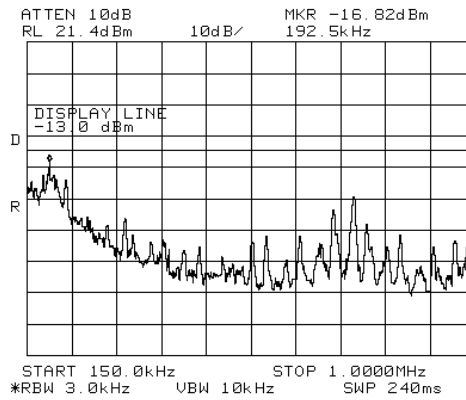


Figure 105.— 891.50 MHz

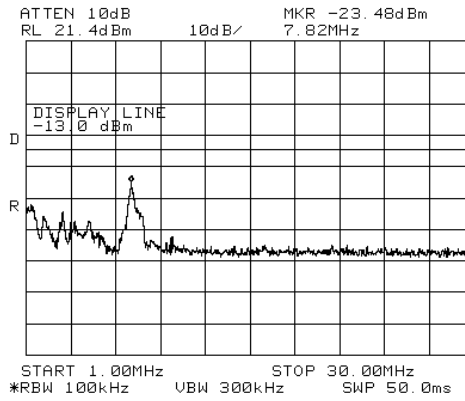


Figure 106.— 891.50 MHz

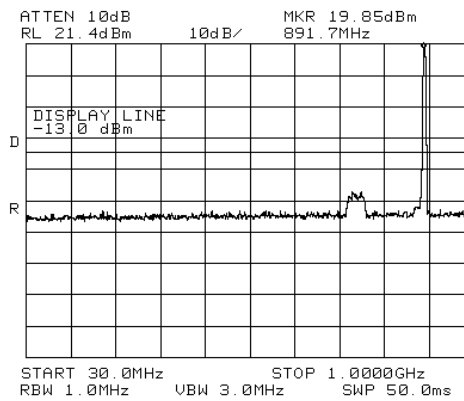


Figure 107.— 891.50 MHz

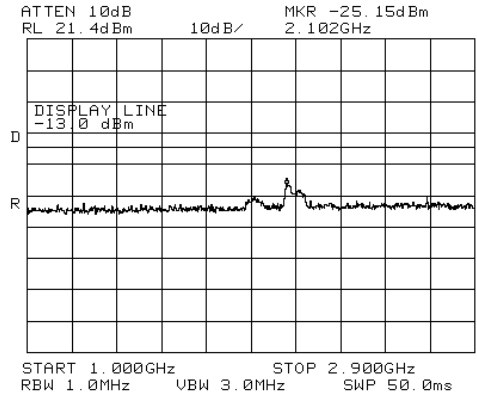


Figure 108.— 891.50 MHz

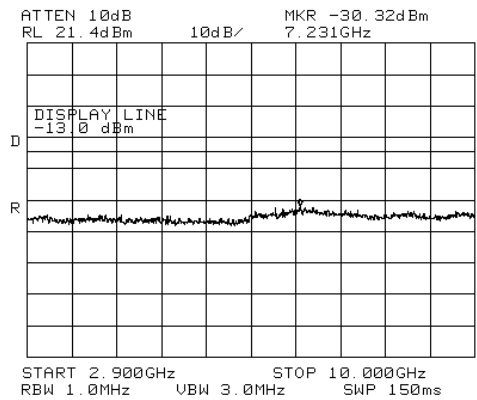


Figure 109.— 891.50 MHz



6.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	January 19, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 110 Test Equipment Used



7. Band Edge Spectrum CELL

7.1 Test Specification

FCC Part 22, FCC Part 2.1051

7.2 Test procedure

For LTE 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.



7.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	874.00	869.00	-29.31	-13.0	-16.31
	889.00	894.00	-32.28	-13.0	-19.28
LTE 16QAM	874.00	869.00	-32.34	-13.0	-19.34
	889.00	894.00	-35.99	-13.0	-22.99
LTE QPSK	874.00	869.00	-34.92	-13.0	-21.92
	889.00	894.00	-35.42	-13.0	-22.42
GSM	870.20	894.00	-27.57	-13.0	-14.57
	892.80	869.00	-29.13	-13.0	-16.13
W-CDMA	871.50	869.00	-31.17	-13.0	-18.17
	891.50	894.00	-33.13	-13.0	-20.13

Figure 111 Band Edge Spectrum Results CELL

See additional information in Figure 112 to Figure 121.

JUDGEMENT: Passed by 14.57 dB

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: A. Sharabi



LTE:

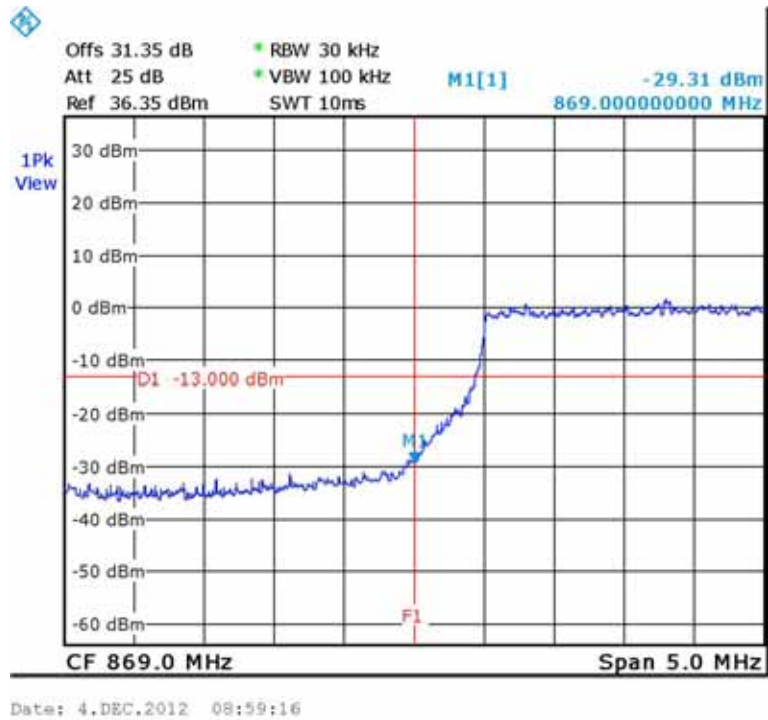


Figure 112.— 64QAM 874.00 MHz

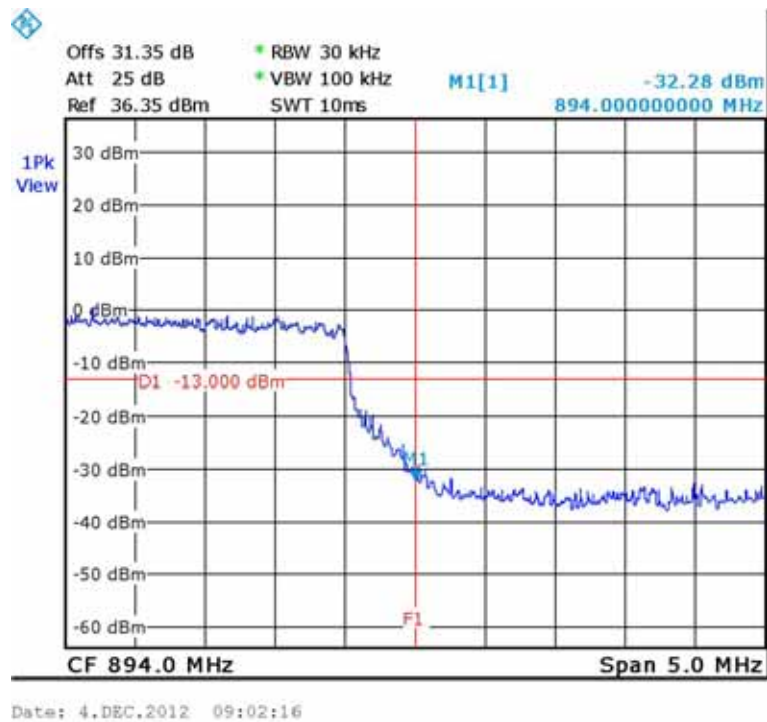
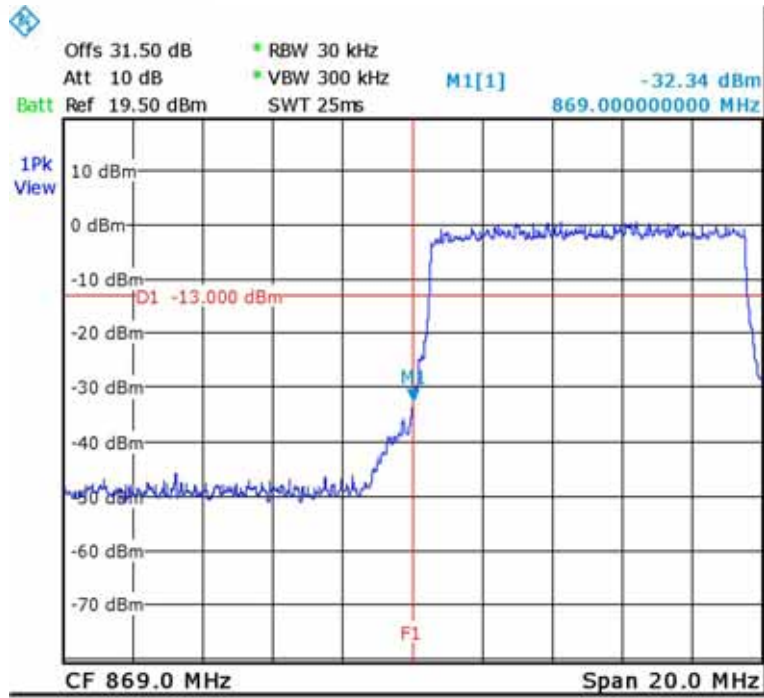
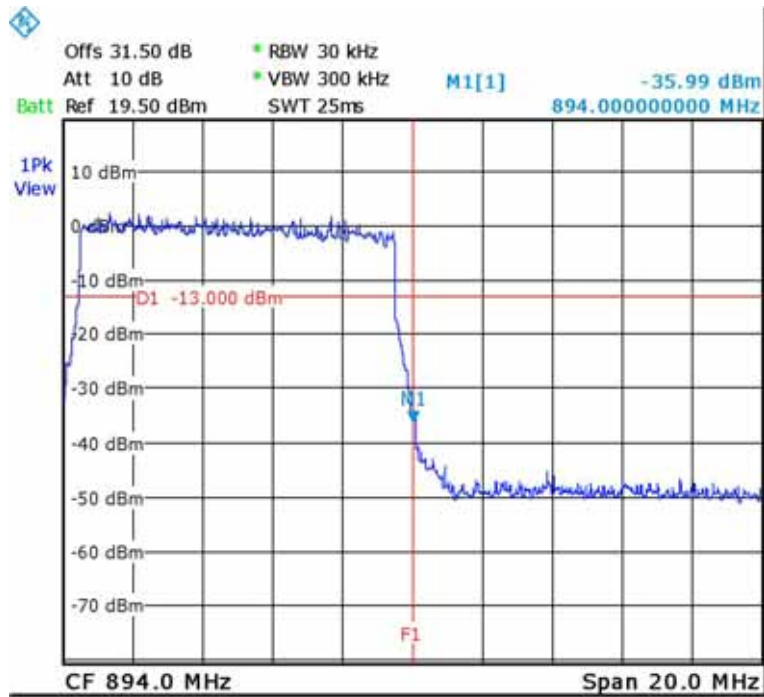


Figure 113.— 64QAM 889.00 MHz



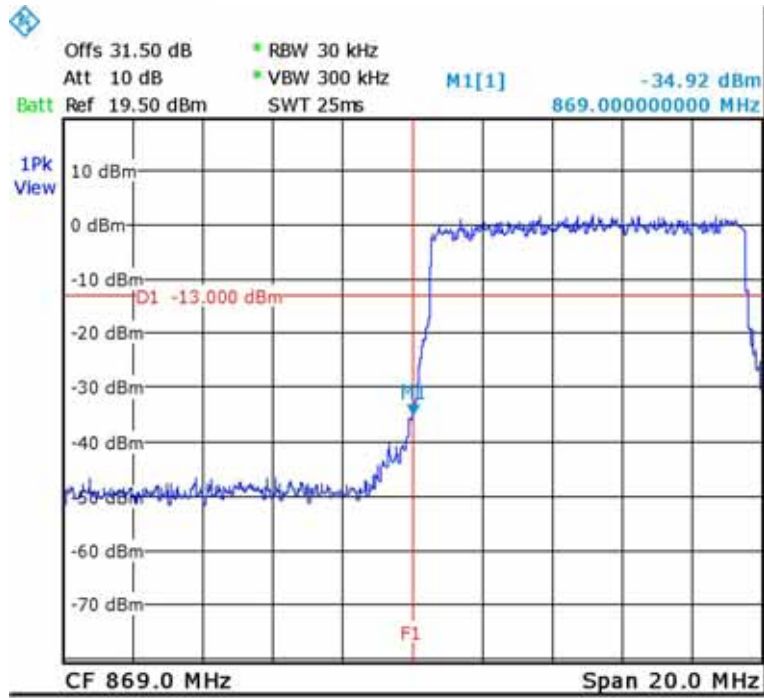
Date: 16.JAN.2013 17:06:05

Figure 114.— 16QAM 874.00 MHz



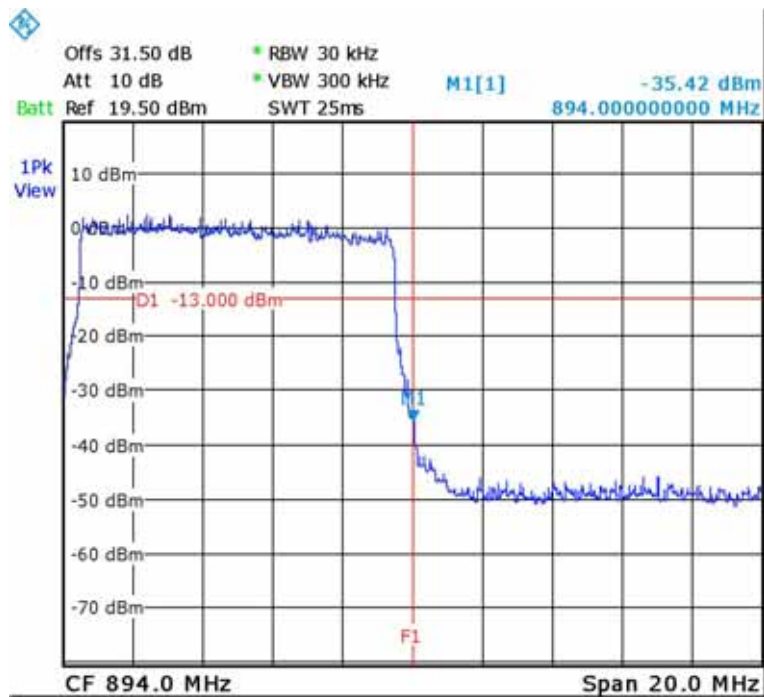
Date: 16.JAN.2013 17:07:53

Figure 115.— 16QAM 889.00 MHz



Date: 16.JAN.2013 17:06:30

Figure 116.— QPSK 874.00 MHz



Date: 16.JAN.2013 17:07:28

Figure 117.— QPSK 889.00 MHz



GSM:

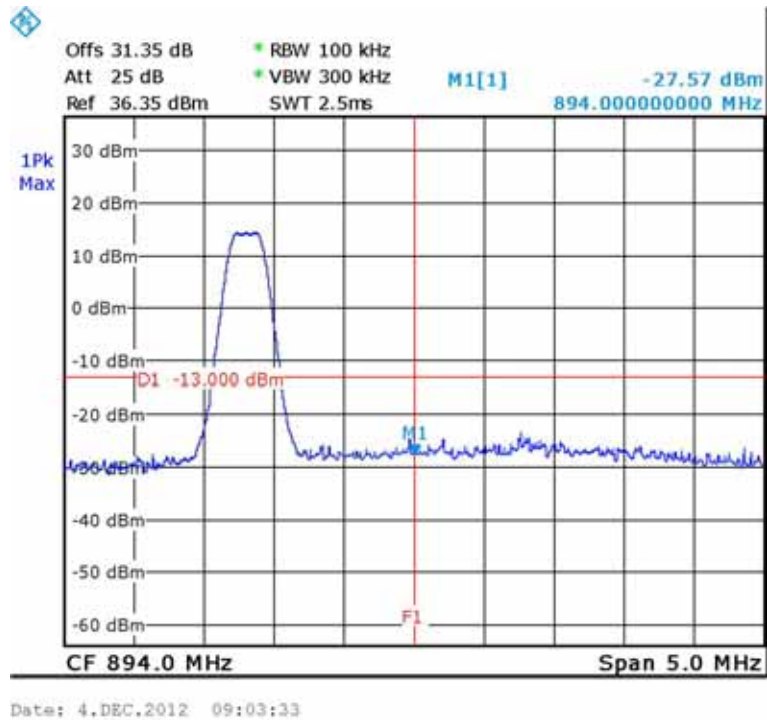


Figure 118.— 870.20 MHz

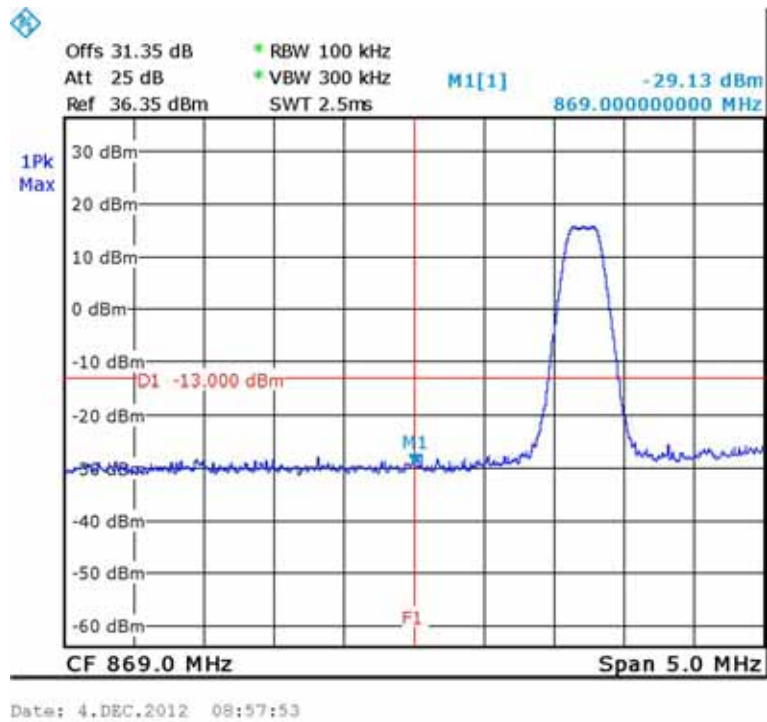


Figure 119.— 892.80 MHz



W-CDMA:

