ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

ACCREDITED
TESTING Cert No.1152.01

DATE: 17 January 2013

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

FCC Radio Test Report

for

Corning MobileAccess

Equipment under test:

QX Remote Unit

QX CELL-PCS-LTE-AWS AC
(LTE/AWS Section)

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
I. Siboni, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for
Corning MobileAccess

QX Remote Unit

QX CELL-PCS-LTE-AWS AC

FCC ID: OJFQXC85P19L70A17

This report concerns:	Original Grant: X
	Class II change:
	Class I change:
Equipment type:	PCS Licensed Transmitter

Limits used:
47CFR Parts 2; 27

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

Application for Certification prepared by:

Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail sraz@itl.co.il

Applicant for this device: (different from "prepared by")

Steve Blum
Corning MobileAccess
8391 Old Courthouse Rd., Suite #300
Vienna, VA. 22182
U.S.A.
Tel: +1-541-758-2880
Fax: +1-703-848-0260
e-mail: sblum@mobileaccess.com

TABLE OF CONTENTS

1. General Information

1.1 Administrative Information

Manufacturer:	Corning MobileAccess
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-LTE-AWS 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 2; 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 reconversion 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

Radiated testing was 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

The 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

Radiated Emission

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, 1meter from the tests antenna, which was 1 m high.

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

Frequency (MHz)	**AC Configuration (dBµV/m)**	**DC Configuration (dBµV/m)**
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 buil 00 (for RHU).
BU Embedded SW version 5.2 build 00

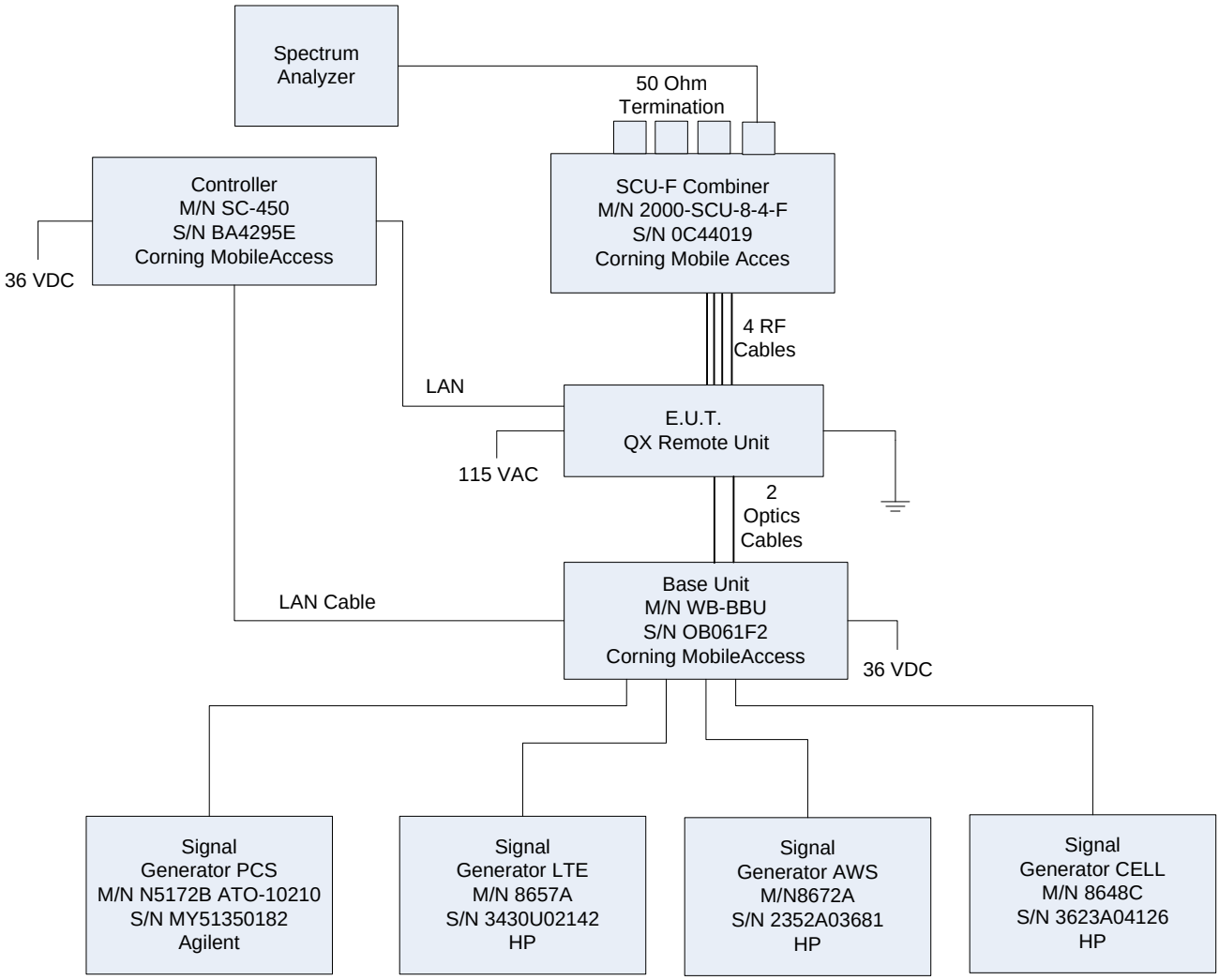
2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary 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. Four 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. Test Set-up

3. Test Set-up Photos

Figure 2. Conducted Emission From Antenna Port Tests

Figure 3. Radiated Emission Test

4. RF Power Output LTE

4.1 Test Specification

FCC Part 27, Subpart C (27.50)

4.2 Test procedure

Peak Power Output must not exceed 1000W. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (31.5 dB) and an appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

4.3 Test Results

	Operation Frequency (MHz)	Reading (dBm)
LTE 64QAM	733	29.99
LTE 64QAM	747	28.82
LTE 64QAM	753	29.41
LTE 16QAM	733	27.55
LTE 16QAM	747	28.74
LTE 16QAM	753	29.20
LTE QPSK	733	28.30
LTE QPSK	747	28.05
LTE QPSK	753	28.52

Figure 4 RF Power Output LTE

See additional information in Figure 5 to Figure 13.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: A. Sharabi