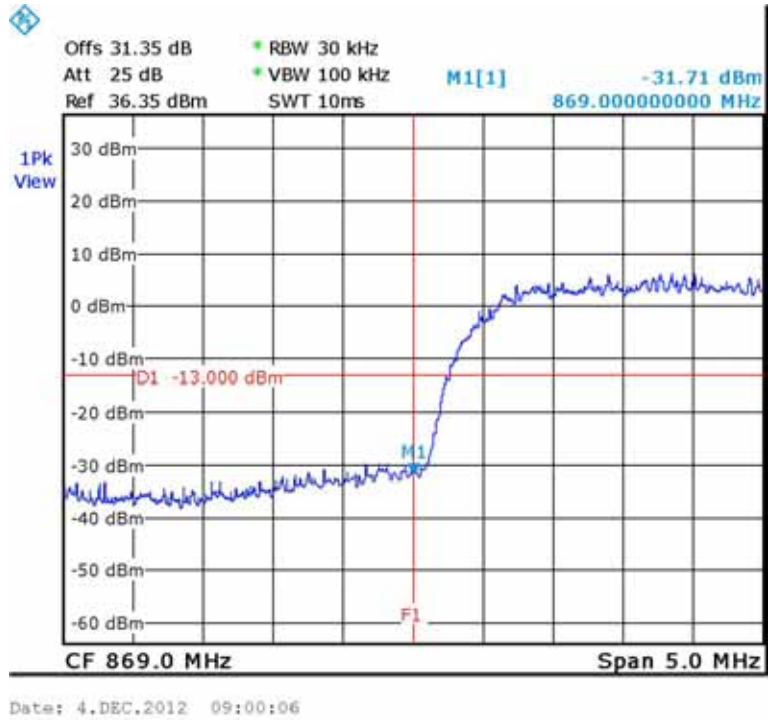


Figure 120.— 871.50 MHz

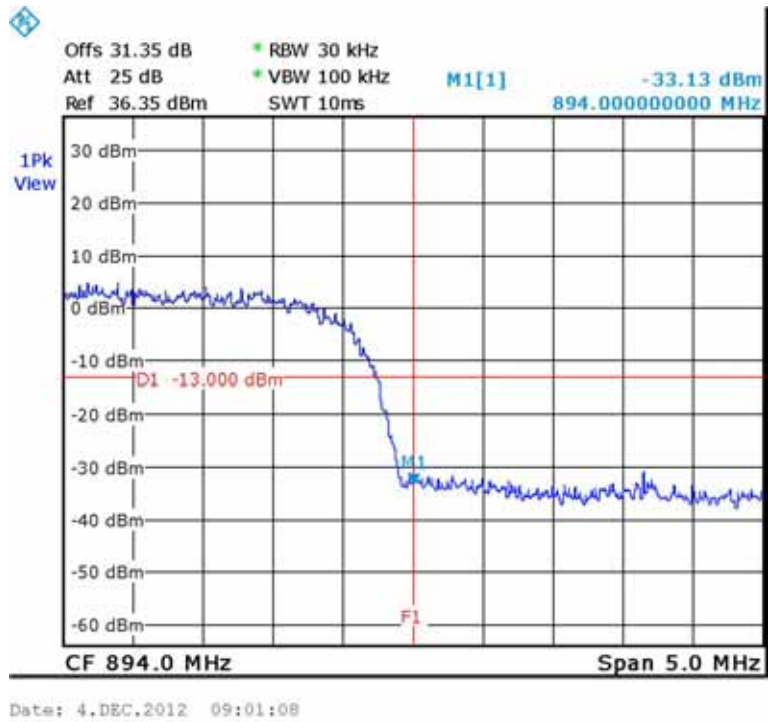


Figure 121.— 891.50 MHz



7.4 Test Equipment Used

Band Edge Spectrum CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 122 Test Equipment Used



8. Out of Band Emissions (Radiated) CELL

8.1 Test Specification

FCC Part 22, Section 917; FCC Part 2.1053

8.2 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 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:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dB)}$$

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.

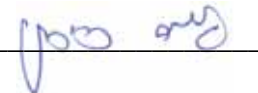


8.3 Test Results

Carrier Channel	Freq.	Antenna Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	Effective Radiated Power Level	Spec.	Margin
(MHz)	(MHz)		(dB μ V/m)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
870.20	1740.40	V	55.8	-43.5	6.7	7.6	-42.6	-13.0	-29.6
870.20	1740.40	H	56.6	-42.7	6.7	8.0	-41.4	-13.0	-28.4
881.00	1762.00	V	60.6	-36.8	6.7	7.6	-35.9	-13.0	-22.9
881.00	1762.00	H	60.9	-37.3	6.7	8.0	-36.0	-13.0	-23.0
892.80	1785.60	V	60.7	-36.7	6.7	7.6	-35.8	-13.0	-22.8
892.80	1785.60	H	61.1	-37.1	6.7	8.0	-35.8	-13.0	-22.8

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

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: I. Siboni



8.4 Test Instrumentation Used, Radiated Measurements CELL

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	Rohde & Schwarz	1066.301	100120	November 1, 2012	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2012	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2012	1 year
Antenna Bioconilog	EMCO	3142B	1250	July 7, 2012	1 year
Horn	EMCO	3115	6142	March 14, 2012	2 year
Horn	ARA	SWH-28	1007	January 26, 2011	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2012	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2012	1 year
Signal Generator	Agilent	N5172B ATO10210	MY51350182	May 31, 2012	2 years
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A



9. Peak Output Power PCS

9.1 Test Specification

FCC Part 24, Subpart E

9.2 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 and an appropriate coaxial cable (loss = 31.35 dB). The E.U.T. RF output was W-CDMA and GSM and LTE modulated. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

9.3 Test Results

Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	1935.0	24.52	50.0	-25.48
	1962.5	26.95	50.0	-23.05
	1990.0	26.44	50.0	-23.56
LTE 16QAM	1935.0	25.53	50.00	-24.47
	1962.5	26.36	50.00	-23.64
	1990.0	24.86	50.00	-25.14
LTE QPSK	1935.0	26.08	50.00	-23.92
	1962.5	26.57	50.00	-23.43
	1990.0	25.05	50.00	-24.95
GSM	1931.2	23.59	50.0	-26.41
	1960.0	26.84	50.0	-23.16
	1993.8	23.88	50.0	-26.12
W-CDMA	1932.5	24.67	50.0	-25.33
	1960.0	27.65	50.0	-22.35
	1992.5	24.84	50.0	-25.16

Figure 123 Peak Output Power PCS

See additional information in Figure 124 to Figure 138.

JUDGEMENT: Passed by 22.35 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 20.01.13

Typed/Printed Name: A. Sharabi



LTE

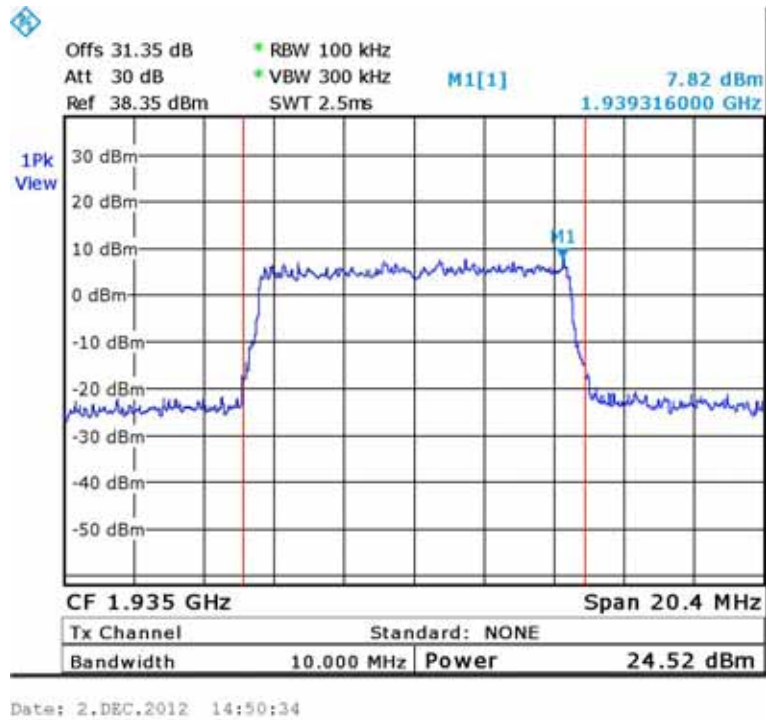


Figure 124.— 64QAM 1935.00 MHz

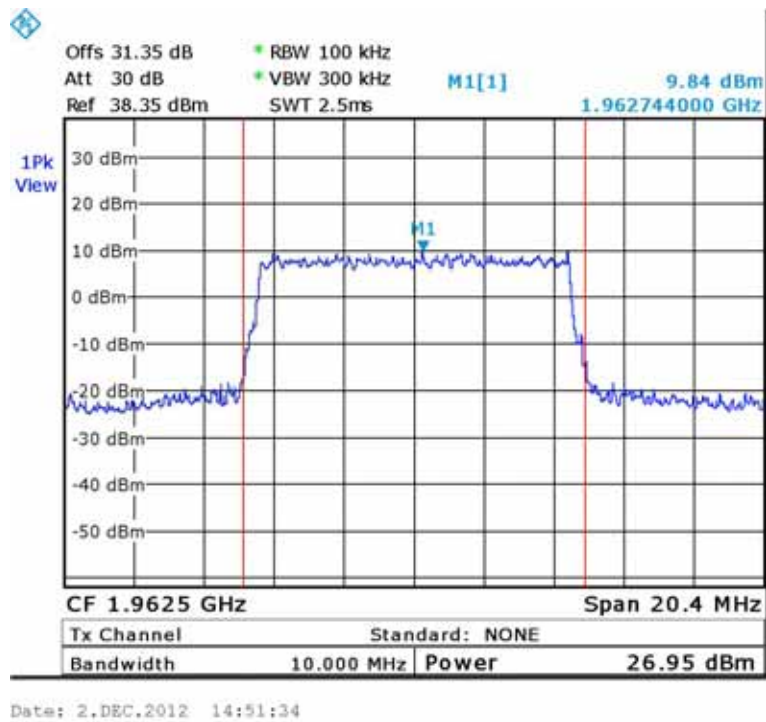


Figure 125.— 64QAM 1962.50 MHz

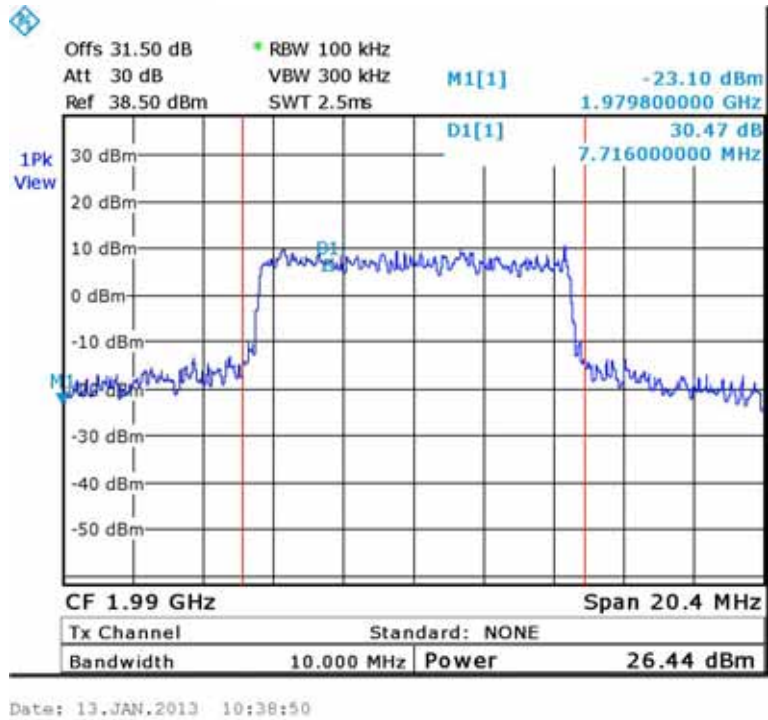


Figure 126.— 64QAM 1990.00 MHz

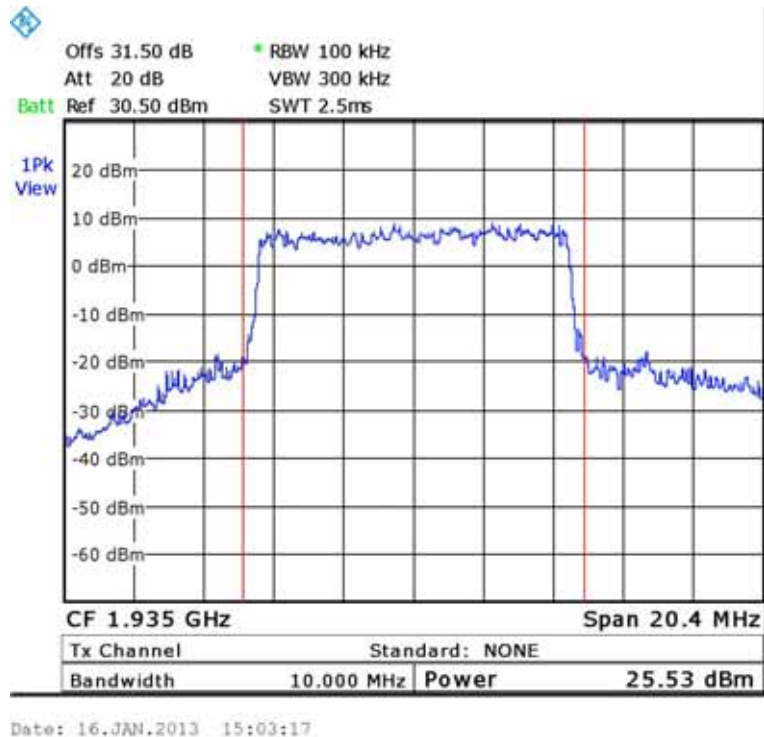
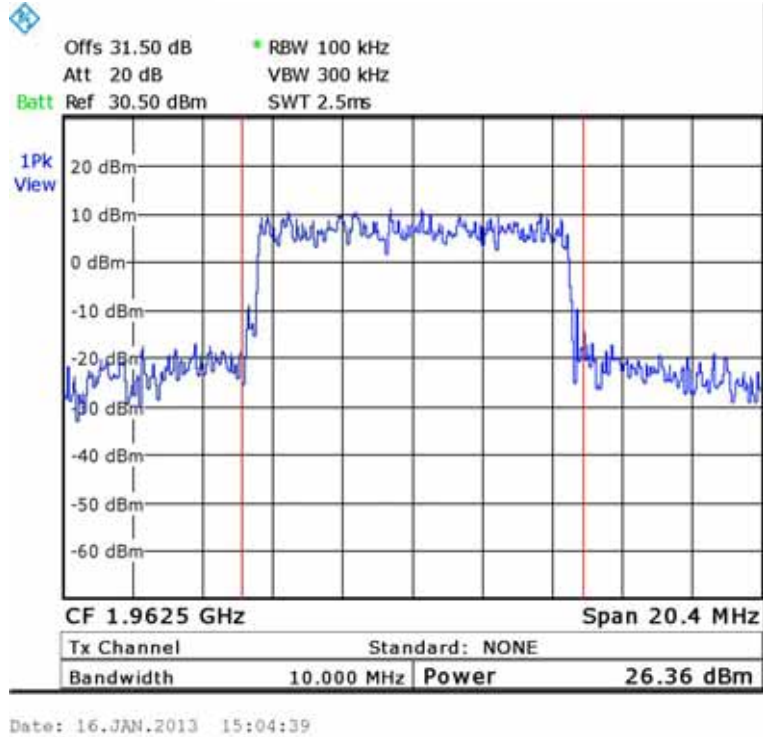
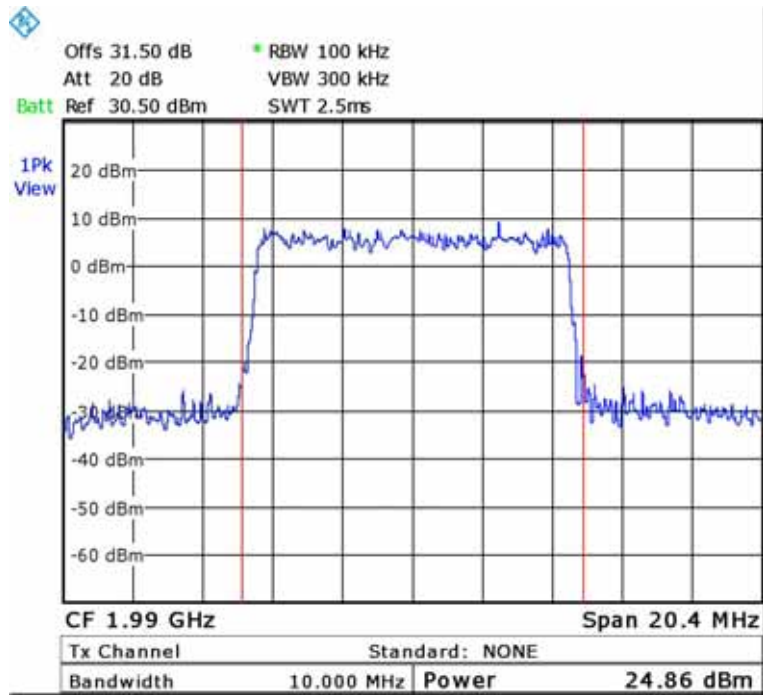


Figure 127.— 16QAM 1935.00 MHz



Date: 16.JAN.2013 15:04:39

Figure 128.— 16QAM 1962.50 MHz



Date: 16.JAN.2013 15:05:50

Figure 129.— 16QAM 1990.00 MHz

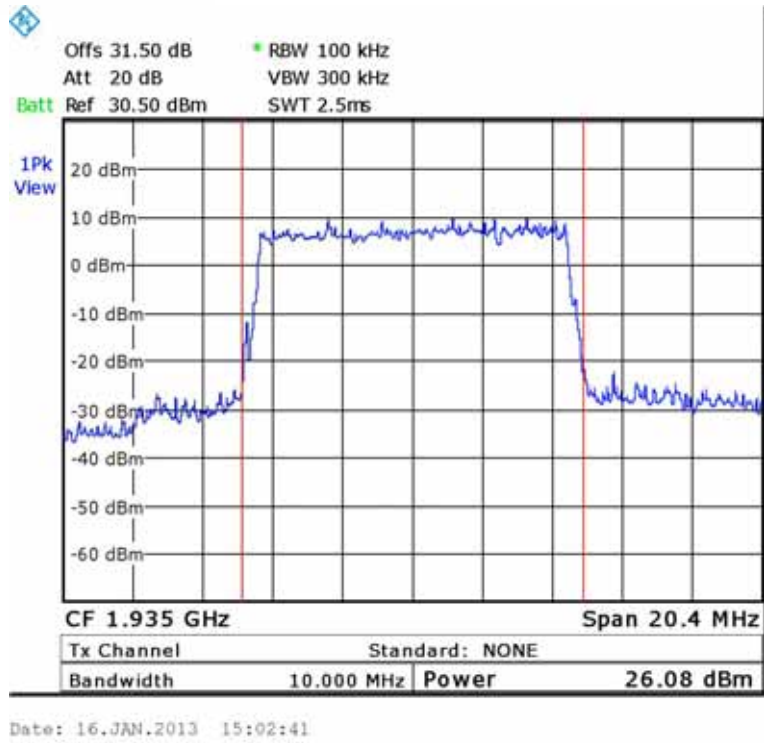


Figure 130.— QPSK 1935.00 MHz

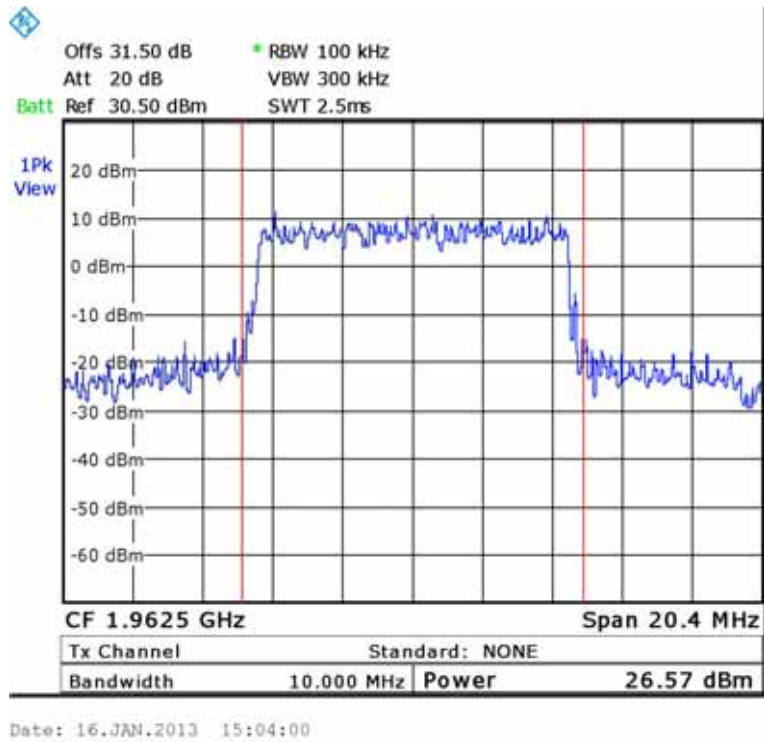


Figure 131.— QPSK 1962.50 MHz

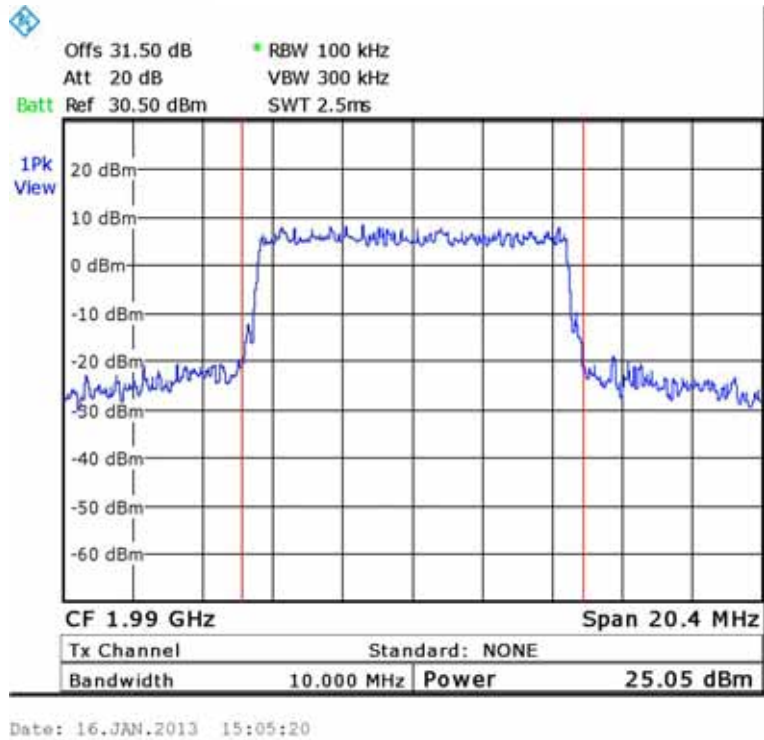


Figure 132.— QPSK 1990.00 MHz

GSM:

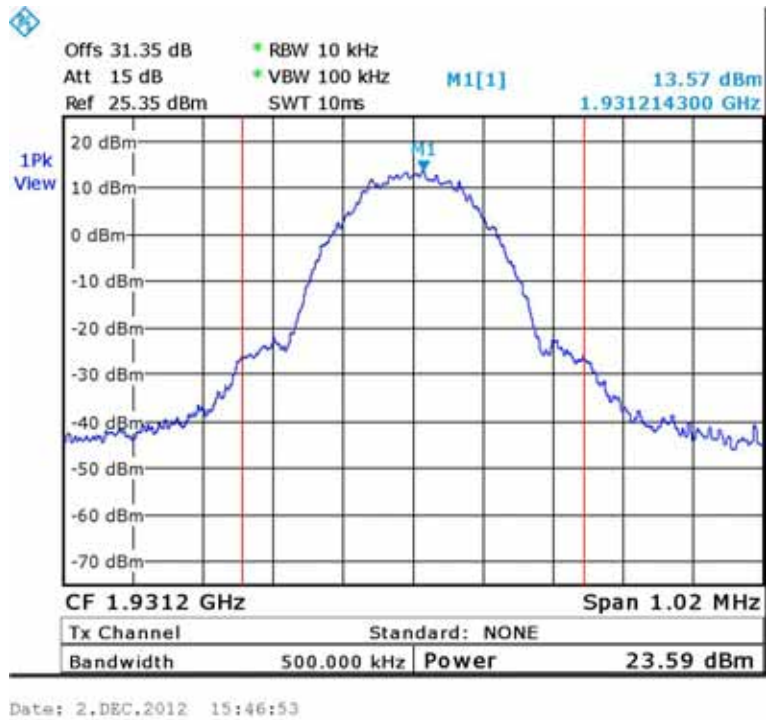


Figure 133.— 1931.20 MHz

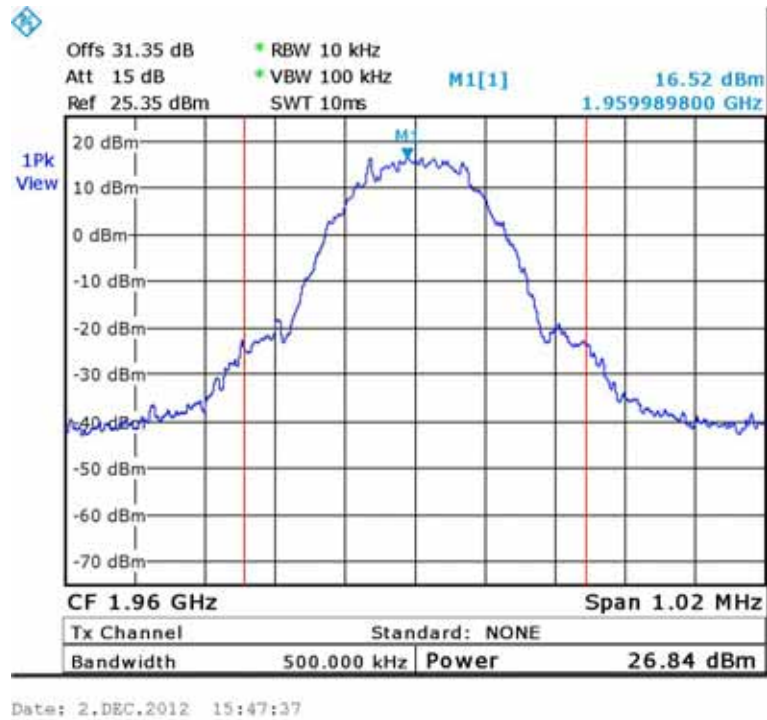


Figure 134.— 1960.00 MHz

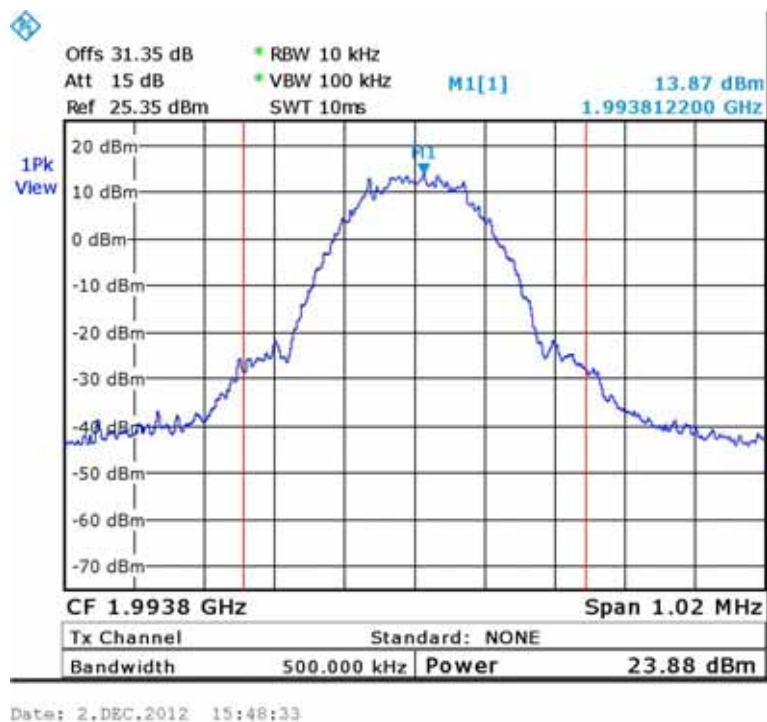


Figure 135.— 1993.80 MHz



W-CDMA:

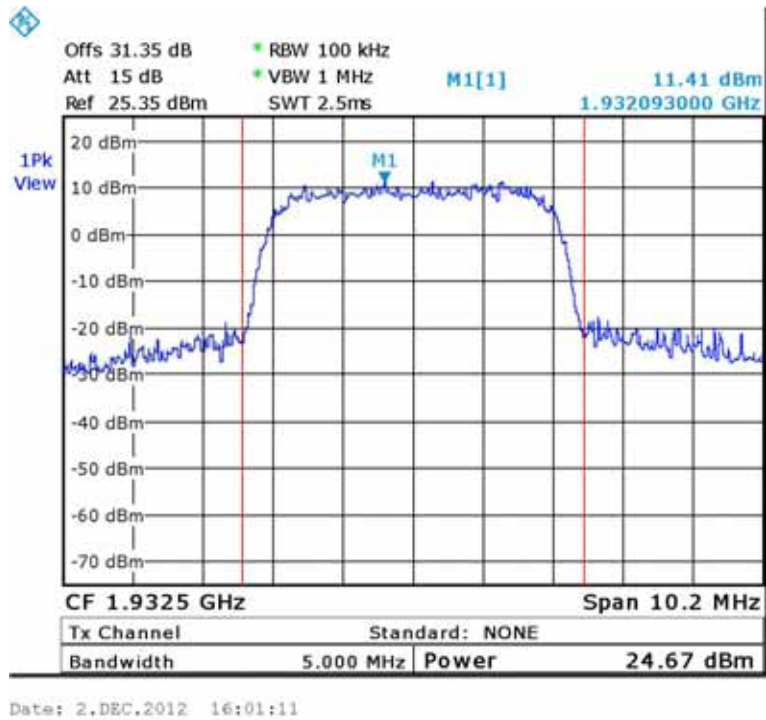


Figure 136.— 1932.50 MHz

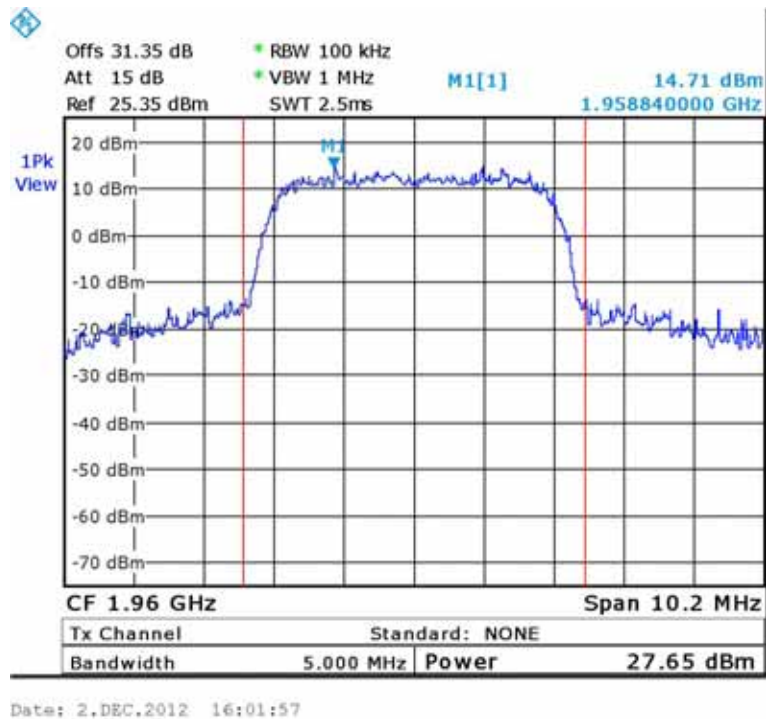


Figure 137.— 1960.00 MHz

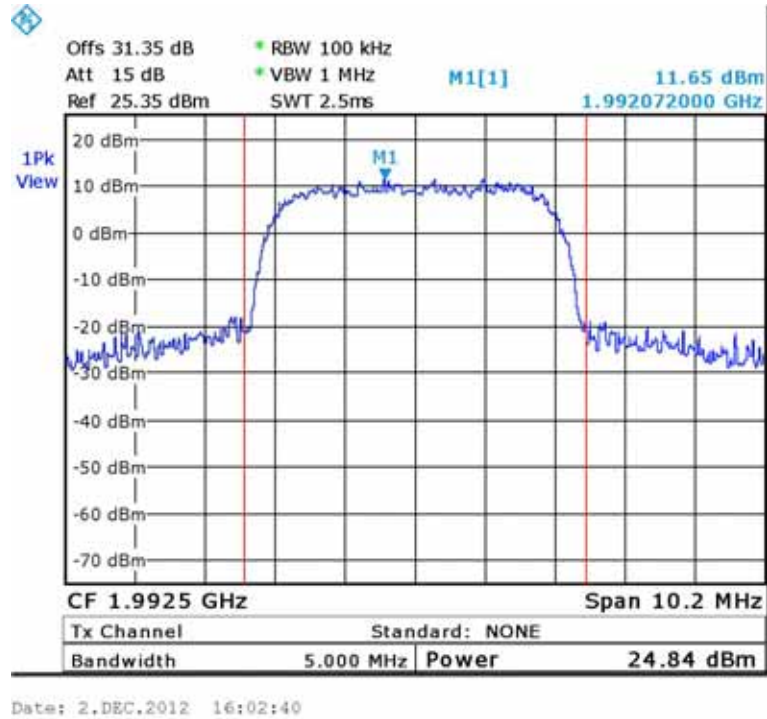


Figure 138.— 1992.50 MHz

9.4 Test Equipment Used

Peak Output Power PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 139 Test Equipment Used



10. Occupied Bandwidth PCS

10.1 Test Specification

FCC Part 2, Section 1049

10.2 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.



10.3 Test Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	1935.00	9.581
	Output	1935.00	9.551
	Input	1962.50	9.611
	Output	1962.50	9.626
	Input	1990.00	9.406
	Output	1990.00	9.487
LTE 16QAM	Input	1935.00	9.381
	Output	1935.00	9.341
	Input	1962.50	9.421
	Output	1962.50	9.261
	Input	1990.00	9.341
	Output	1990.00	9.381
LTE QPSK	Input	1935.00	9.461
	Output	1935.00	9.381
	Input	1962.50	9.222
	Output	1962.50	9.461
	Input	1990.00	9.341
	Output	1990.00	9.501
GSM	Input	1931.20	0.295
	Output	1931.20	0.295
	Input	1960.00	0.295
	Output	1960.00	0.293
	Input	1993.80	0.291
	Output	1993.80	0.295
W-CDMA	Input	1932.50	4.540
	Output	1932.50	4.601
	Input	1960.00	4.581
	Output	1960.00	4.581
	Input	1992.50	4.560
	Output	1992.50	4.560

Figure 140 Occupied Bandwidth PCS

See additional information in Figure 141 to Figure 170.