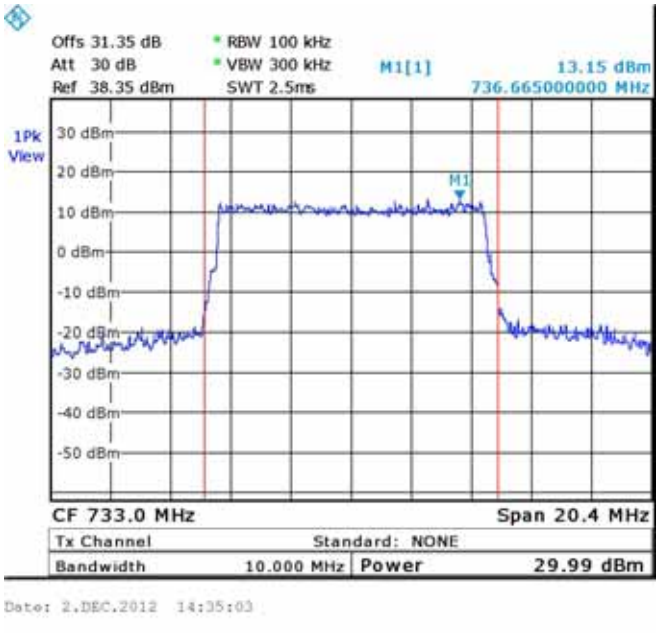


Figure 5.— 64QAM, 733 MHz

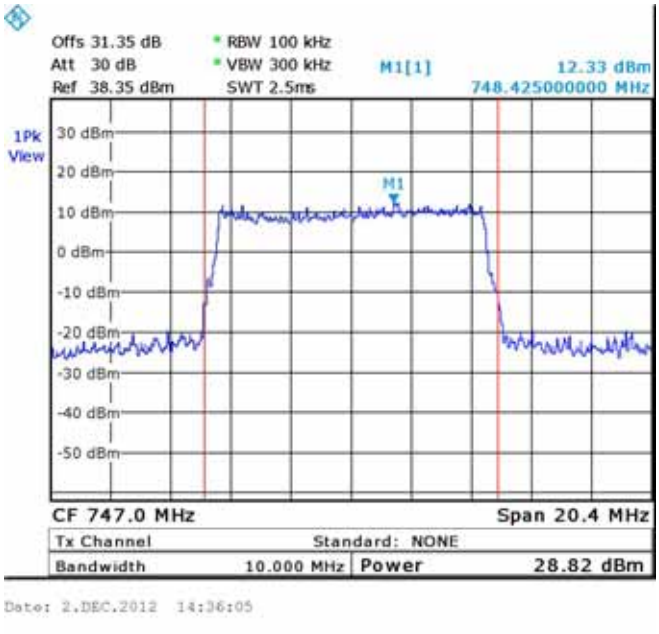


Figure 6.— 64QAM 747 MHz

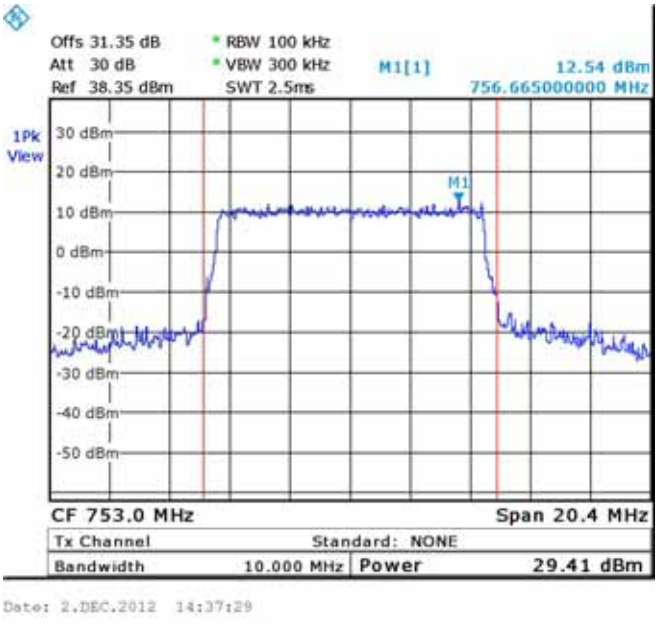


Figure 7.— 64QAM 753 MHz

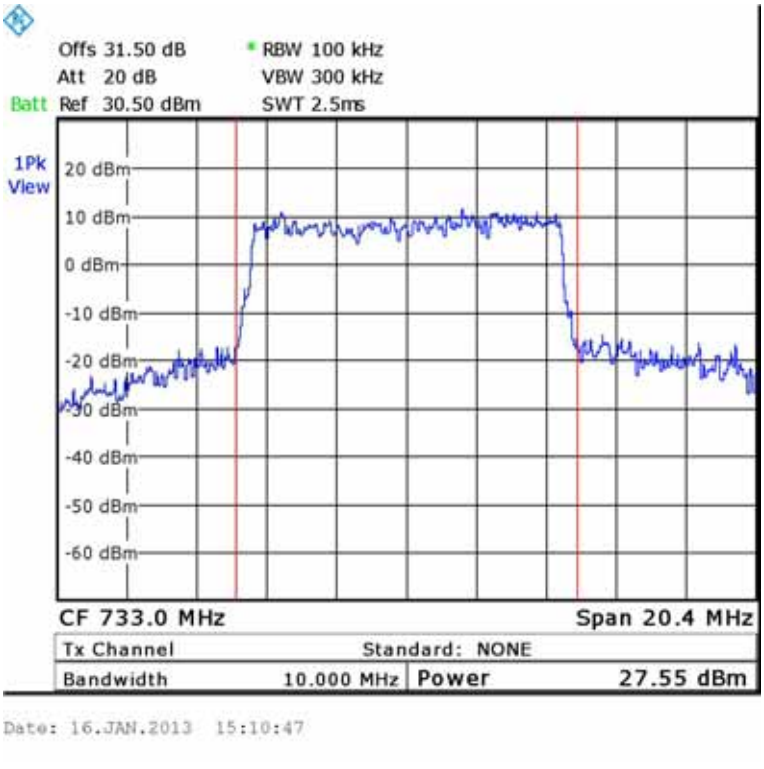


Figure 8.— 16QAM 733 MHz

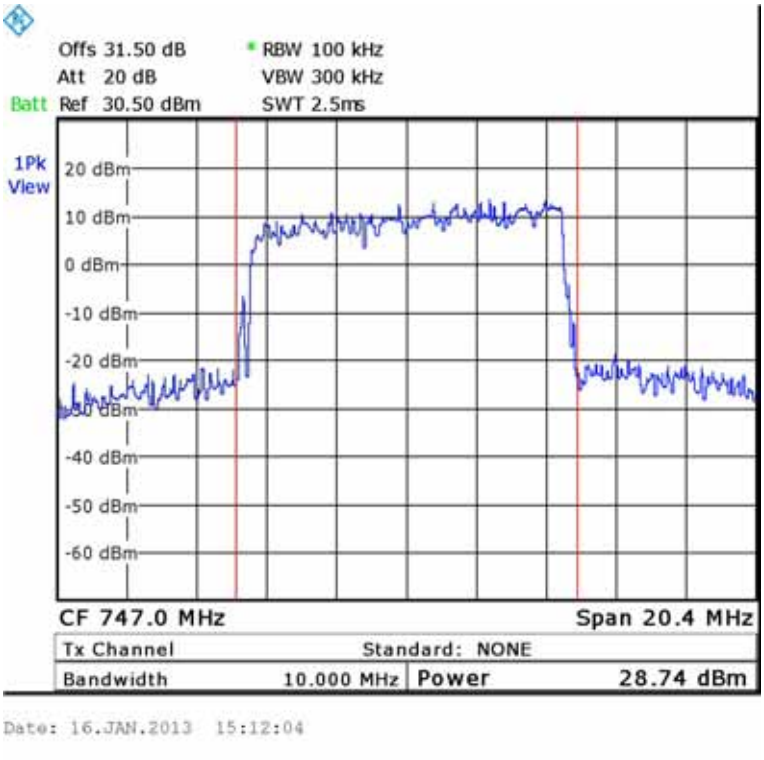


Figure 9.— 16QAM 747 MHz

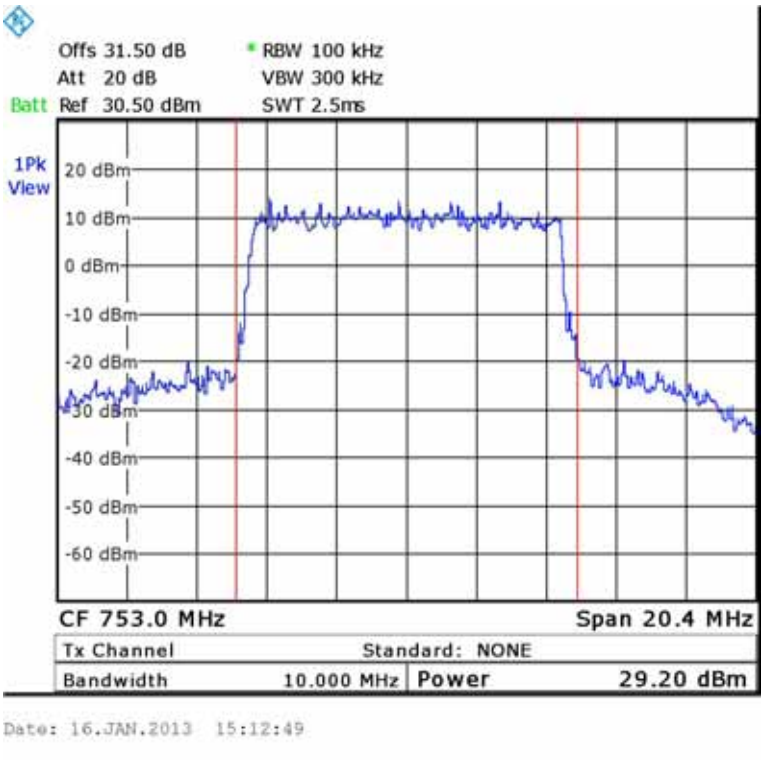


Figure 10.— 16QAM 753 MHz

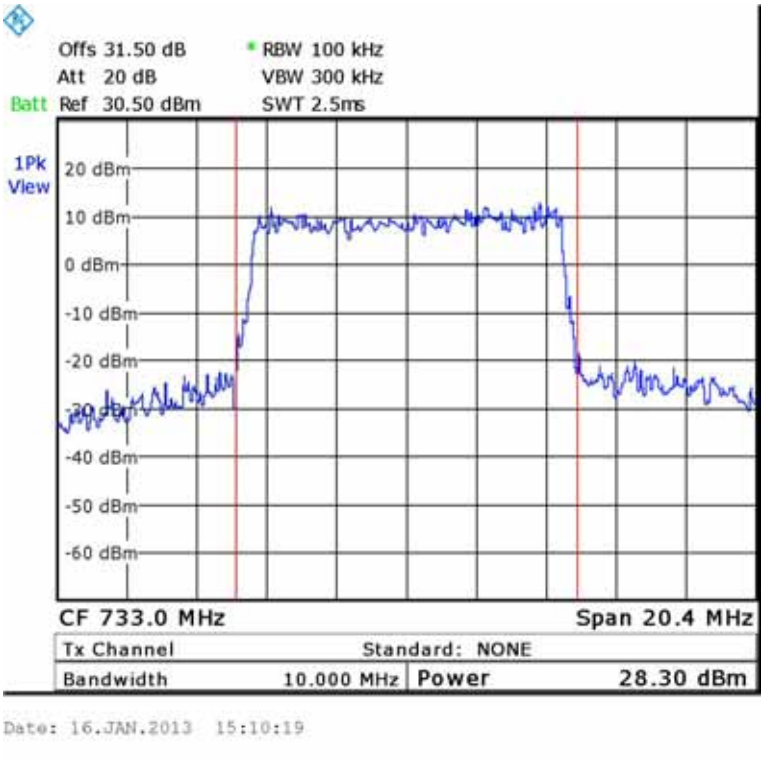


Figure 11.— QPSK 733 MHz

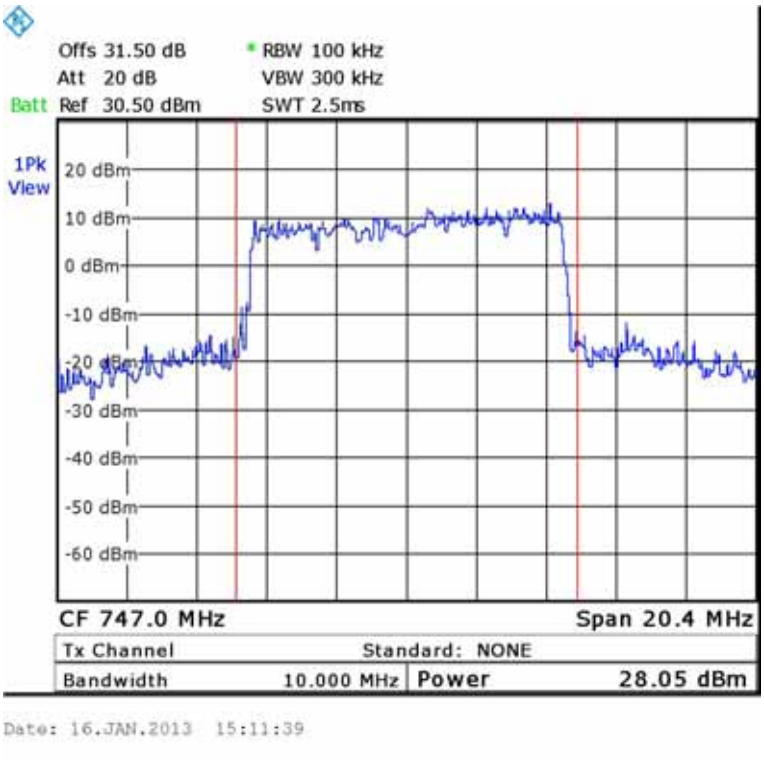


Figure 12.— QPSK 747 MHz

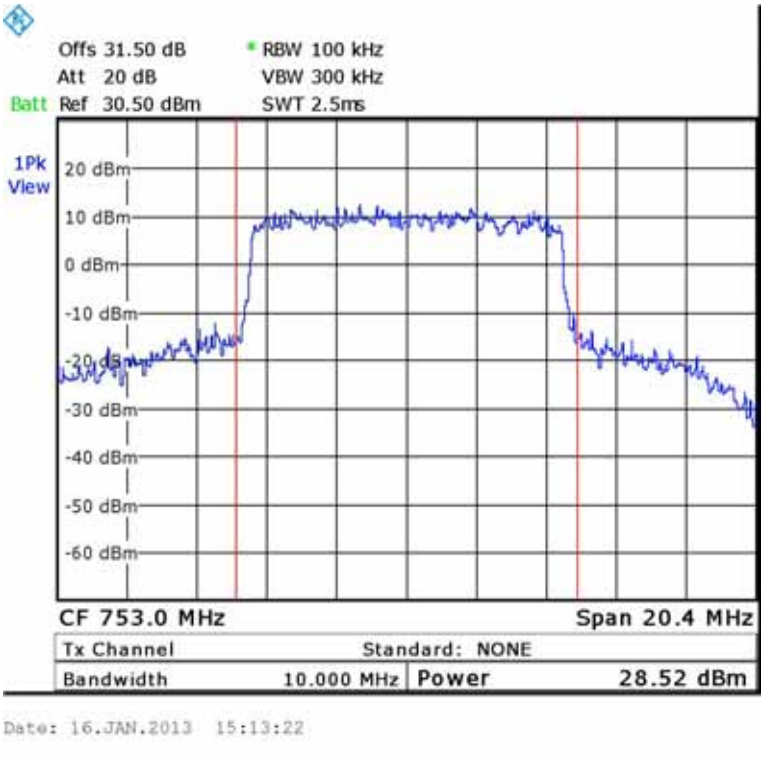


Figure 13.— QPSK 753 MHz

4.4 Test Equipment Used.

RF Power Output LTE

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 14 Test Equipment Used

5. Occupied Bandwidth LTE

5.1 Test Specification

FCC Part 2, Section 1049

5.2 Test Procedure

The E.U.T. was set to the applicable test frequency in the 728-757 MHz band. 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 (31.35 dB). The spectrum analyzer was set to proper 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.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

5.3 Test Results

		Operating Frequency (MHz)	Reading (MHz)
LTE 64QAM	Input	733	9.641
LTE 64QAM	Output	733	9.641
LTE 64QAM	Input	747	9.611
LTE 64QAM	Output	747	9.461
LTE 64QAM	Input	753	9.569
LTE 64QAM	Output	753	9.479
LTE 16QAM	Input	733	9.301
LTE 16QAM	Output	733	9.381
LTE 16QAM	Input	747	9.421
LTE 16QAM	Output	747	9.341
LTE 16QAM	Input	753	9.261
LTE 16QAM	Output	753	9.222
LTE QPSK	Input	733	9.461
LTE QPSK	Output	733	9.501
LTE QPSK	Input	747	9.381
LTE QPSK	Output	747	9.461
LTE QPSK	Input	753	9.301
LTE QPSK	Output	753	9.261

Figure 15 Occupied Bandwidth LTE

JUDGEMENT: Passed

See additional information in Figure 16 to Figure 33.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: A. Sharabi