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: A. Sharabi



LTE

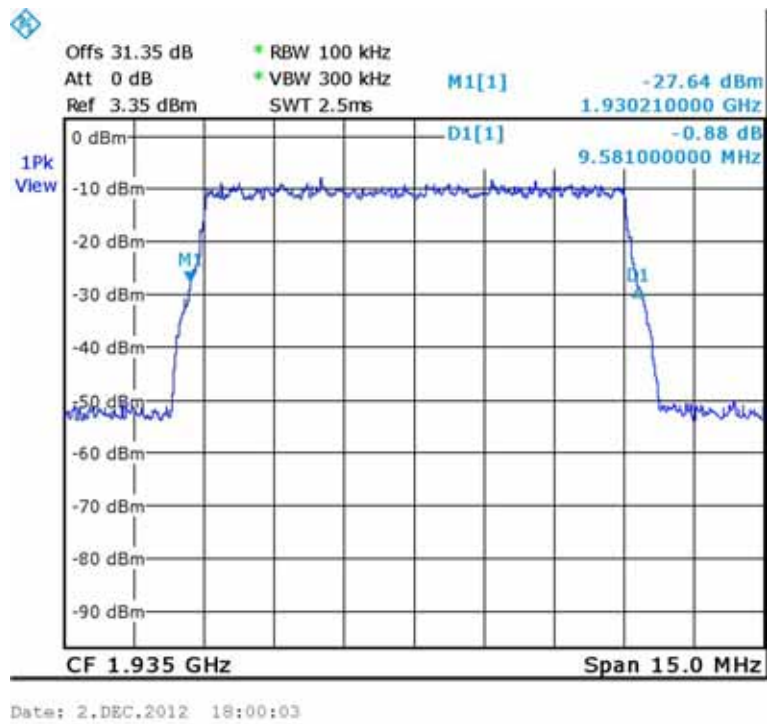


Figure 141.— 64QAM Input 1935.00 MHz

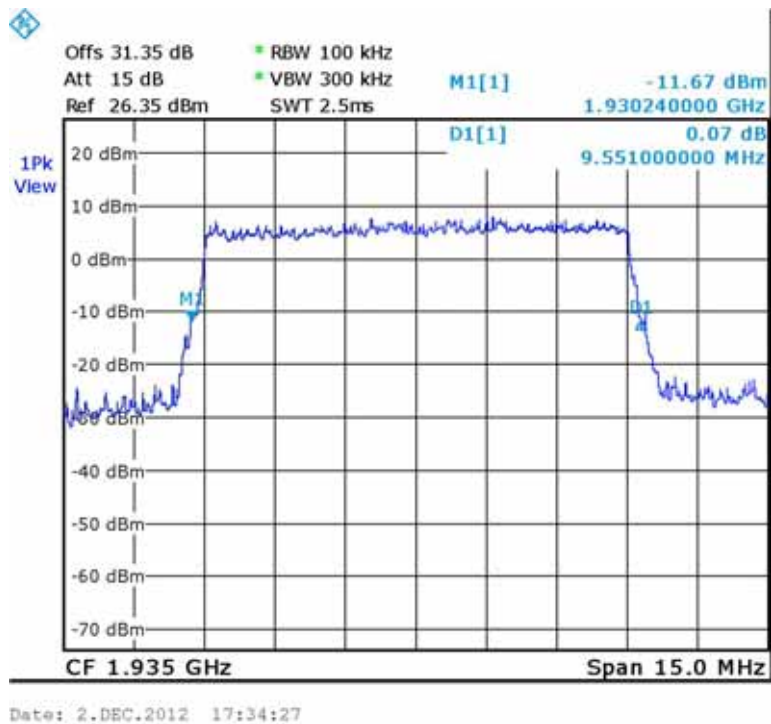


Figure 142.— 64QAM Output 1935.00 MHz

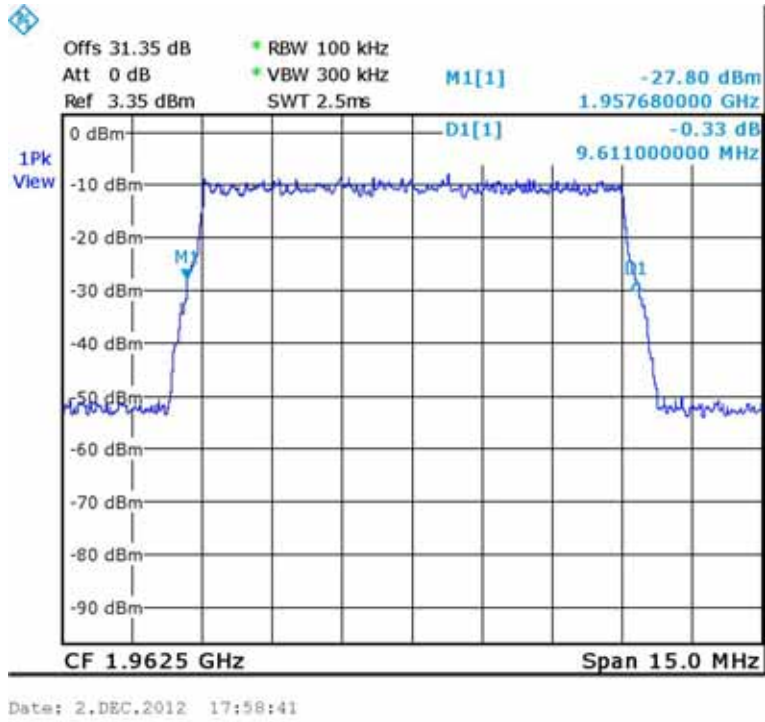


Figure 143.— 64QAM Input 1962.50 MHz

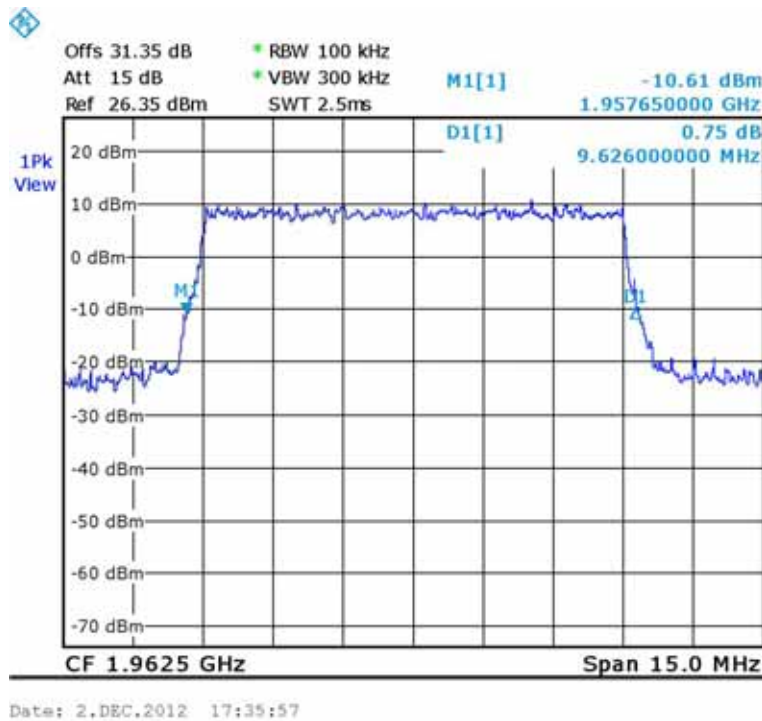
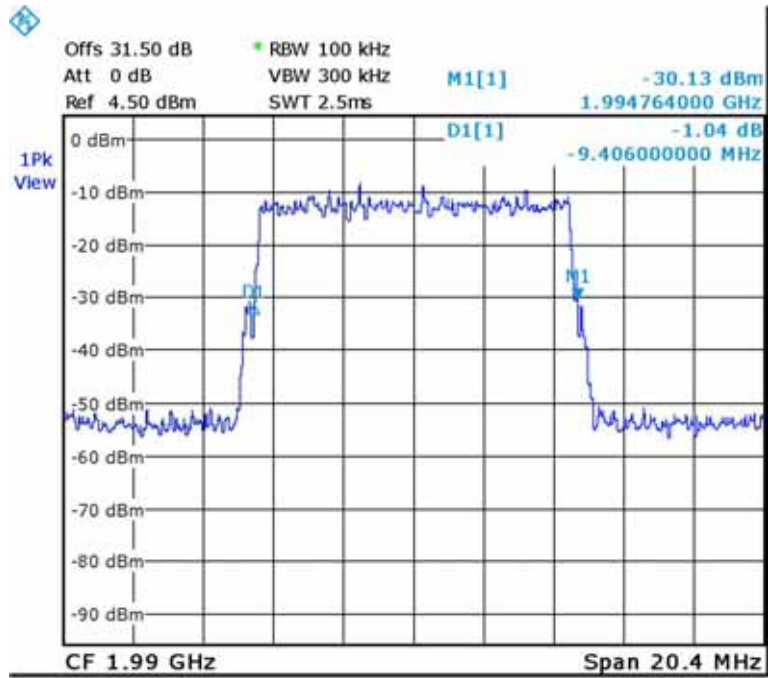
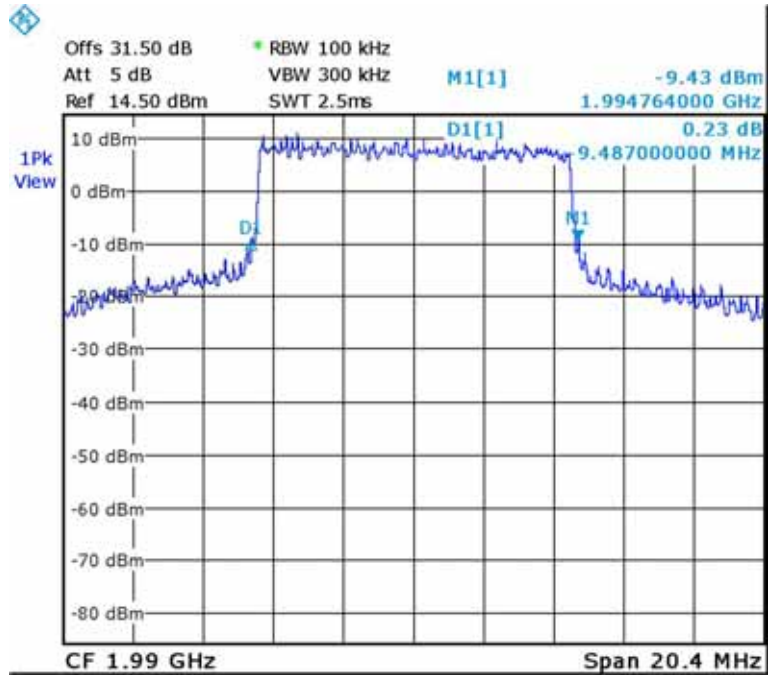