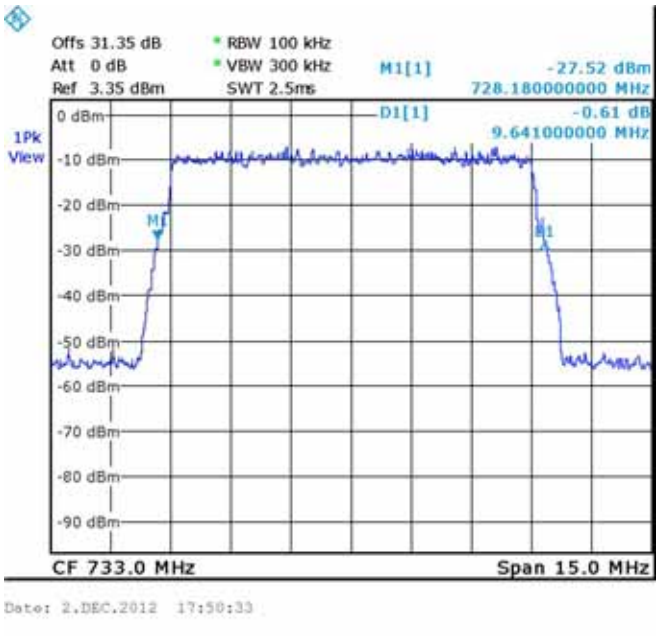


Figure 16.— 64QAM 733 MHz IN

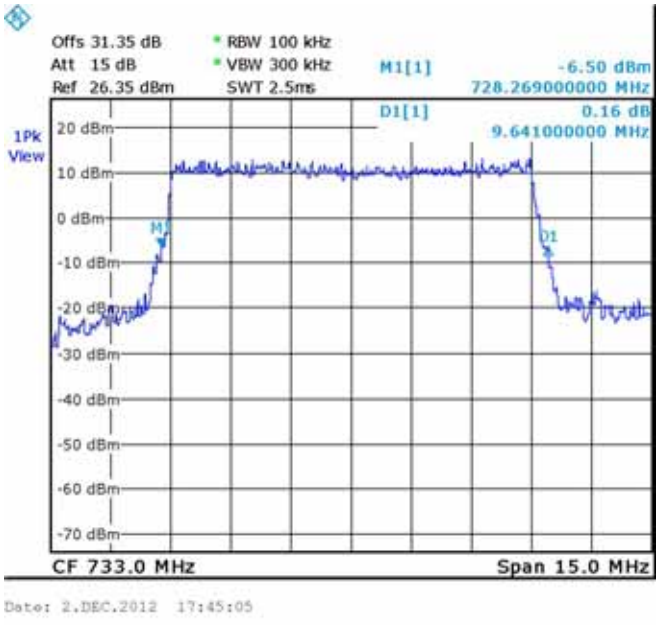


Figure 17.— 64QAM 733 MHz OUT

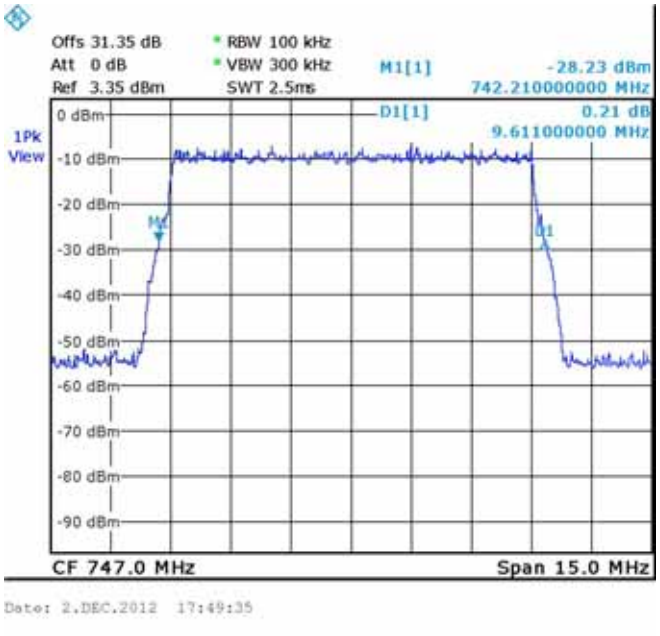


Figure 18.— 64QAM 747 MHz IN

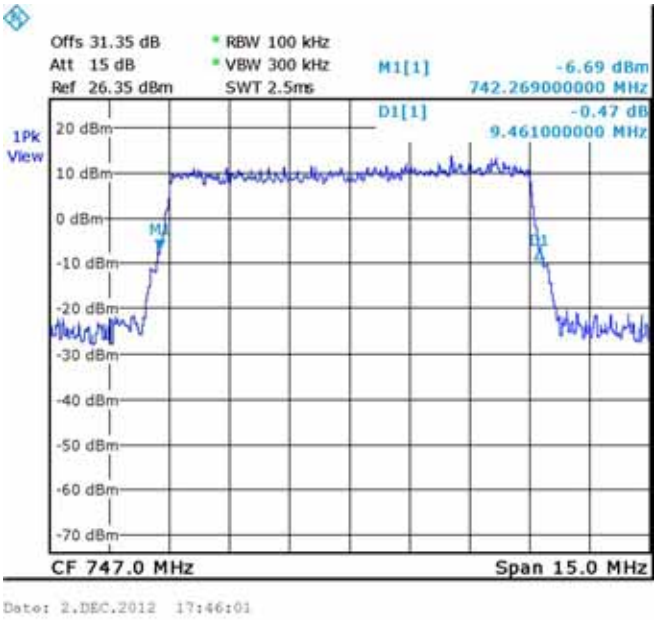


Figure 19.— 64QAM 747 MHz OUT

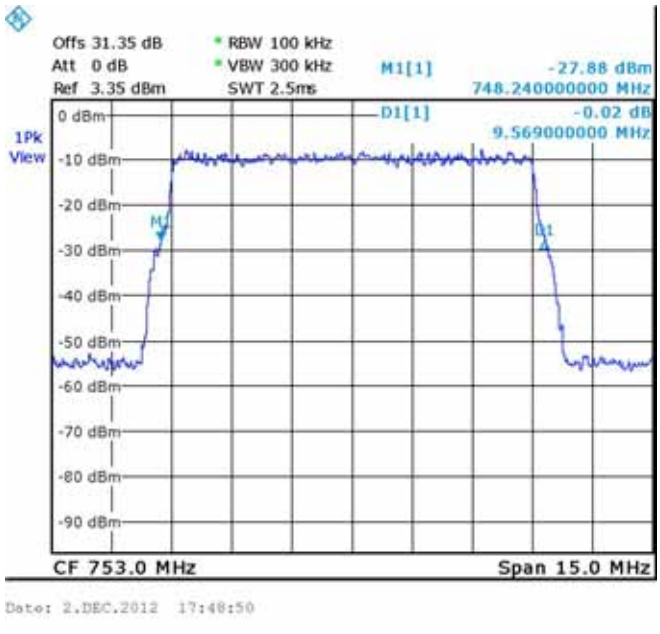


Figure 20.— 64QAM 753 MHz IN

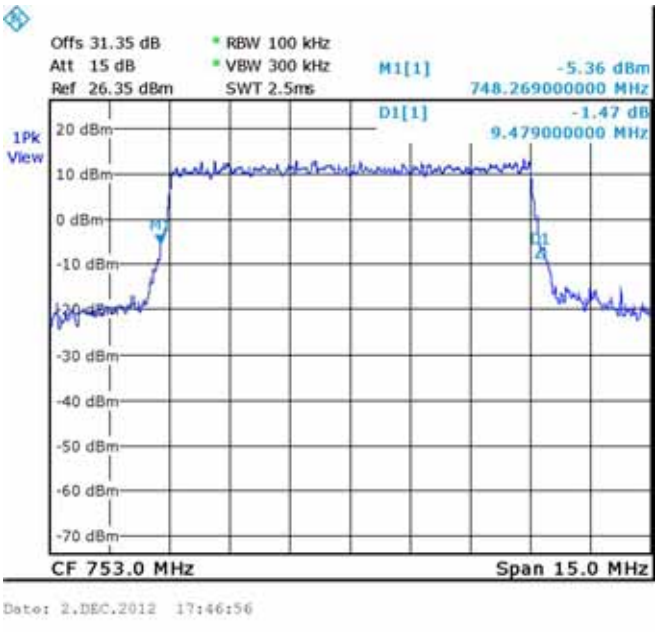


Figure 21.— 64QAM 753 MHz OUT

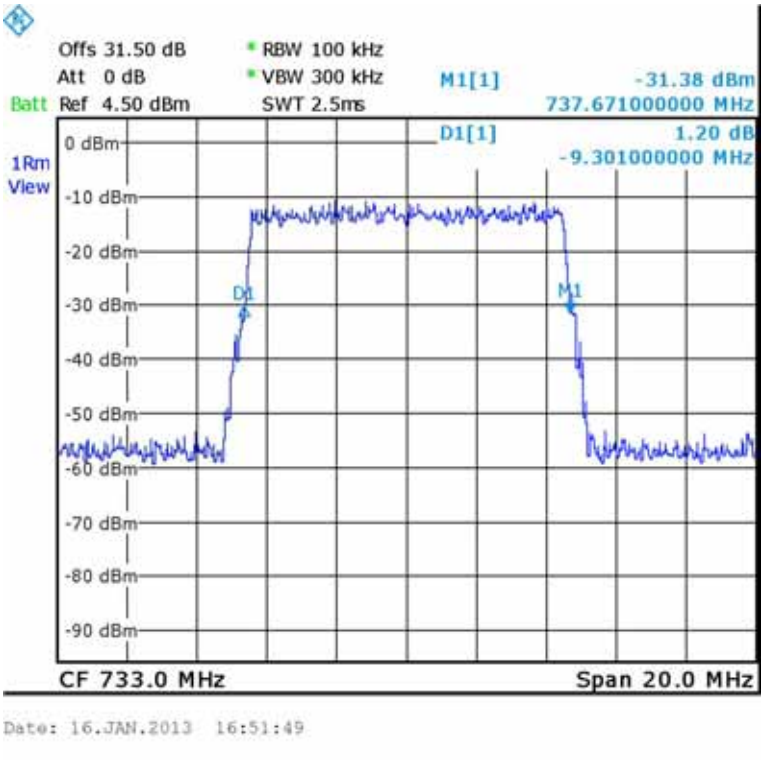


Figure 22.— 16QAM 733 MHz IN

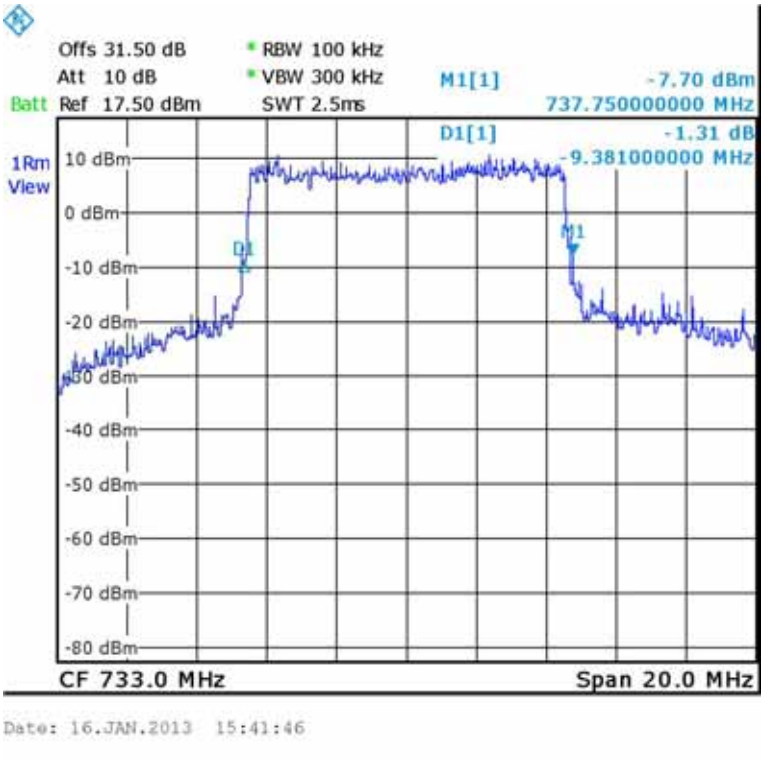


Figure 23.— 16QAM 733 MHz OUT

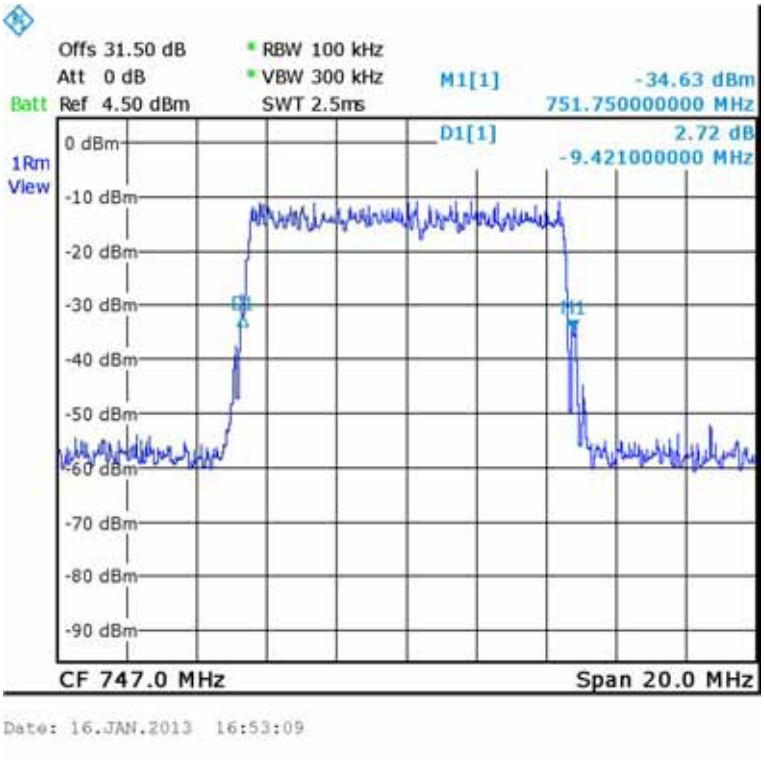


Figure 24.— 16QAM 747 MHz IN

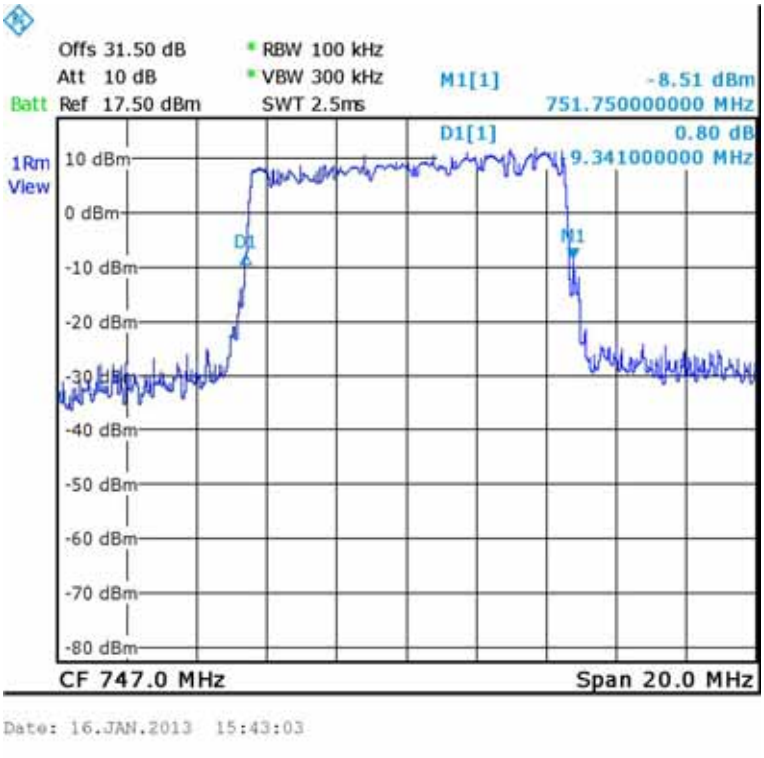


Figure 25.— 16QAM 747 MHz OUT

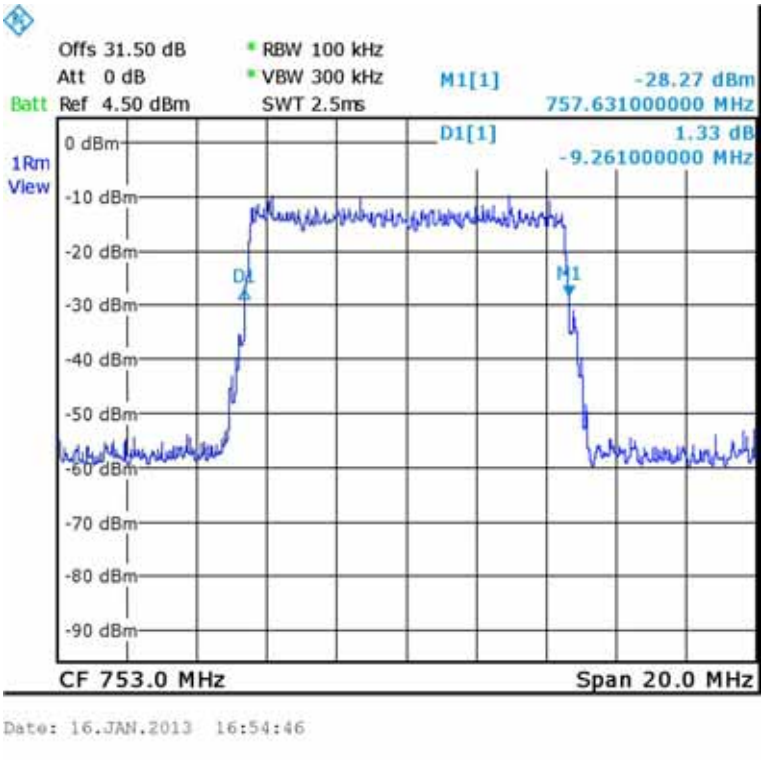


Figure 26.— 16QAM 753 MHz IN

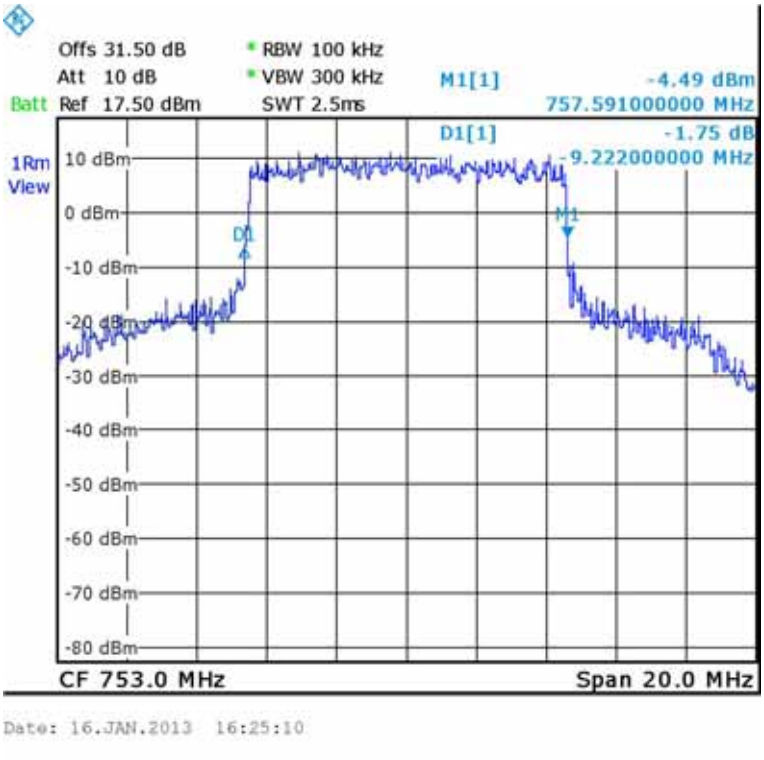


Figure 27.— 16QAM 753 MHz OUT

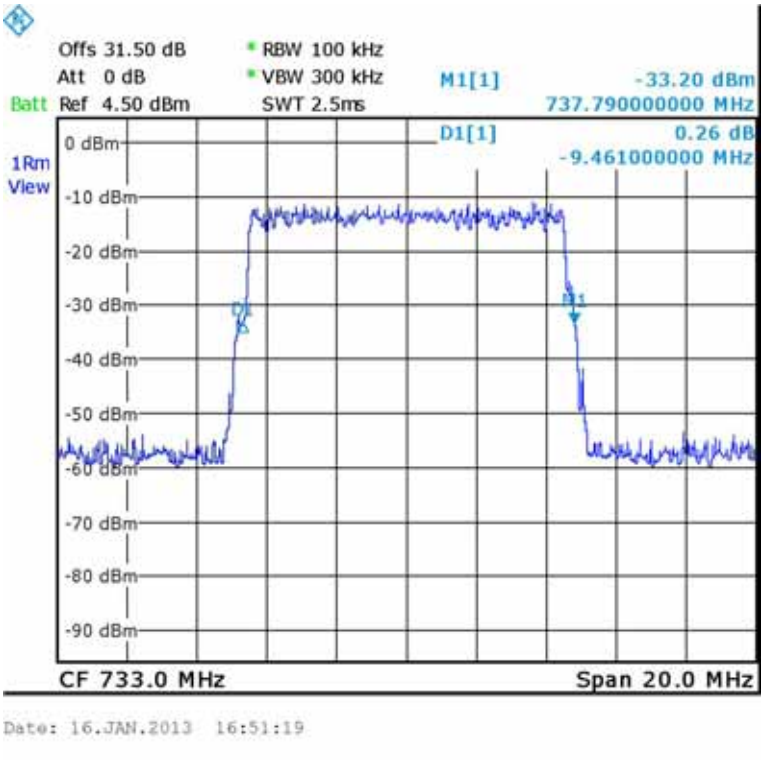


Figure 28.— QPSK 733 MHz IN

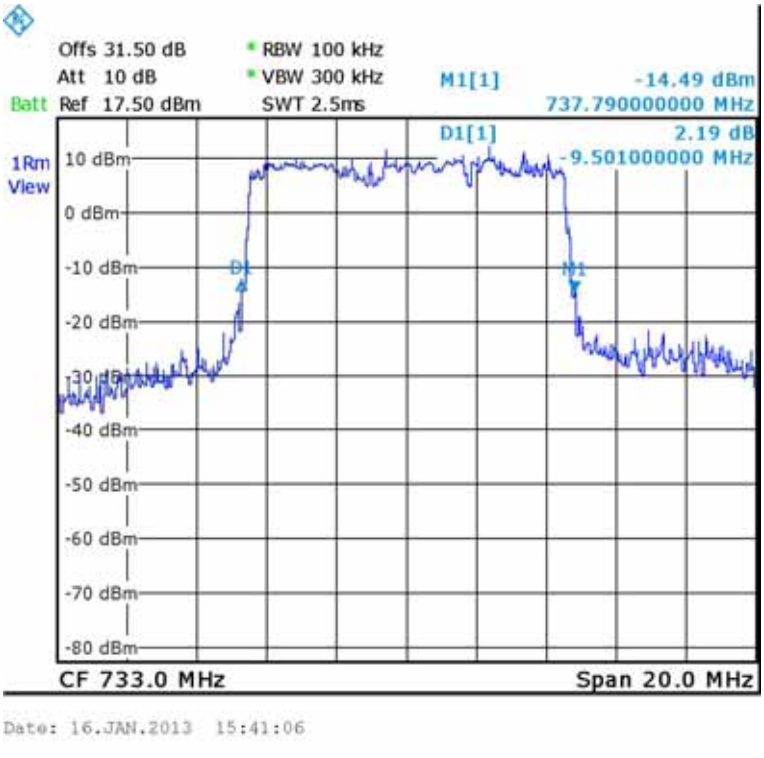


Figure 29.— QPSK 733 MHz OUT

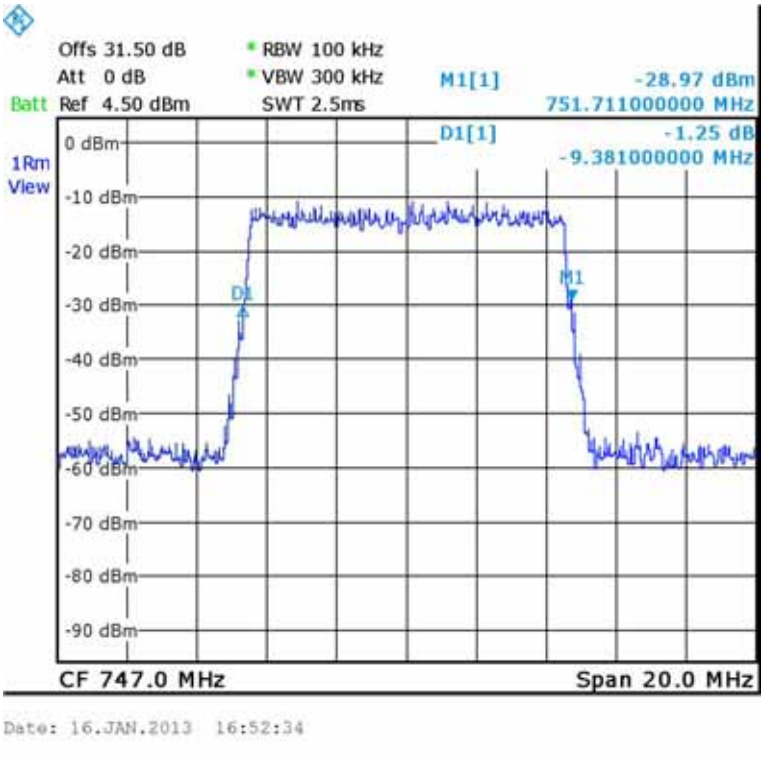


Figure 30.— QPSK 747 MHz IN

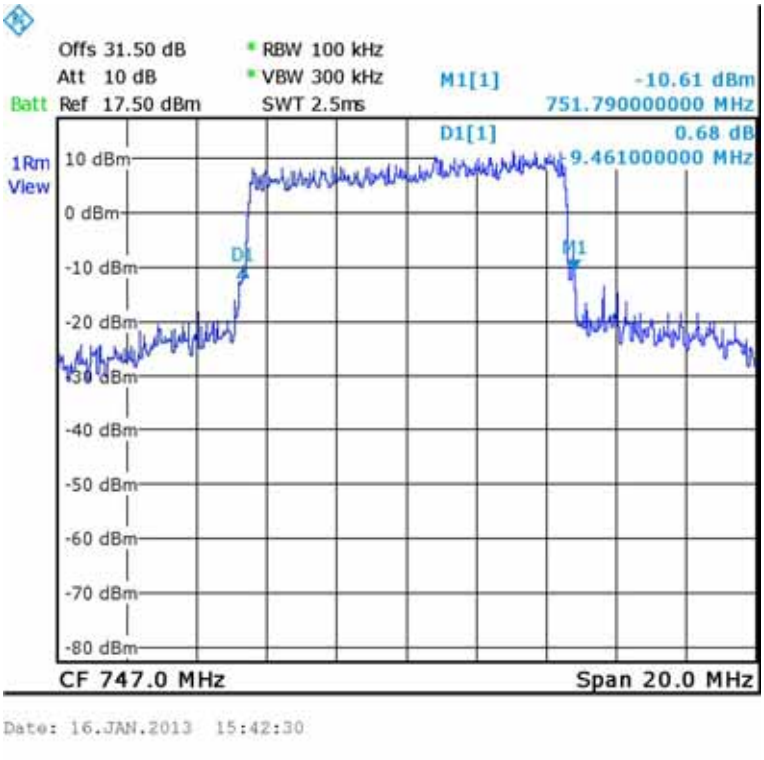


Figure 31.— QPSK 747 MHz OUT

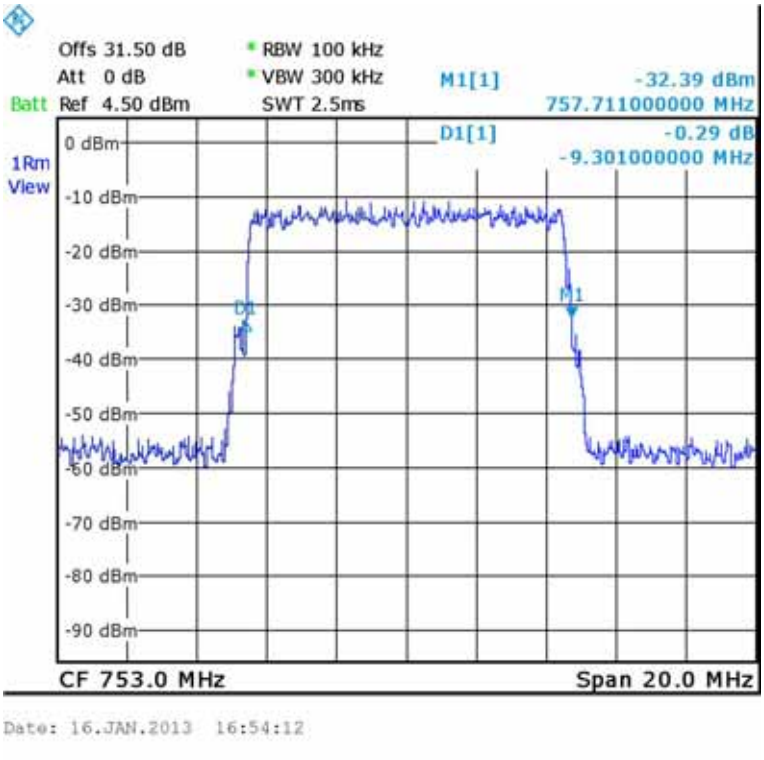


Figure 32.— QPSK 753 MHz IN

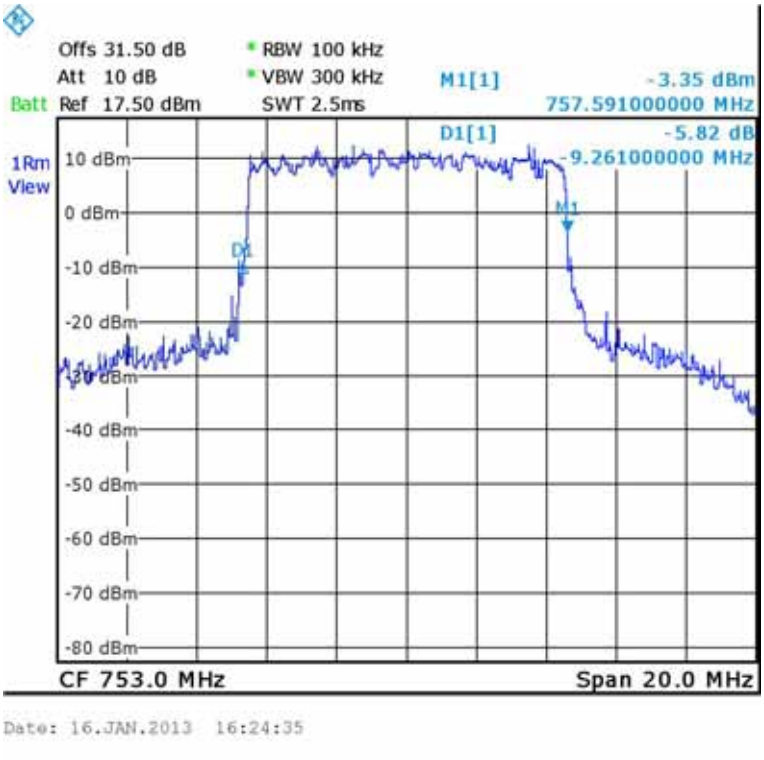


Figure 33.— QPSK 753 MHz OUT

5.4 Test Equipment Used.

Occupied Bandwidth LTE

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 34 Test Equipment Used

6. Spurious Emissions at Antenna Terminals LTE

6.1 Test Specification

FCC Part 27, Subpart C, Sections 27.53(c)(1) (3) 27.53 (g)

6.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges 728 MHz-758 MHz must be attenuated below the transmitting power (P) by a factor of 43+ 10 log (P) dB .

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (31.35dB). 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 - 22.0 GHz.

6.3 Test Results

Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
733	-20.53	-13.0	-7.53
747	-23.20	-13.0	-10.20
753	-23.03	-13.0	-10.03

Figure 35 Spurious Emissions at Antenna Terminals Results LTE

See additional information in Figure 36 to Figure 53.

JUDGEMENT: Passed by 7.53 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: I. Siboni