Figure 144.— 64QAM Output 1962.50 MHz



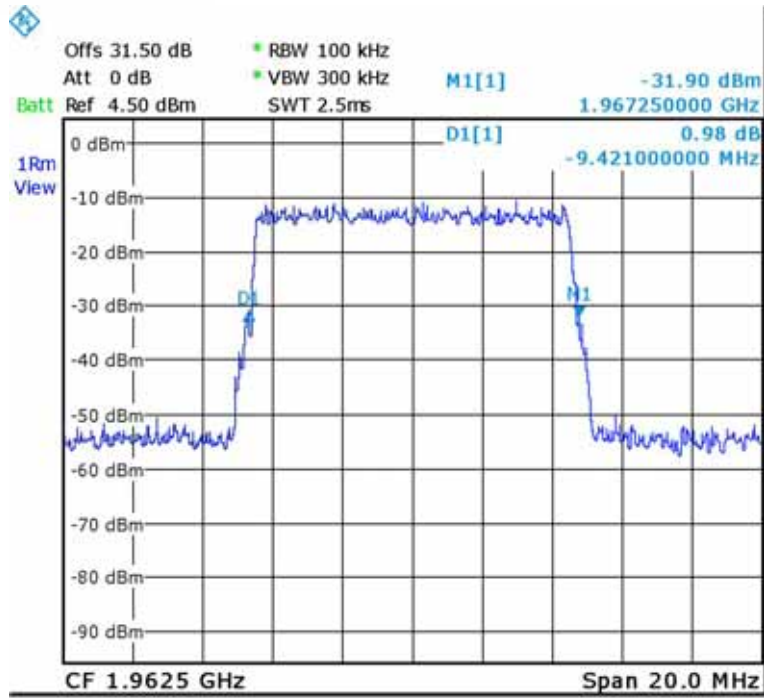
Date: 13.JAN.2013 10:41:50

Figure 145.— 64QAM Input 1990.00 MHz



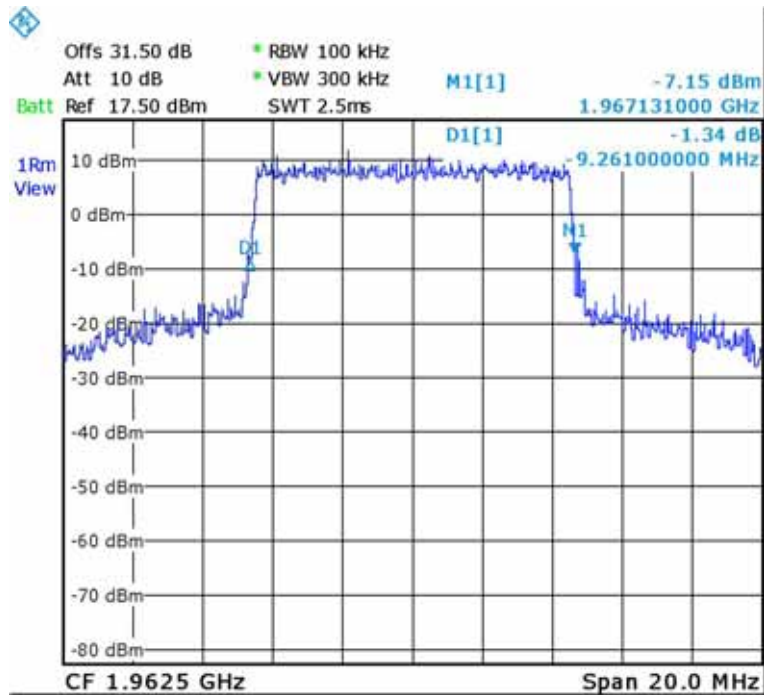
Date: 13.JAN.2013 10:40:52

Figure 146.— 64QAM Output 1990.00 MHz



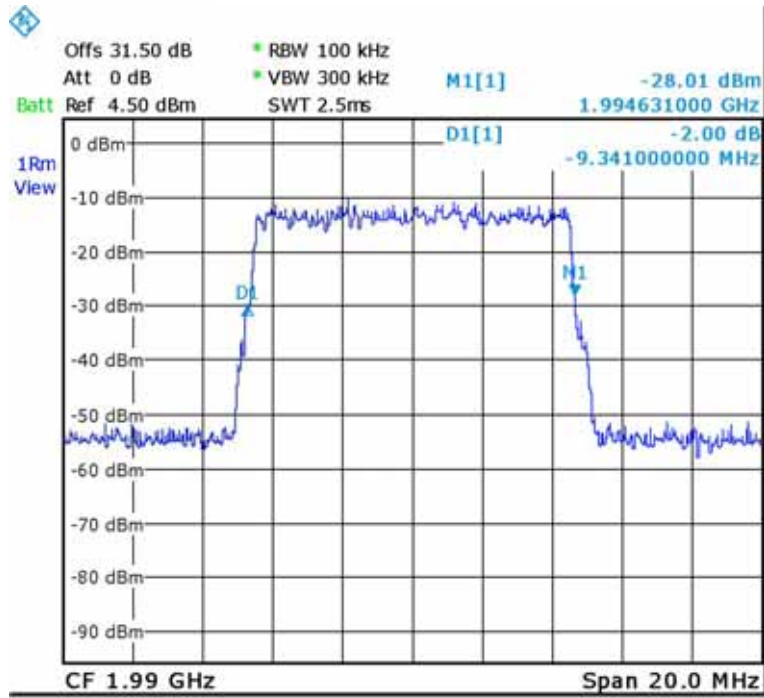
Date: 16.JAN.2013 16:49:01

Figure 149.— 16QAM Input 1962.50 MHz



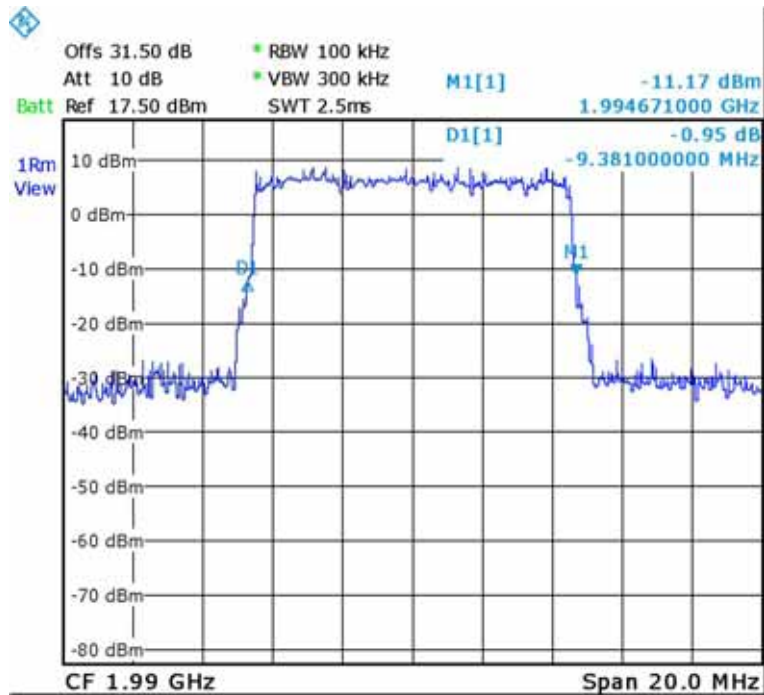
Date: 16.JAN.2013 15:35:57

Figure 150.— 16QAM Output 1962.50 MHz



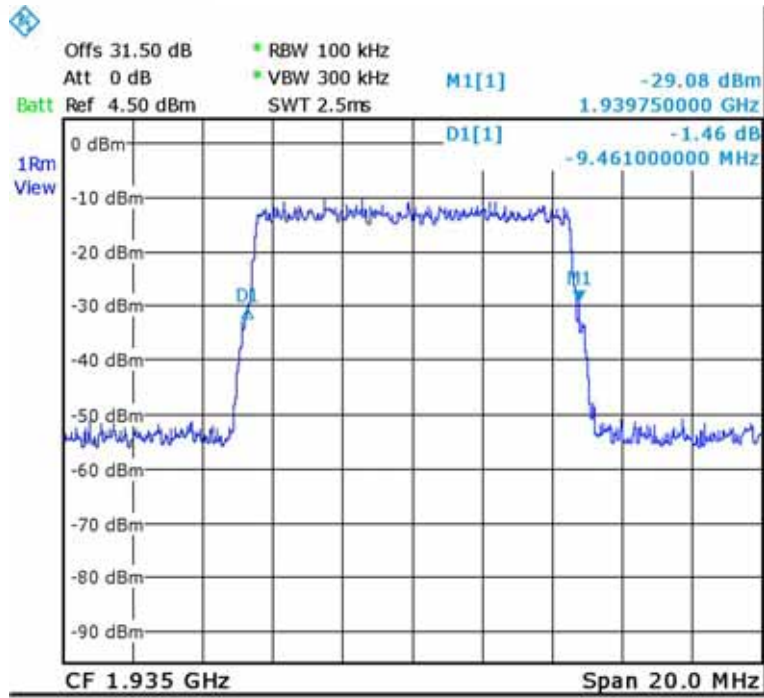
Date: 16.JAN.2013 16:50:22

Figure 151.— 16QAM Input 1990.00 MHz



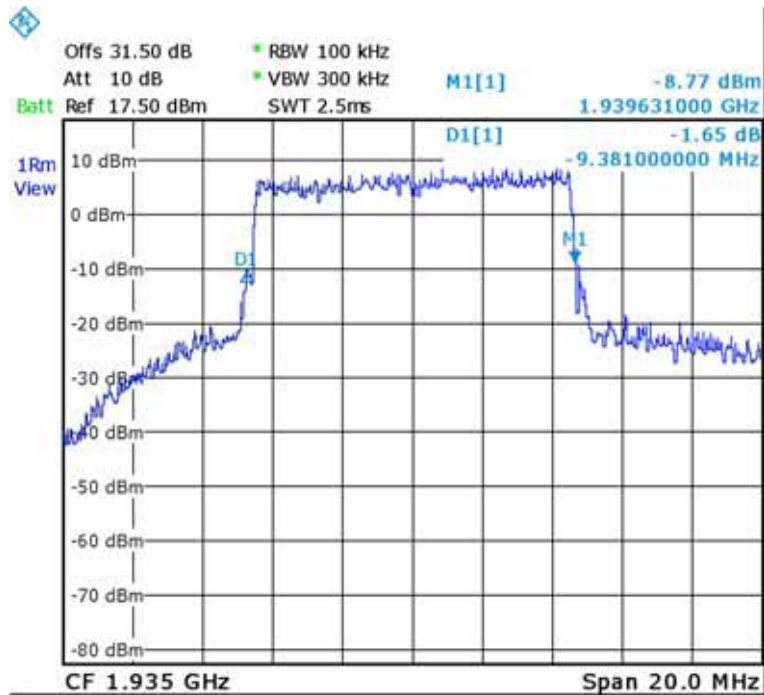
Date: 16.JAN.2013 15:37:34

Figure 152.— 16QAM Output 1990.00 MHz



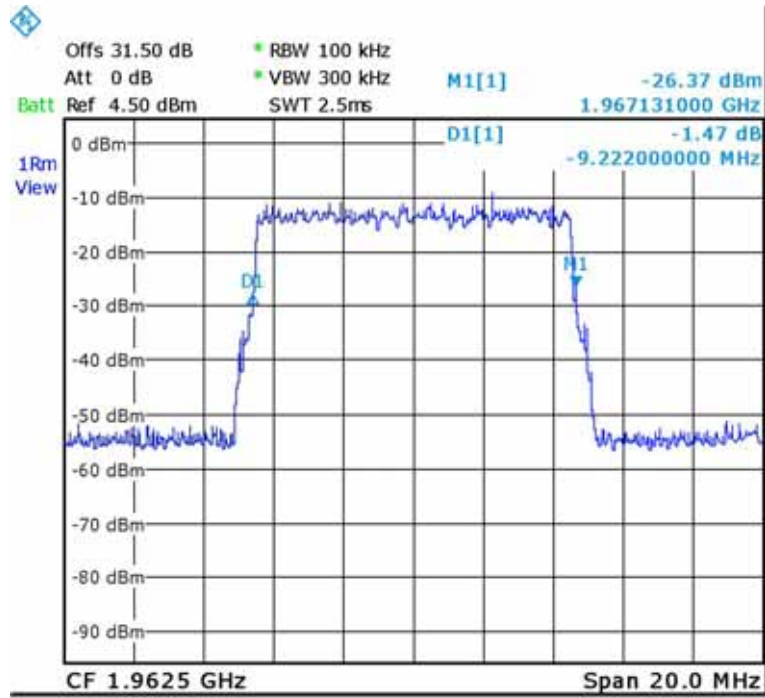
Date: 16.JAN.2013 16:47:11

Figure 153.— QPSK Input 1935.00 MHz



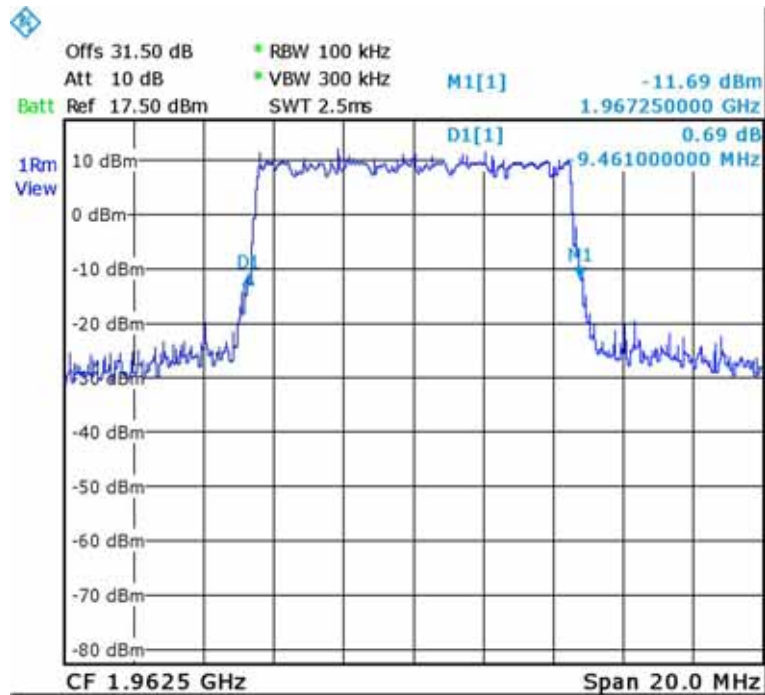
Date: 16.JAN.2013 15:33:39

Figure 154.— QPSK Output 1935.00 MHz



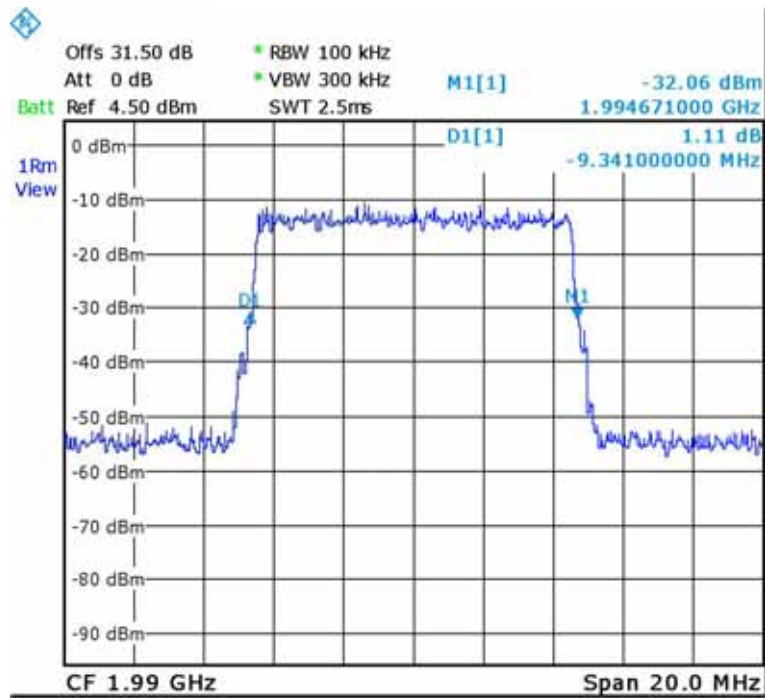
Date: 16.JAN.2013 16:48:29

Figure 155.— QPSK Input 1962.50 MHz



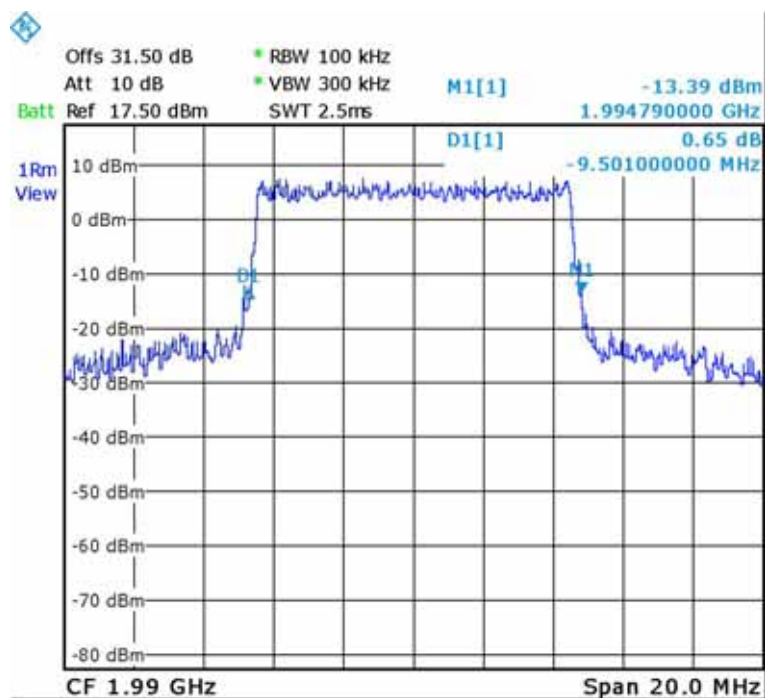
Date: 16.JAN.2013 15:35:20

Figure 156.— QPSK Output 1962.50 MHz



Date: 16.JAN.2013 16:49:44

Figure 157.— QPSK Input 1990.00 MHz



Date: 16.JAN.2013 15:36:56

Figure 158.— QPSK Output 1990.00 MHz



GSM:

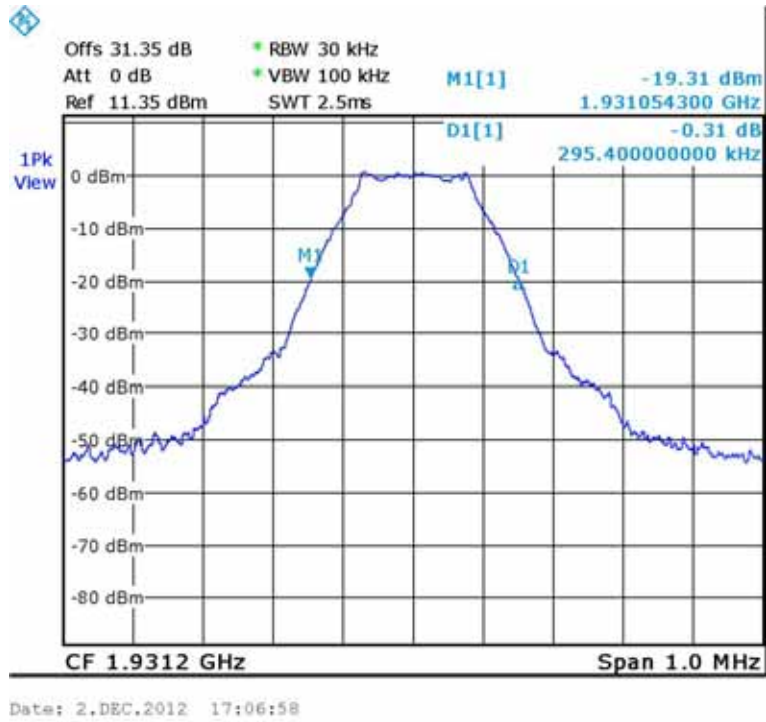


Figure 159.— Input 1931.20 MHz

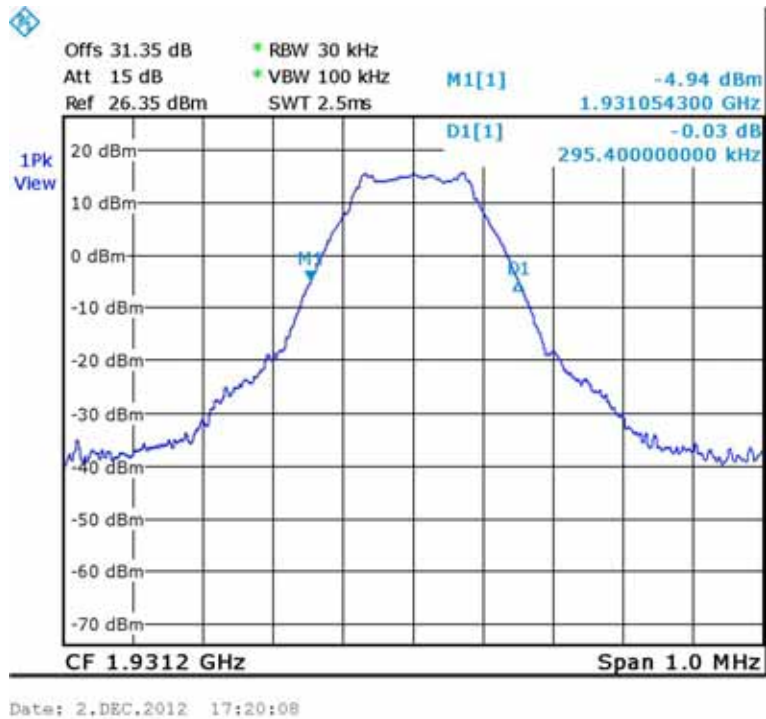


Figure 160.— Output 1931.20 MHz

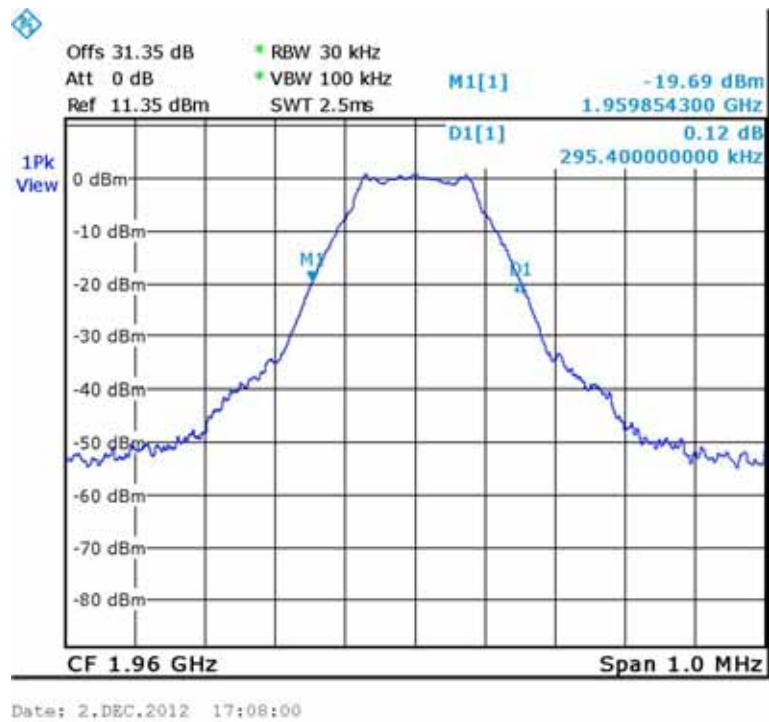


Figure 161.— Input 1960.00 MHz

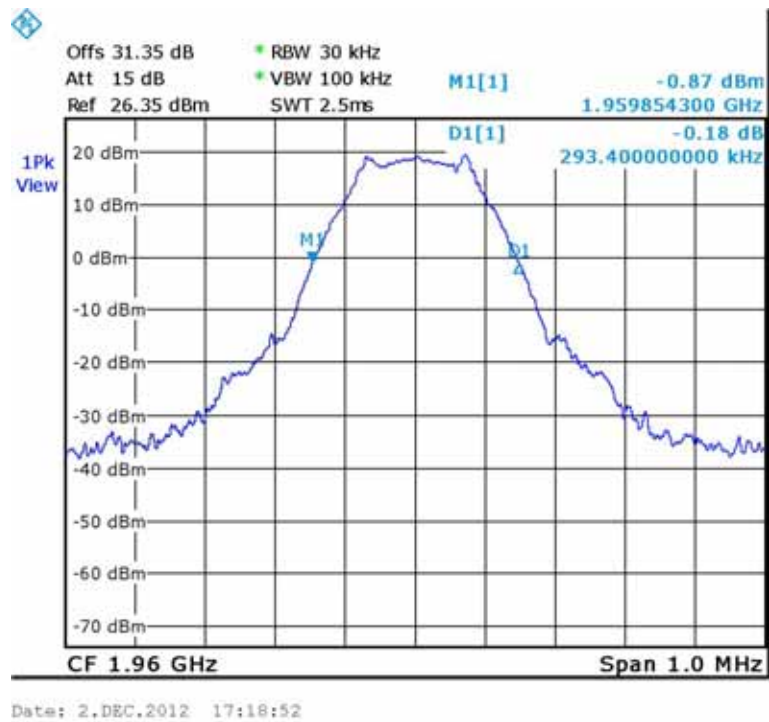


Figure 162.— Output 1960.00 MHz

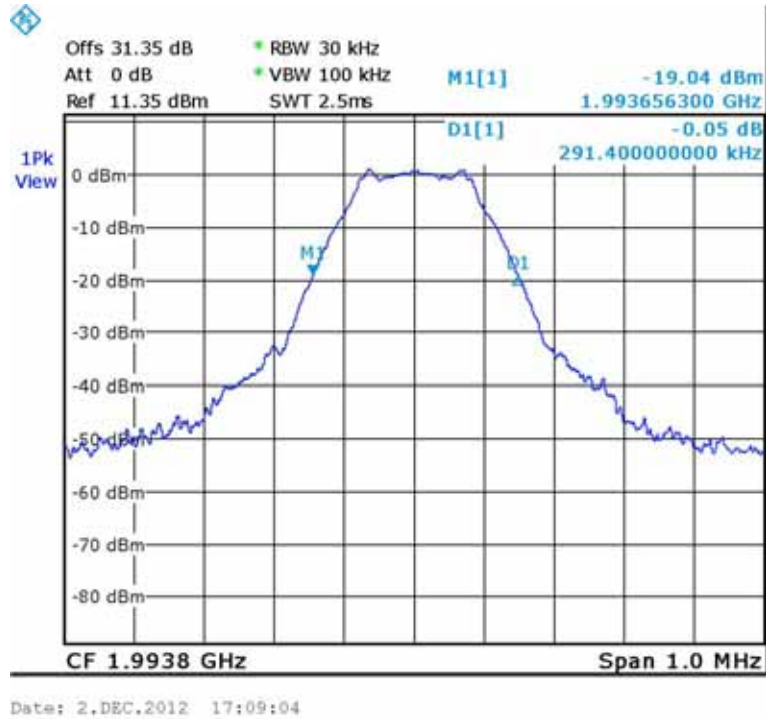


Figure 163.— Input 1993.80 MHz

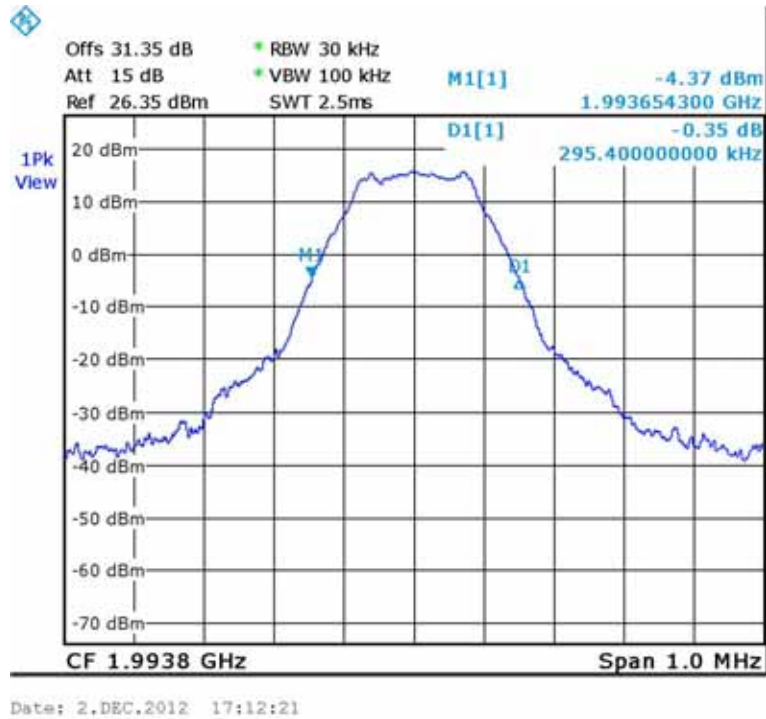


Figure 164.— Output 1993.80 MHz



W-CDMA:

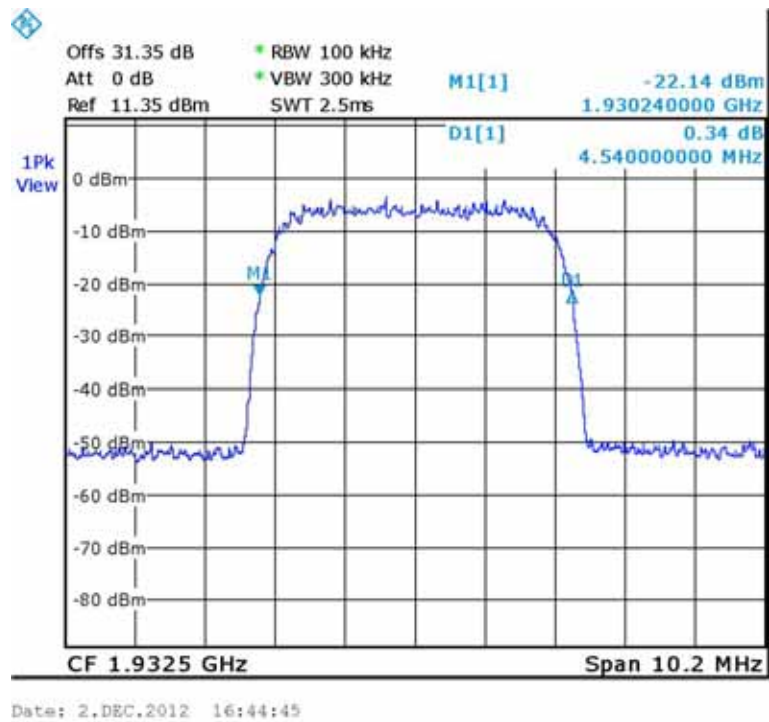


Figure 165.— Input 1932.50 MHz

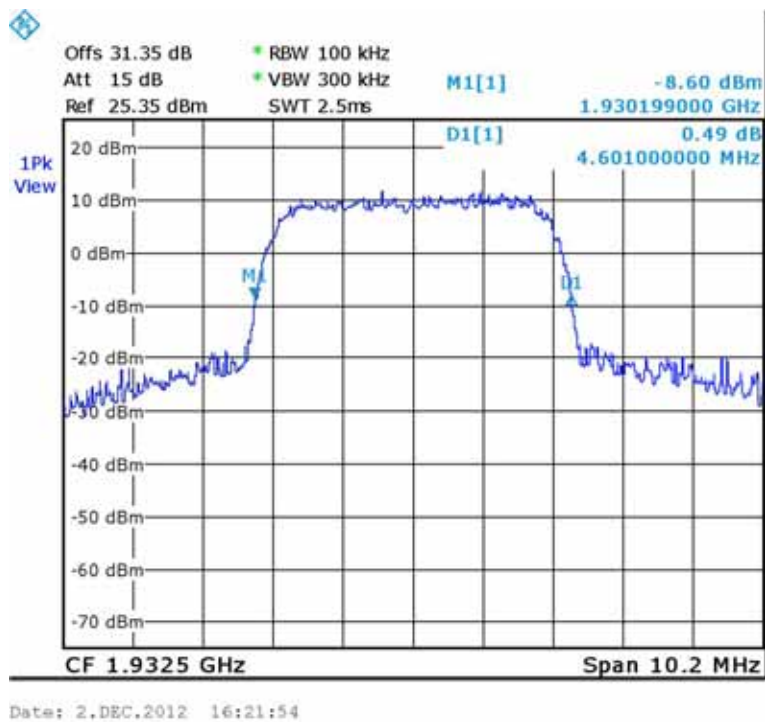


Figure 166.— Output 1932.50 MHz

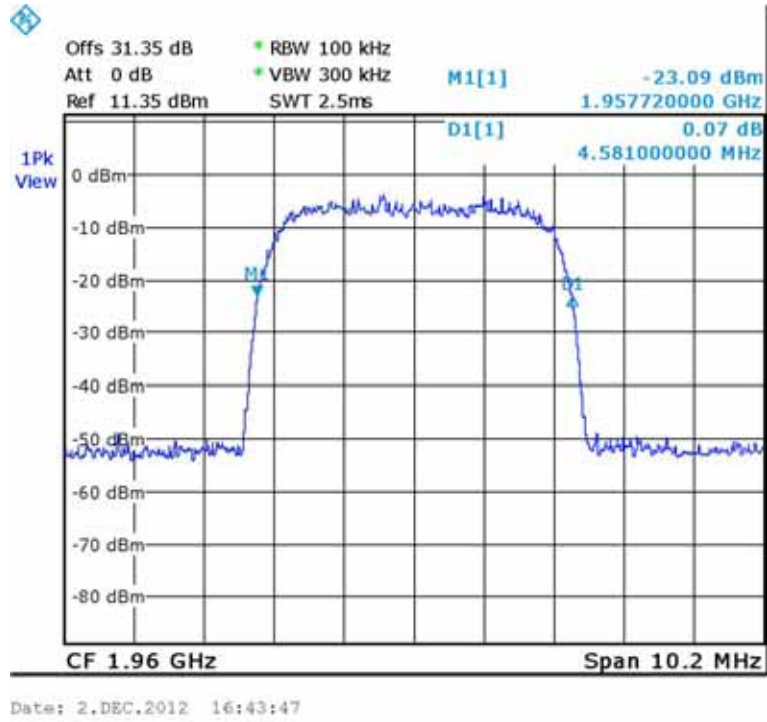


Figure 167.— Input 1960.00 MHz

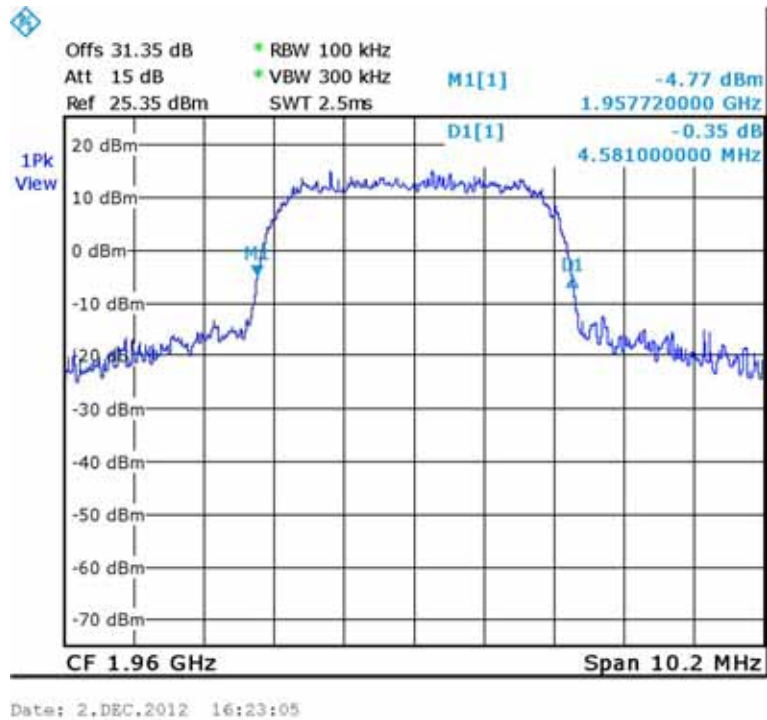


Figure 168.— Output 1960.00 MHz

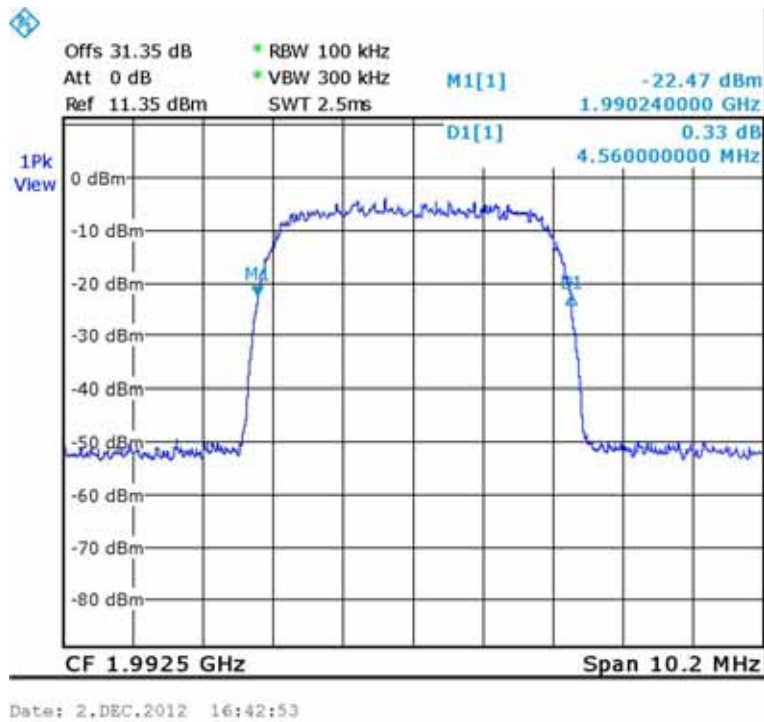


Figure 169.— Input 1992.50 MHz

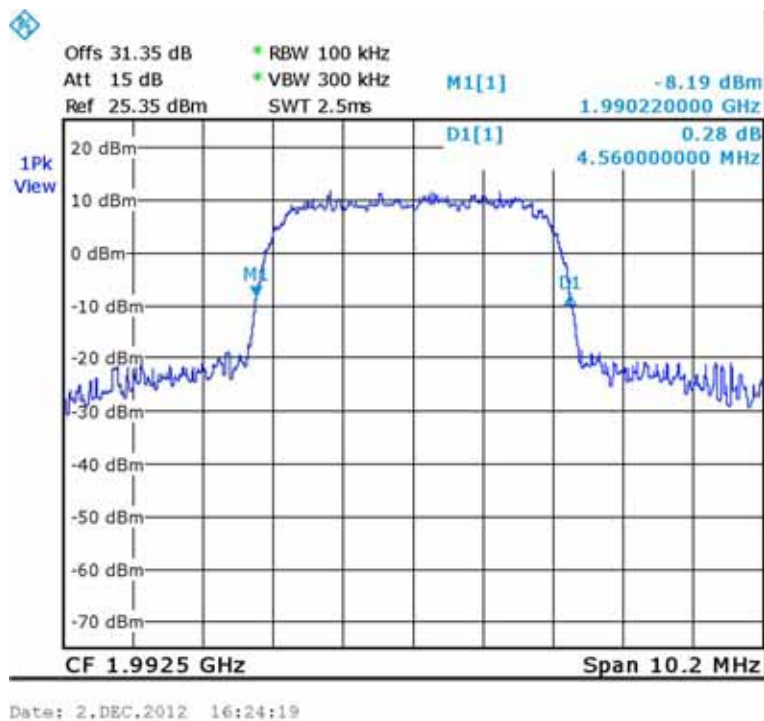


Figure 170.— Output 1992.50 MHz



10.4 Test Equipment Used

Occupied Bandwidth PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 171 Test Equipment Used



11. Out of Band Emissions at Antenna Terminals PCS

11.1 Test Specification

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

11.2 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 (31.35 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10 kHz for the frequency range 150 kHz–1.0 MHz, 100 kHz for the frequency range 1.0 MHz – 30 MHz, and 1MHz for the frequency range 30 MHz - 20.0 GHz. Signal power was +10 dBm to EUT.

11.3 Test Results

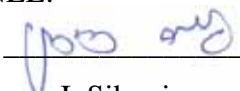
Modulation	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE	1935.00	-18.32	-13.0	-5.32
	1962.50	-21.82	-13.0	-8.82
	1990.00	-24.98	-13.0	-11.98
GSM	1931.20	-22.98	-13.0	-9.98
	1960.00	-22.48	-13.0	-9.48
	1993.80	-19.32	-13.0	-6.32
W-CDMA	1932.50	-24.15	-13.0	-11.15
	1960.00	-24.15	-13.0	-11.15
	1992.50	-25.65	-13.0	-12.65

Figure 172 Out of Band Emission Results PCS

See additional information in Figure 173 to Figure 235

JUDGEMENT: Passed by 5.32 dB

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: I. Siboni



LTE:

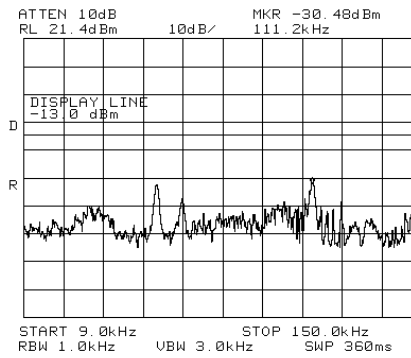


Figure 173.— 1935.00 MHz

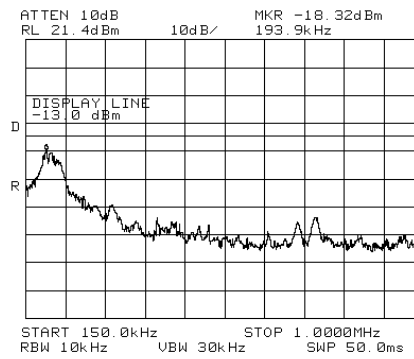


Figure 174.— 1935.00 MHz

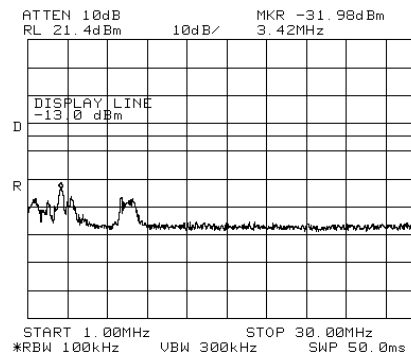




Figure 175.— 1935.00 MHz

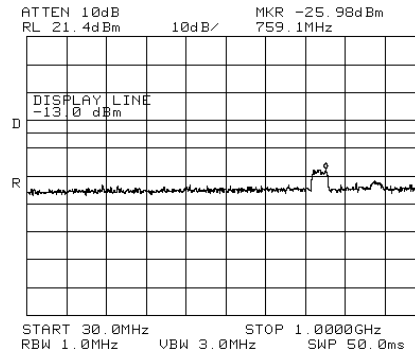


Figure 176.— 1935.00 MHz

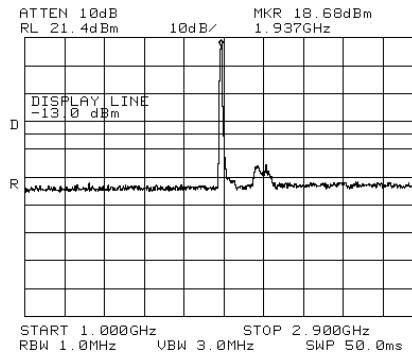




Figure 179.— 1935.00 MHz

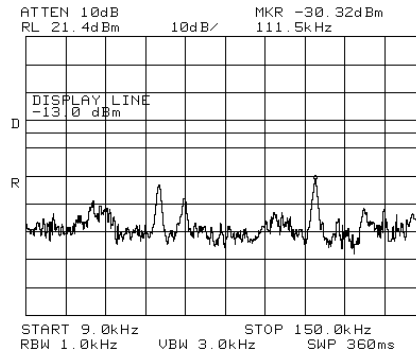


Figure 180.— 1962.50 MHz

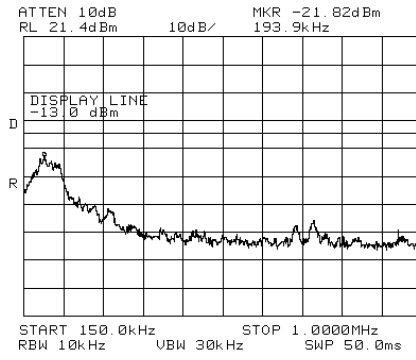


Figure 181.— 1962.50 MHz

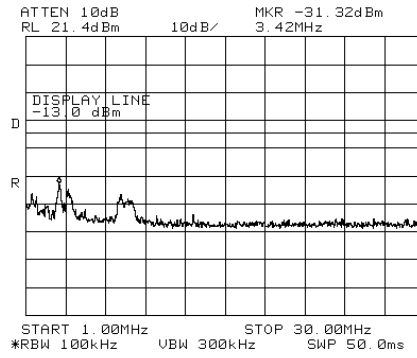


Figure 182.— 1962.50 MHz

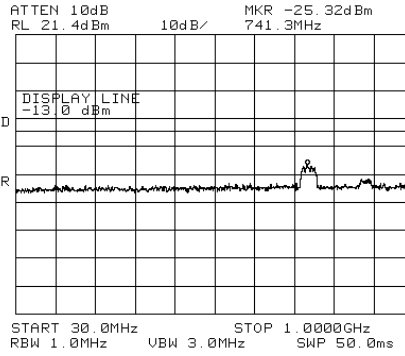


Figure 183.— 1962.50 MHz

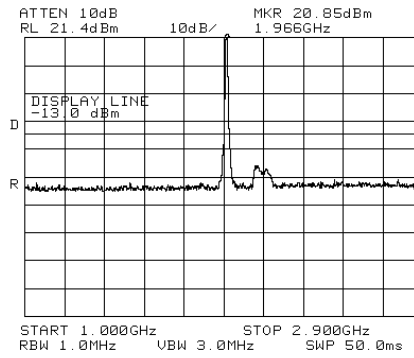


Figure 184.— 1962.50 MHz

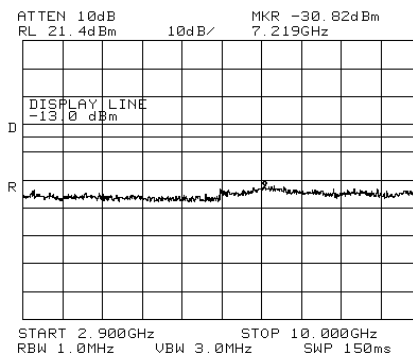




Figure 185.— 1962.50 MHz

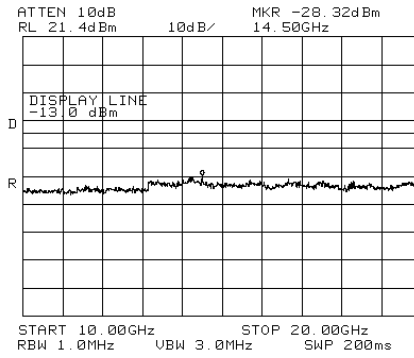


Figure 186.— 1962.50 MHz

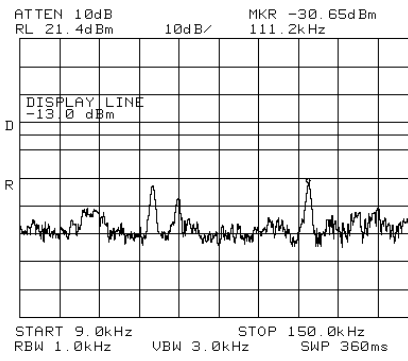


Figure 187.— 1990.00 MHz

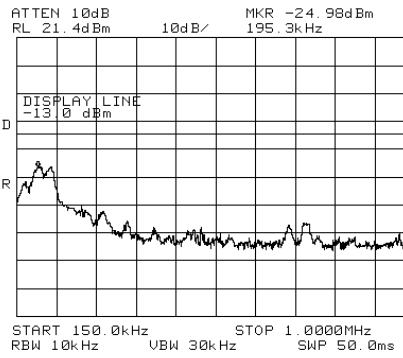


Figure 188.— 1990.00 MHz

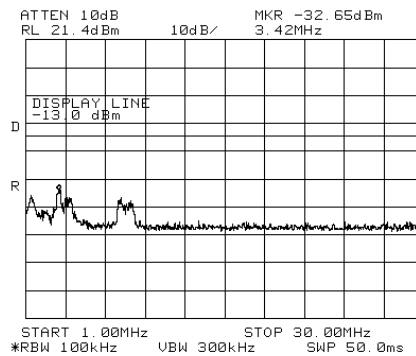




Figure 189.— 1990.00 MHz

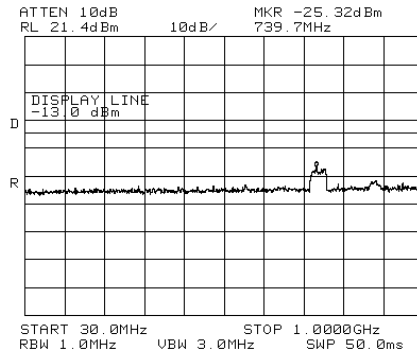


Figure 190.— 1990.00 MHz

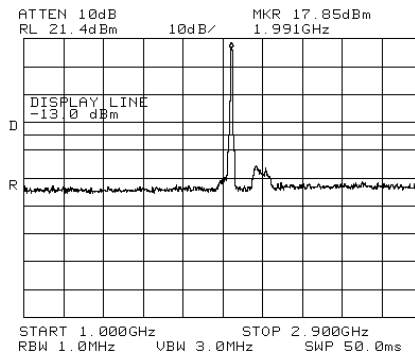


Figure 191.— 1990.00 MHz

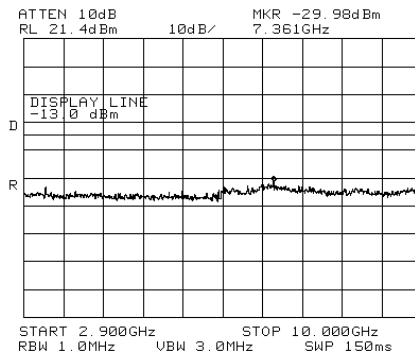


Figure 192.— 1990.00 MHz

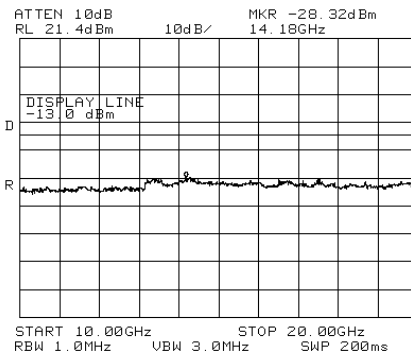


Figure 193.— 1990.00 MHz

GSM:

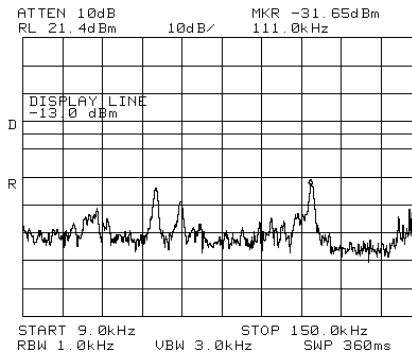


Figure 194.— 1931.20 MHz

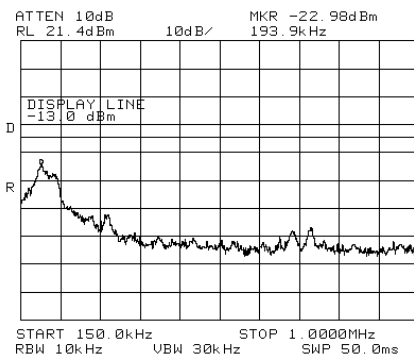


Figure 195.— 1931.20 MHz

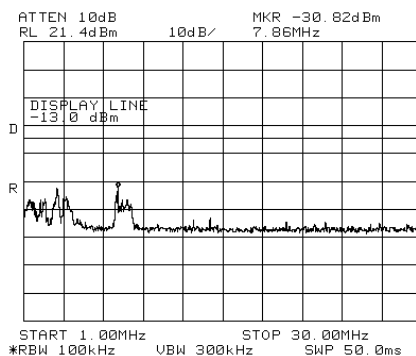


Figure 196.— 1931.20 MHz

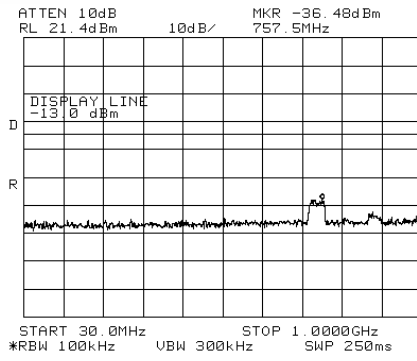


Figure 197.— 1931.20 MHz

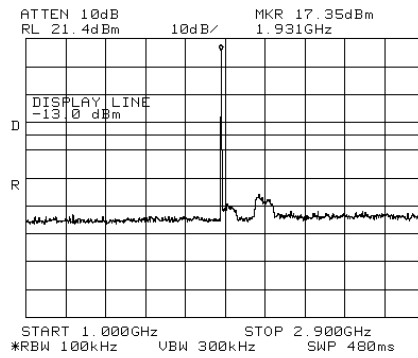


Figure 198.— 1931.20 MHz

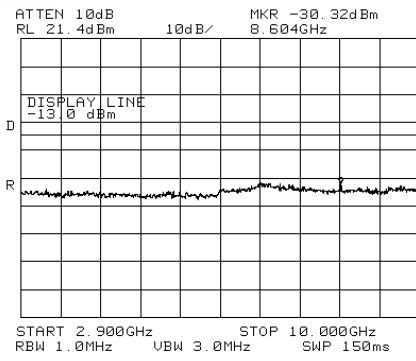


Figure 199.— 1931.20 MHz

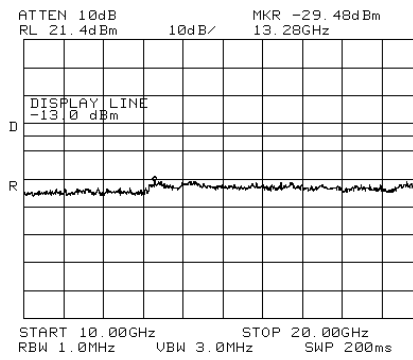


Figure 200.— 1931.20 MHz

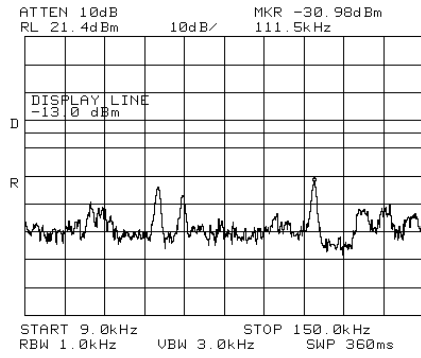


Figure 201.— 1960.00 MHz

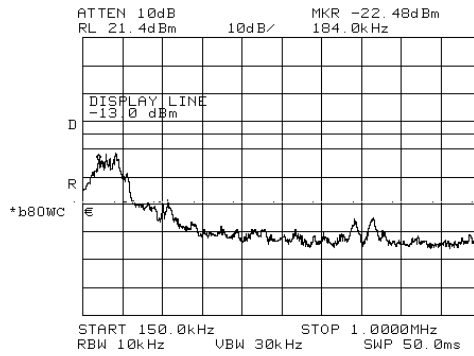


Figure 202.— 1960.00 MHz

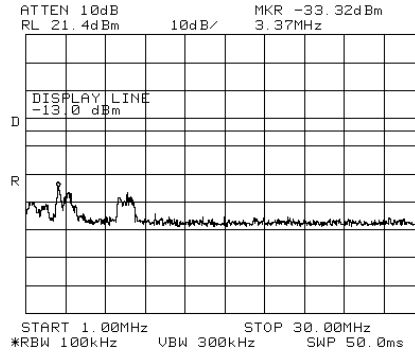


Figure 203.— 1960.00 MHz

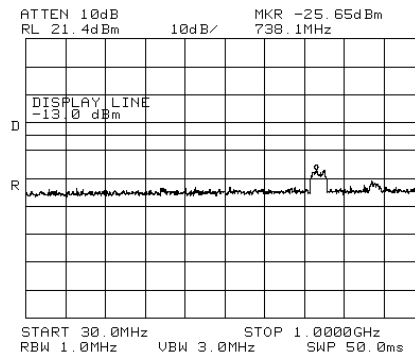


Figure 204.— 1960.00 MHz

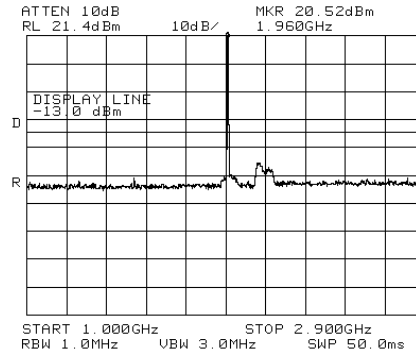


Figure 205.— 1960.00 MHz

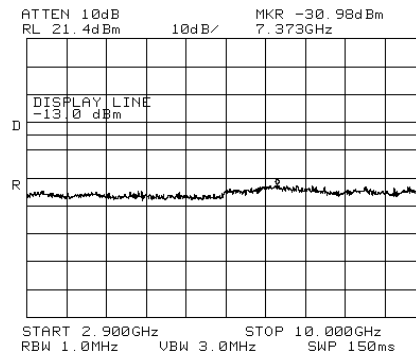


Figure 206.— 1960.00 MHz

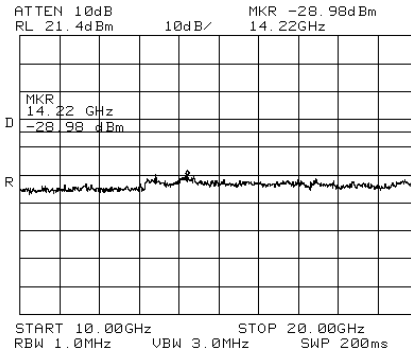


Figure 207.— 1960.00 MHz

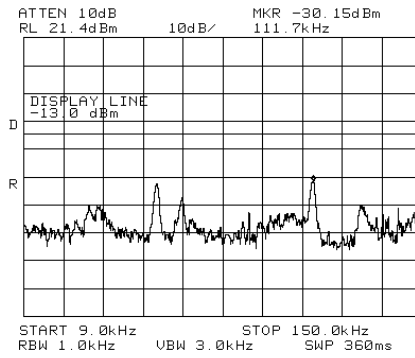


Figure 208.— 1993.80 MHz

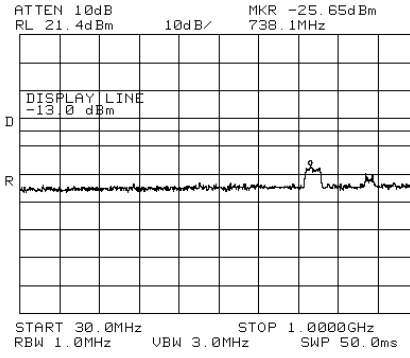


Figure 211.— 1993.80 MHz

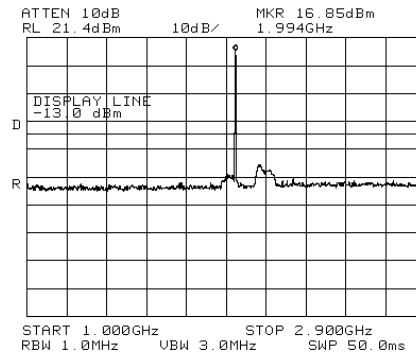


Figure 212.— 1993.80 MHz

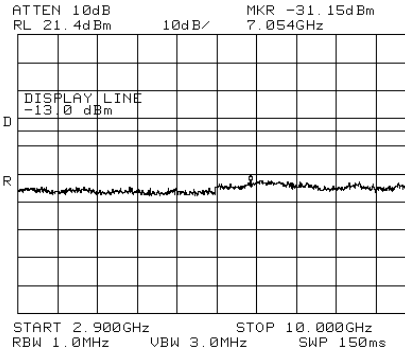


Figure 213.— 1993.80 MHz

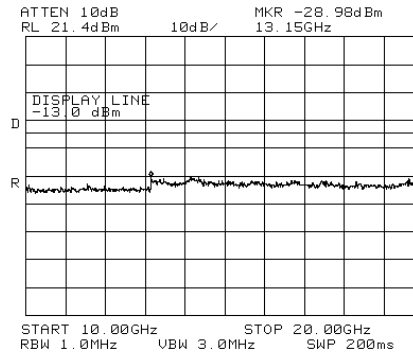


Figure 214.— 1993.80 MHz



W-CDMA:

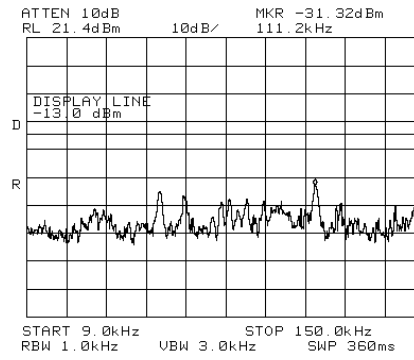


Figure 215.— 1932.50 MHz

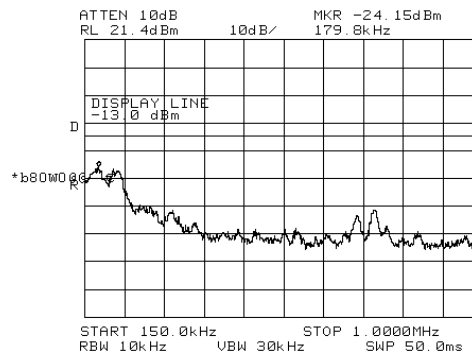


Figure 216.— 1932.50 MHz

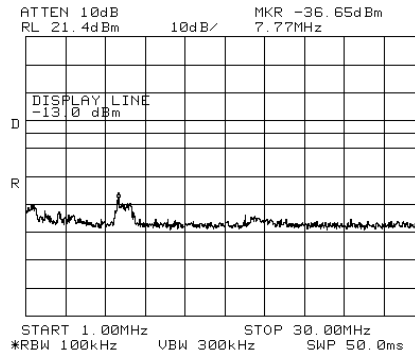


Figure 217.— 1932.50 MHz

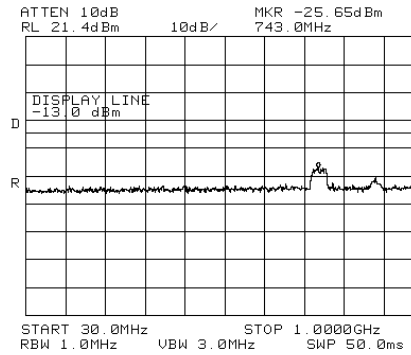


Figure 218.— 1932.50 MHz

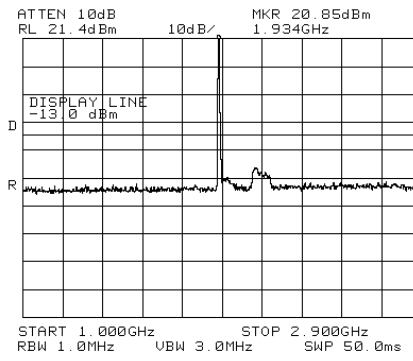


Figure 219.— 1932.50 MHz

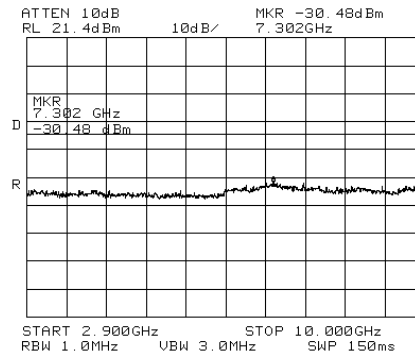


Figure 220.— 1932.50 MHz

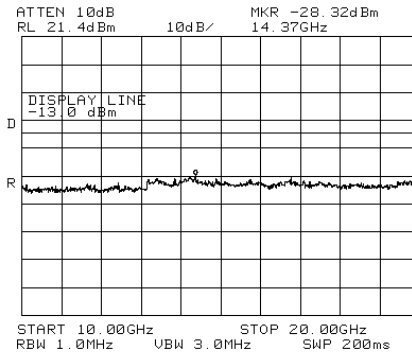


Figure 221.— 1932.50 MHz

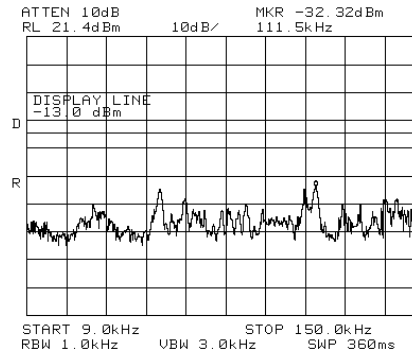


Figure 222.— 1960.00 MHz

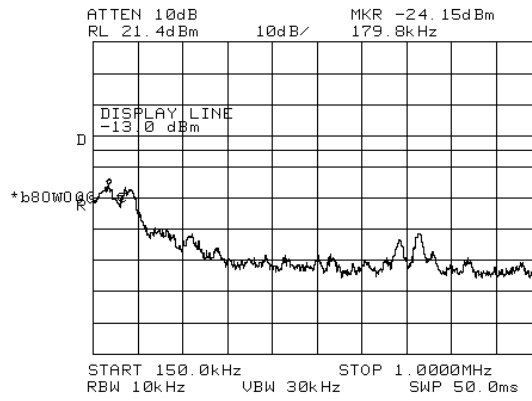


Figure 223.— 1960.00 MHz

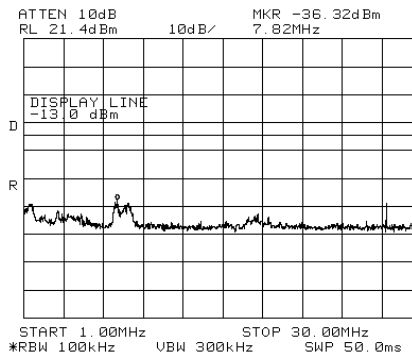


Figure 224.— 1960.00 MHz

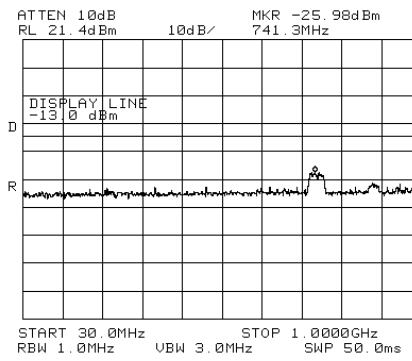


Figure 225.— 1960.00 MHz

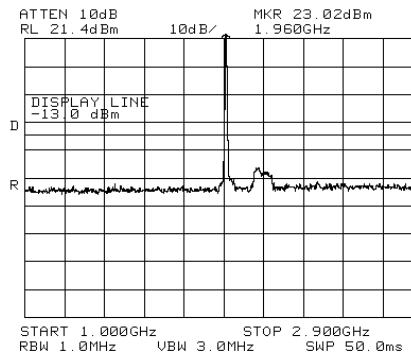


Figure 226.— 1960.00 MHz

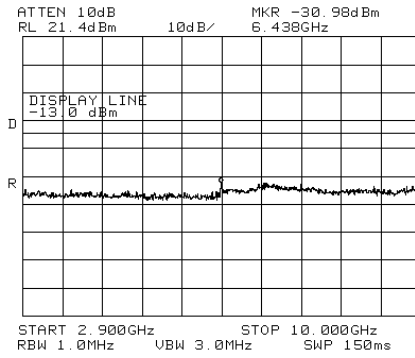


Figure 227.— 1960.00 MHz

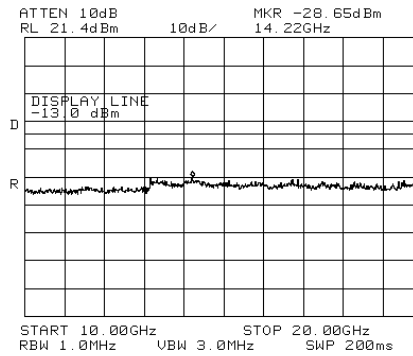


Figure 228.— 1960.00 MHz

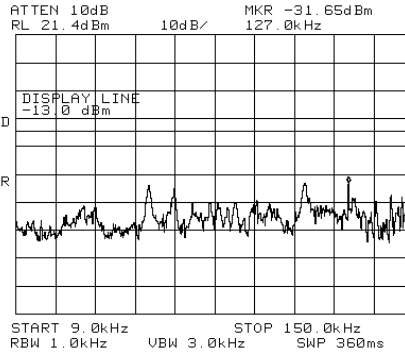


Figure 229.— 1992.50 MHz

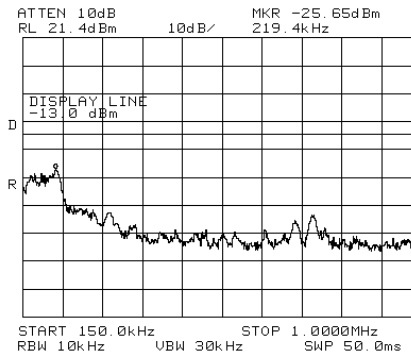


Figure 230.— 1992.50 MHz

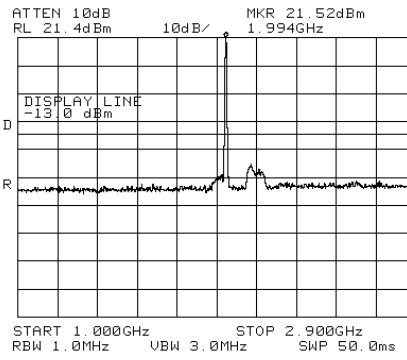


Figure 233.— 1992.50 MHz

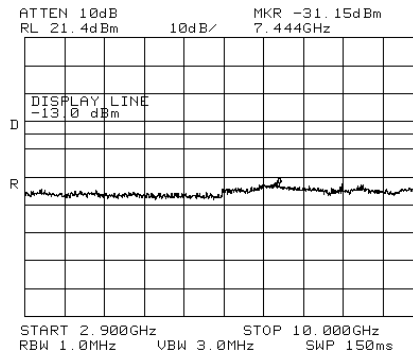


Figure 234.— 1992.50 MHz

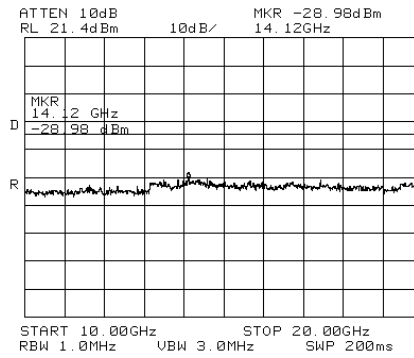


Figure 235.— 1992.50 MHz

11.4 Test Equipment Used.

Out of Band Emission at Antenna Terminals PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	January 19, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 236 Test Equipment Used



12. Band Edge Spectrum PCS

12.1 *Test Specification*

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

12.2 *Test procedure*

For LTE 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 (31.5 dB).

The spectrum analyzer was set to 100 kHz R.B.W.



12.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE 64QAM	1935.00	1930.00	-18.76	-13.0	-5.73
	1990.00	1995.00	-19.83	-13.0	-6.83
LTE 16QAM	1935.00	1930.00	-20.29	-13.0	-7.29
	1990.00	1995.00	-18.50	-13.0	-5.50
LTE QPSK	1935.00	1930.00	-20.60	-13.0	-7.60
	1990.00	1995.00	-21.11	-13.0	-8.11
GSM	1931.20	1930.00	-29.70	-13.0	-16.70
	1993.80	1995.00	-26.38	-13.0	-13.38
W-CDMA	1932.50	1930.00	-23.10	-13.0	-10.10
	1992.50	1995.00	-22.57	-13.0	-9.57

Figure 237 Band Edge Spectrum Results PCS

See additional information in Figure 238 to Figure 247.

JUDGEMENT: Passed by 5.50 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 20.01.13

Typed/Printed Name: A. Sharabi



W-CDMA:

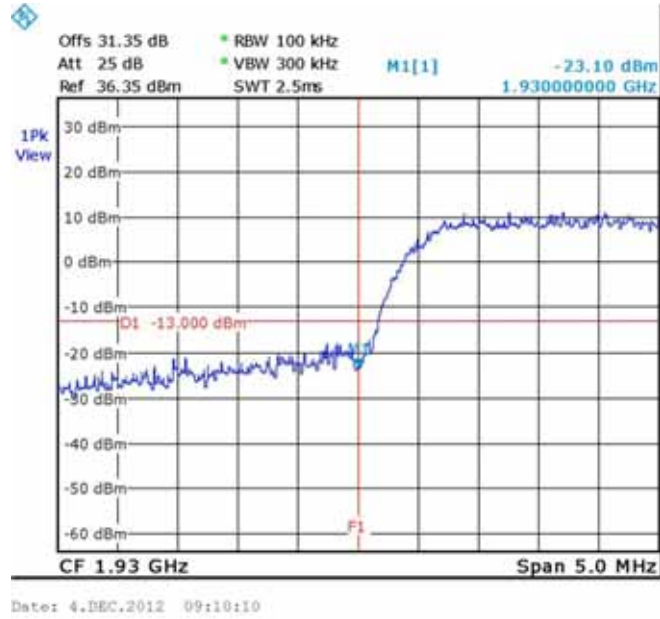


Figure 246.— 1932.50 MHz

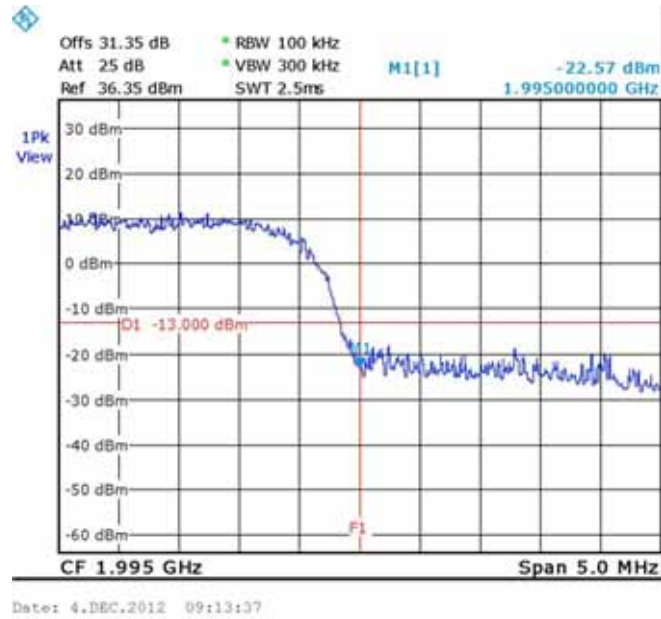


Figure 247.— 1992.50 MHz



12.4 Test Equipment Used.

Band Edge Spectrum PCS

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	November 1, 2012	1 year
Signal Generator	Agilent	N5172B ATO 10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603- 5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624- 10-NNN-02	-	N/A	N/A

Figure 248 Test Equipment Used



13. Out of Band Emissions (Radiated) PCS

13.1 Test Specification

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

13.2 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 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:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dB)}$$

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.




13.3 Results Table

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
1931.20	3862.40	V	66.4	-28.9	10.2	8.7	-30.4	-13.0	-17.4
1931.20	3862.40	H	66.1	-30.8	10.2	9.8	-31.2	-13.0	-18.2
1960.00	3920.00	V	68.3	-27.0	10.2	8.7	-28.5	-13.0	-15.5
1960.00	3920.00	H	70.2	-26.7	10.2	9.8	-27.1	-13.0	-14.1
1993.80	3987.60	V	70.0	-25.7	11.2	9.5	-27.4	-13.0	-14.4
1993.80	3987.60	H	70.7	-25.5	11.2	8.6	-28.1	-13.0	-15.1

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

TEST PERSONNEL:

Tester Signature: 

Date: 20.01.13

Typed/Printed Name: I. Siboni



13.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	Rohde & Schwarz	1066.301	100120	November 1, 2012	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2012	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2012	1 year
Antenna Bioconilog	EMCO	3142B	1250	July 7, 2012	1 year
Horn	EMCO	3115	6142	March 14, 2012	2 year
Horn	ARA	SWH-28	1007	January 26, 2011	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2012	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2012	1 year
Signal Generator	Agilent	N5172B ATO10210	MY51350182	May 31, 2012	2 years
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

14. Intermodulation Conducted

14.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (loss = 31.35 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10kHz for the frequency range 150kHz-1.0MHz, 100kHz for the frequency range 1.0MHz-30MHz, 1MHz for the frequency range 30MHz-22GHz, .

3 input signals were sent simultaneously to the E.U.T. as follows:

CELL 811 MHz GSM 0 dBm

PCS 1960 MHz CW 0 dBm

The frequency range of 9 kHz – 22.0GHz was scanned for unwanted signals.

14.2 Test Results

Judgement: Passed

TEST PERSONNEL:

Tester Signature:  Date: 20.01.13

Typed/Printed Name: I. Siboni

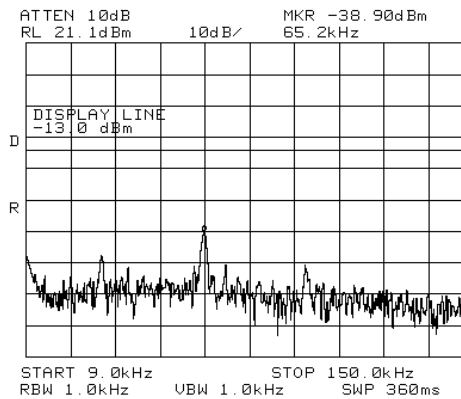


Figure 249 Intermodulation

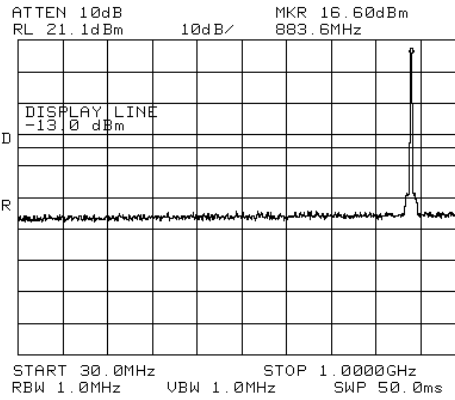


Figure 252 Intermodulation

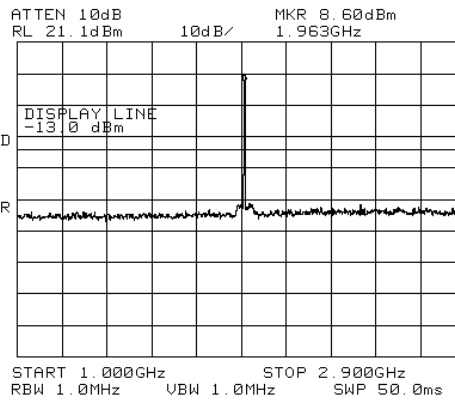


Figure 253 Intermodulation



14.3 Test Equipment Used.

Intermodulation Conducted

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8564E	3442A00275	January 19, 2012	1 year
Signal Generator	HP	8657A	3430U02142	February 20, 2011	2 years
Signal Generator	HP	8648C	3623A04126	February 28, 2012	1 year
Signal Generator	Agilent	N5172B ATO-10210	MY51350182	May 31, 2012	2 years
Attenuator	Bird	8304-N20DB	-	August 14, 2012	1 year
Cable	Avnet MTS	P-3636-603-5236	-	August 28, 2012	1 year
DC Block	MIDWEST MICROWAVE	DCDB-3624-10-NNN-02	-	N/A	N/A

Figure 256 Test Equipment Used



15. Intermodulation Radiated

15.1 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; 1930-1960 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 2.

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, 0.8 meters above the ground. The configuration tested is shown in Figure 1.

The E.U.T. was operated in Downlink mode at 4 different channels at center frequency of each band at the same time, transmitting at CW signal.

- (b) The frequency range 9 kHz-25 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:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dB)}$$

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.

15.2 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 20.01.13

Typed/Printed Name: I. Siboni



Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dB μ V/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
2*747+881	2375.00	V	63.4	-32.1	9.0	7.7	-33.4	-13.0	-20.4
2*747+881	2375.00	H	63.5	-33.6	9.0	8.5	-34.1	-13.0	-21.1
2*747-881	613.00	V	35.9	-59.7	4.2	1.6	-62.3	-13.0	-46.3
2*747-881	613.00	H	38.4	-58.9	4.2	1.6	-61.6	-13.0	-48.6
2*1960-2135	1785.00	V	60.7	-36.7	6.7	7.6	-35.8	-13.0	-22.8
2*1960-2135	1785.00	H	60.8	-37.4	6.7	8.0	-36.1	-13.0	-23.1



15.3 Test Instrumentation Used, Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	Rohde & Schwarz	1066.301	100120	November 1, 2012	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2012	1 year
Active Loop Antenna	Emco	6502	2950	October 19, 2012	1 year
Antenna Bioconilog	EMCO	3142B	1250	July 7, 2012	1 year
Horn	EMCO	3115	6142	March 14, 2012	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2012	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2012	1 year
Signal Generator	HP	8657A	3430U02142	February 20, 2011	2 years
Signal Generator	HP	8672A	2352A03681	February 28, 2012	1 year
Signal Generator	HP	8648C	3623A04126	February 28, 2012	1 year
Signal Generator	Agilent	N5172B ATO-10210	MY51350182	May 31, 2012	2 years
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 257 Test Equipment Used



16. APPENDIX A - CORRECTION FACTORS

16.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FRQ	S.G.	REF	A AMP		FRQ	S.G.	REF	A	
								AMP	
10K	-30	-29.8	-30.2	0.4	50M	-30	-30.5	-31.7	1.2
15K	-30	-29.5	-29.7	0.2	100M	-30	-30.5	-32.2	0.7
20K	-30	-29.7	-29.9	0.2	150M	-30	-30.4	-32.5	2.1
30K	-30	-29.6	-29.9	0.3	200M	-30	-30.5	-32.8	2.3
50K	-30	-29.7	-30.0	0.3	300M	-30	-30.4	-33.3	2.9
75K	-30	-29.7	-30.0	0.3	500M	-30	-30.5	-34.3	3.8
100K	-30	-29.8	-30.0	0.2	750M	-30	-30.7	-35.3	4.8
150K	-30	-29.8	-30.0	0.2	1G	-30	-30.9	-36.3	5.4
200K	-30	-29.9	-30.2	0.3	1.5G	-15	-15.7	-22.4	6.7
500K	-30	-29.9	-30.3	0.4	2G	-15	-15.9	-24.9	9.0
1M	-30	-30.1	-30.5	0.4	2.5G	-15	-16.3	-25.7	9.4
1.5M	-30	-30.1	-30.6	0.5	3G	-15	-16.5	-26.4	9.9
2M	-30	-30.2	-30.7	0.5	3.5G	-15	-16.7	-26.9	10.2
5M	-30	-30.3	-30.9	0.6	4G	-15	-16.3	-27.5	11.2
10M	-30	-30.2	-31.0	0.8	4.5G	-15	-16.6	-28.7	12.1
15M	-30	-30.2	-31.1	0.9	5G	-15	-16.8	-29.9	13.1
20M	-30	-30.5	-31.3	0.8	5.5G	-15	-17.6	-31.1	13.5
					6G	-15	-17.2	-31.7	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long
2. The cable is manufactured by Huber + Suhner



16.2 Correction factors for Bilog ANTENNA

Model: 3142

Antenna serial number: 1250

3 meter range

FREQUENCY	APE	FREQUENCY	APE
(MHz)	(dB/m)	(MHz)	(dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
500	18.6		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		



16.3 Correction factors for Horn ANTENNA

Model: 3115
Antenna serial number: 6142
3 meter range

FREQUENCY	Antenna Factor	FREQUENCY	Antenna Factor
(MHz)	(dB/m)	(MHz)	(dB/m)
1000	23.9	10500	38.4
1500	25.4	11000	38.5
2000	27.3	11500	39.4
2500	28.5	12000	39.2
3000	30.4	12500	39.4
3500	31.6	13000	40.7
4000	33	14000	42.1
4500	32.7	15000	40.1
5000	34.1	16000	38.2
5500	34.5	17000	41.7
6000	34.9	17500	45.7
6500	35.1	18000	47.7
7000	35.9		
7500	37.5		
8000	37.6		
8500	38.3		
9000	38.5		
9500	38.1		
10000	38.6		



16.1 Correction factors for Horn ANTENNA

Model: SWH-28
Antenna serial number: 1007
1 meter range

FREQUENCY	Antenna Factor
(MHz)	(dB/m)
18000	33.0
18500	32.9
19000	33.1
19500	33.3
20000	33.6
20500	33.6
21000	33.4
21500	33.8
22000	33.7
22500	33.9
23000	34.8
23500	34.5
24000	34.2
24500	34.8
25000	34.4
25500	35.2
26000	35.9
26500	36.0



16.2 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