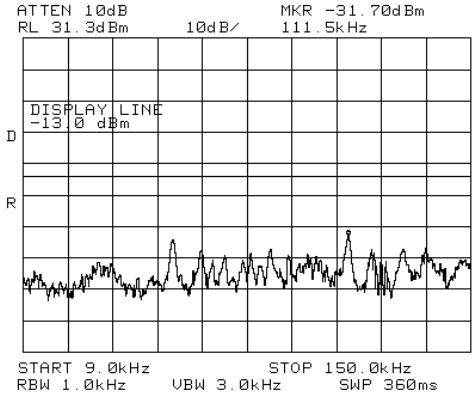


Figure 36.— 733 MHz

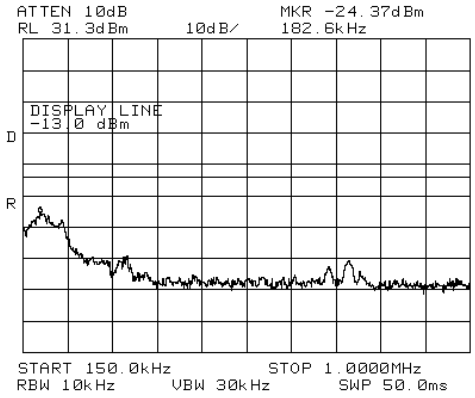


Figure 37.— 733 MHz

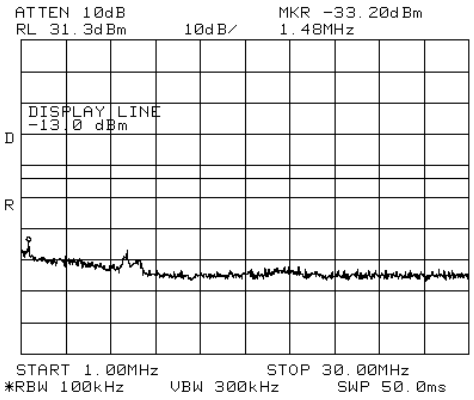


Figure 38.— 733 MHz

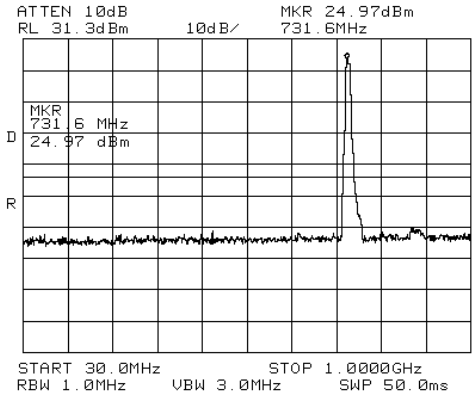


Figure 39.— 733 MHz

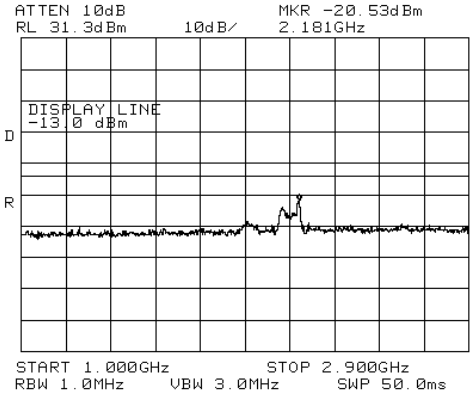


Figure 40.— 733 MHz

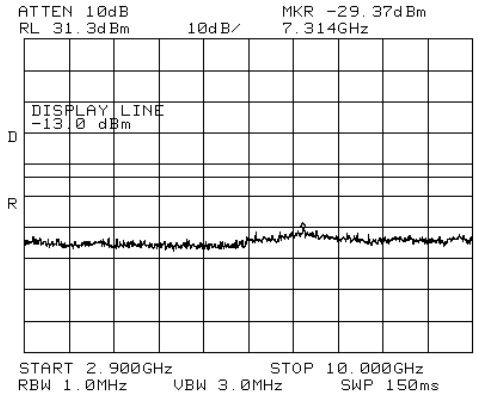


Figure 41.— 733 MHz

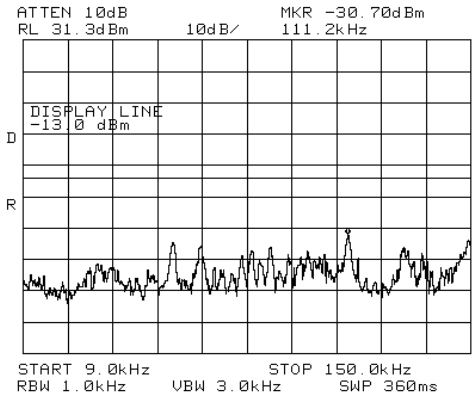


Figure 42.— 747 MHz

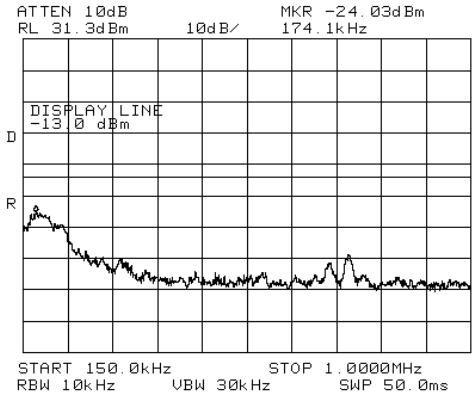


Figure 43.— 747 MHz

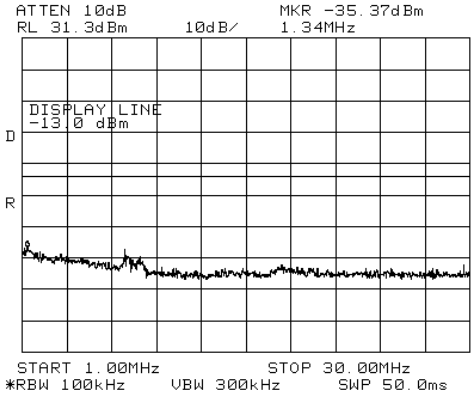


Figure 44.— 747 MHz

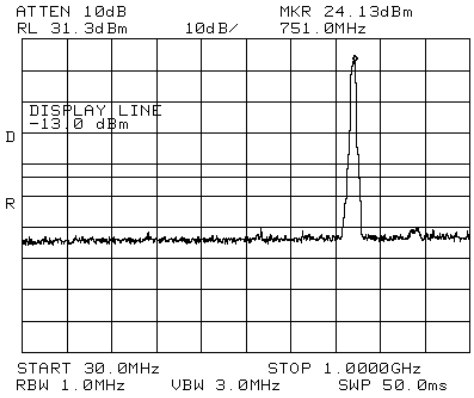


Figure 45.— 747 MHz

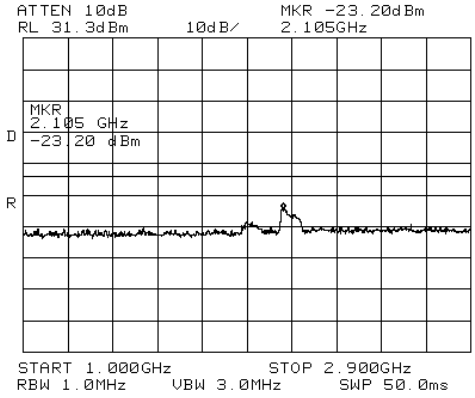


Figure 46.— 747 MHz

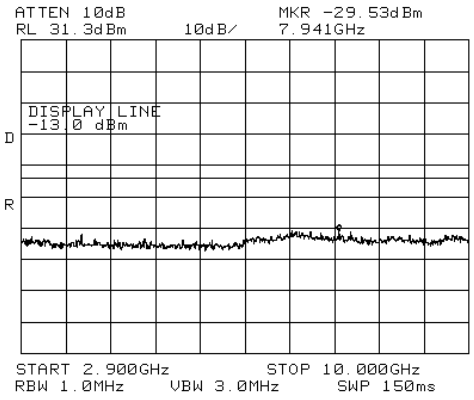


Figure 47.— 747 MHz

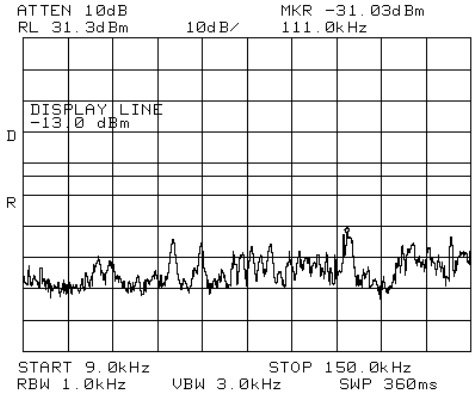


Figure 48.— 753 MHz

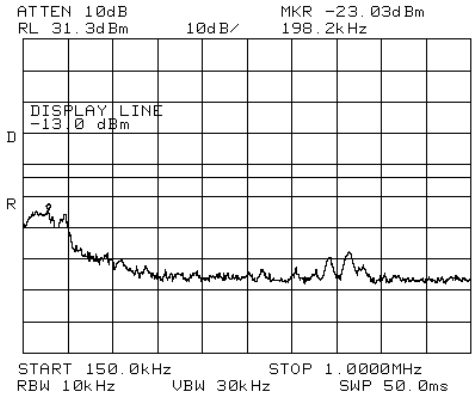


Figure 49.— 753 MHz

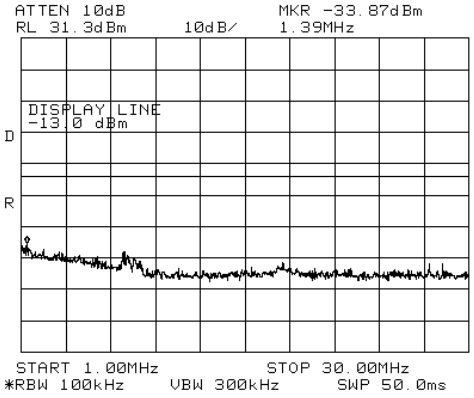


Figure 50.— 753 MHz

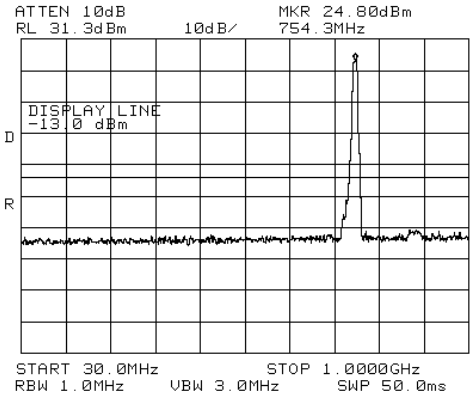


Figure 51.— 753 MHz

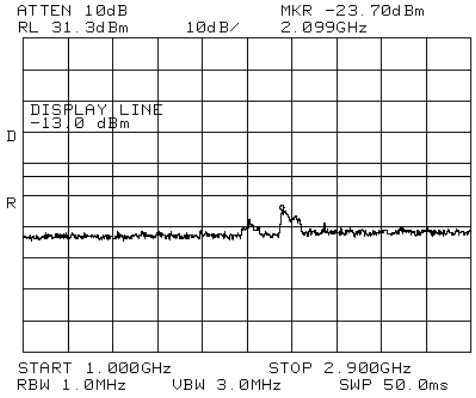


Figure 52.— 753 MHz

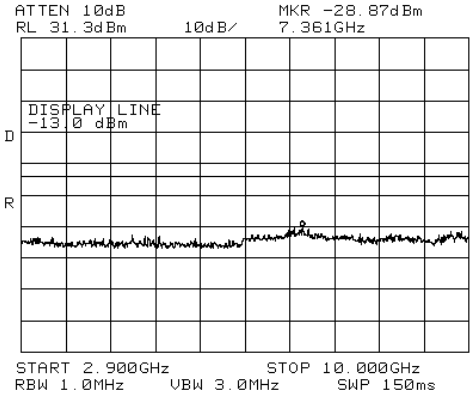


Figure 53.— 753 MHz

6.4 Test Equipment Used

Spurious Emissions at Antenna Terminals LTE

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 54 Test Equipment Used

7. Band Edge Spectrum LTE

7.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (c)(1)

7.2 Test procedure

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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 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 30kHz R.B.W.

7.3 Results

	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
LTE64QAM	733.00	728.00	-23.32	-13.0	-10.32
LTE64QAM	753.00	758.00	-22.20	-13.0	-9.20
LTE16QAM	733.00	728.00	-25.98	-13.0	-12.98
LTE16QAM	753.00	758.00	-25.20	-13.0	-12.20
LTEQPSK	733.00	728.00	-27.07	-13.0	-14.07
LTEQPSK	753.00	758.00	-24.27	-13.0	-11.27

Figure 55 Band Edge Spectrum Results LTE

JUDGEMENT: Passed by 9.2 dB

See additional information in Figure 56 to Figure 61.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: A

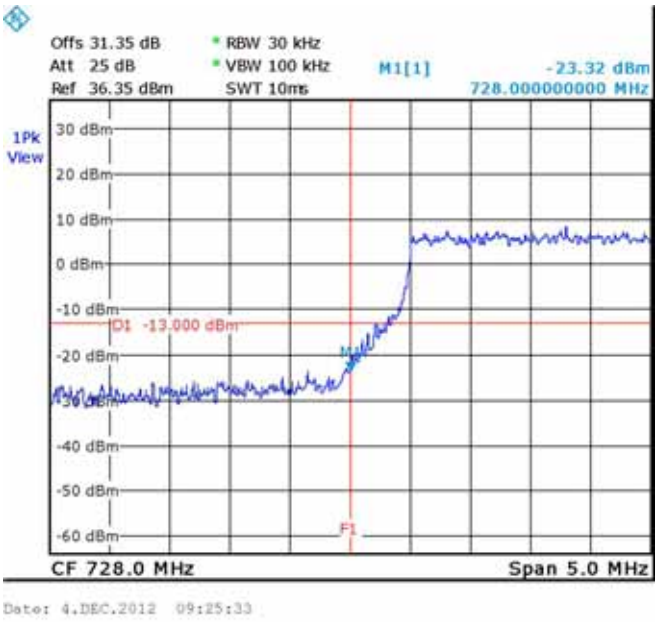


Figure 56.—64QAM 733.0 MHz

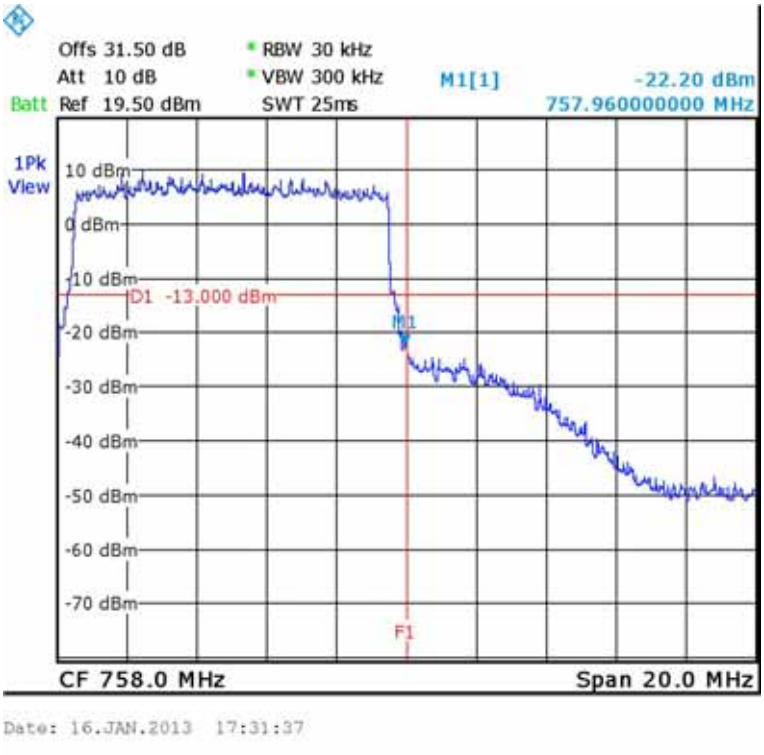


Figure 57.— 64QAM 753.0 MHz

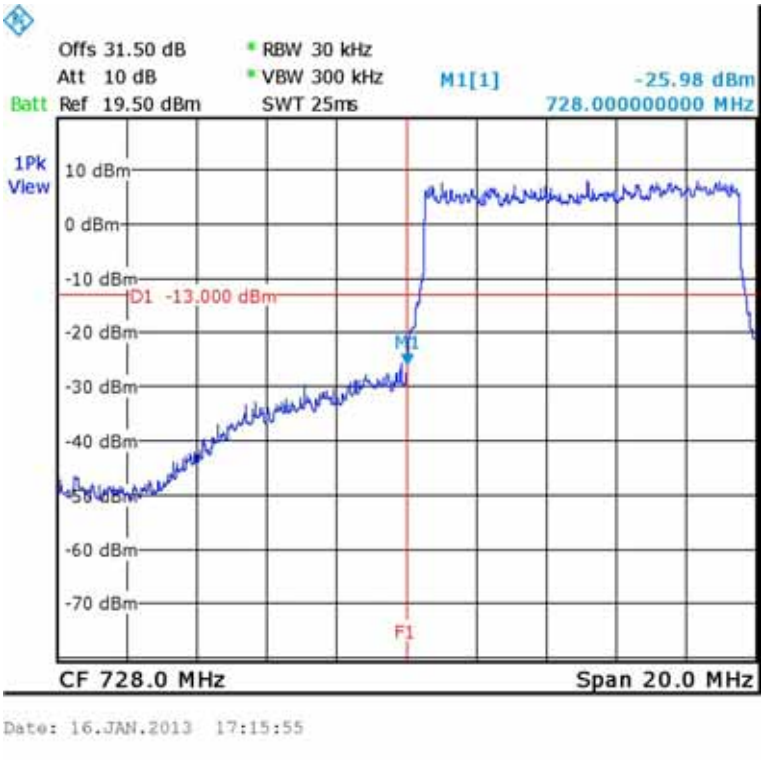


Figure 58.—16QAM 733.0 MHz

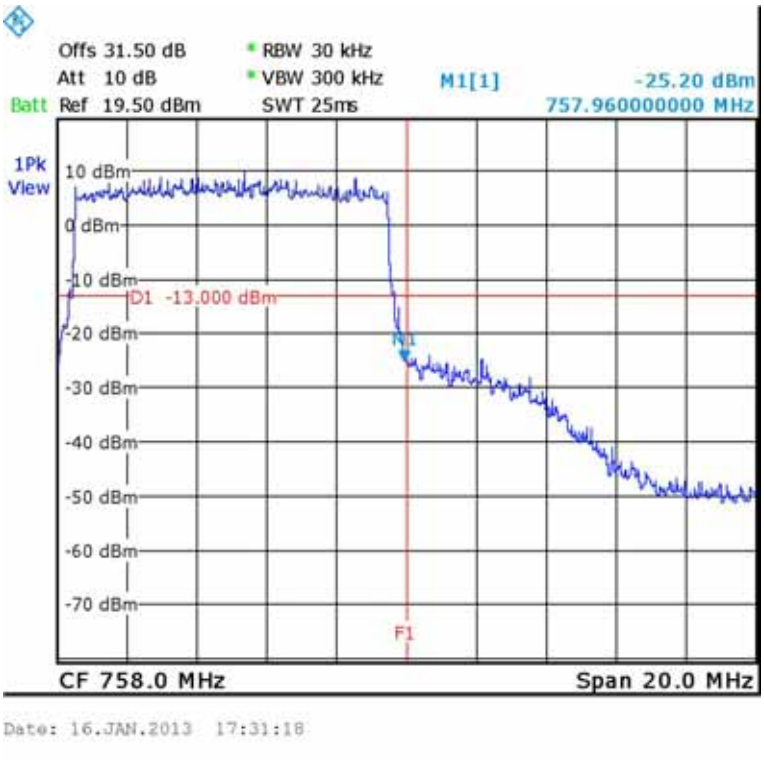


Figure 59.— 16QAM 753.0 MHz

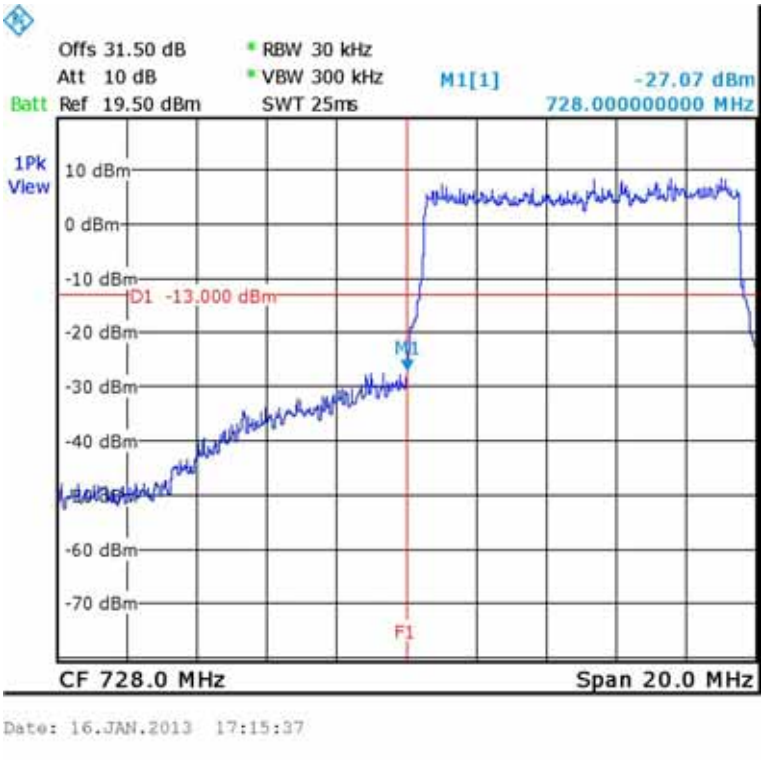


Figure 60.— QPSK 733.0 MHz

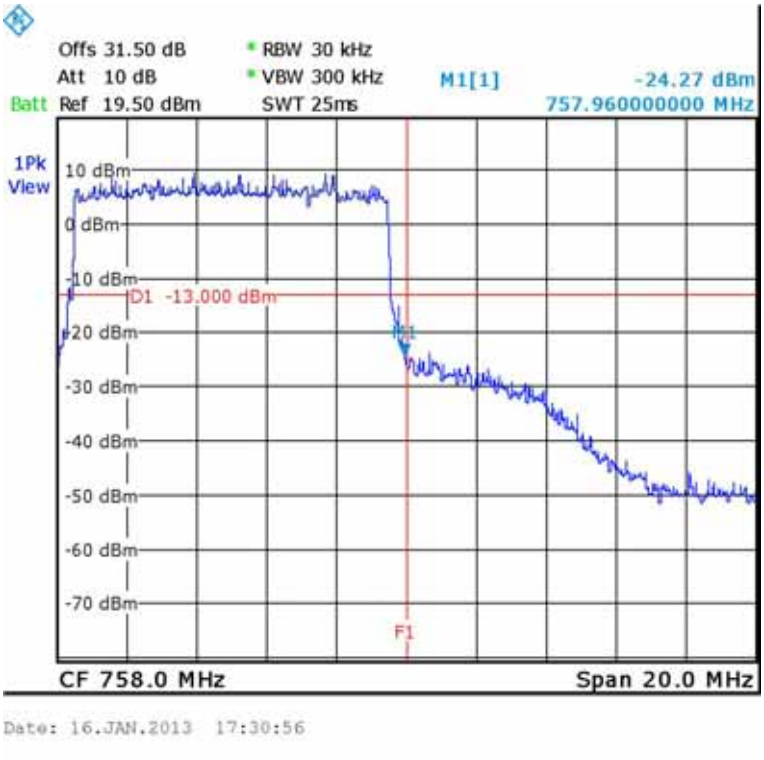


Figure 61.—QPSK 753.0 MHz

7.4 Test Equipment Used.

Band Edge Spectrum

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 62 Test Equipment Used

8. Spurious Radiated Emission LTE

8.1 Test Specification

FCC, Part 27, Subpart C Section 27.53 (g)

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 (728-758 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, 0.8 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(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dB)
P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

8.3 Test Results

JUDGEMENT: Passed by 27.3 dB

The E.U.T met the requirements of the FCC, Part 27, Subpart C, Section 27.53 (g) specifications.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: I. Siboni

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
733.00	1466	V	57.1	-42.8	6.7	7.6	-41.9	-13.0	-28.9
733.00	1466	H	56.5	-43.0	6.7	8.0	-41.7	-13.0	-28.7
747.00	1494	V	57.4	-42.5	6.7	7.6	-41.6	-13.0	-28.6
747.00	1494	H	57.9	-41.6	6.7	8.0	-40.3	-13.0	-27.3
753.00	1506	V	55.9	-44.0	6.7	7.6	-43.1	-13.0	-30.1
753.00	1506	H	57.6	-41.9	6.7	8.0	-40.6	-13.0	-27.6

8.4 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

9. RF Power Output AWS

9.1 Test Specification

FCC Part 27, Subpart C (27.50(d))

9.2 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 E.U.T. RF output was modulated as follows:

CDMA at 1.25 MHz BW channels (2112.2 MHz, 2132.5 MHz and 2153.8 MHz)

LTE at 1.25 MHz BW channels (2115.0 MHz, 2132.0 MHz and 2150.0 MHz)

WCDMA at 5 MHz BW channels (2112.5 MHz, 2132.5 MHz and 2153.5 MHz)

Special attention was taken to prevent Spectrum Analyzer RF input overload.

9.3 Results

Modulation	Operation Frequency (MHz)	Reading (dBm)
CDMA	2112.2	29.74
CDMA	2132.5	27.80
CDMA	2153.8	28.53
LTE 64QAM	2115.0	30.04
LTE 64QAM	2132.5	27.71
LTE 64QAM	2150.0	28.58
LTE 16QAM	2115.0	29.40
LTE 16QAM	2132.5	28.19
LTE 16QAM	2150.0	28.85
LTE QPSK	2115.0	28.41
LTE QPSK	2132.5	27.92
LTE QPSK	2150.0	28.70
WCDMA	2112.5	29.54
WCDMA	2132.5	28.45
WCDMA	2152.5	29.34

Figure 63 RF Power Output AWS

See additional information in Figure 64 to Figure 78.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: A. Sharabi

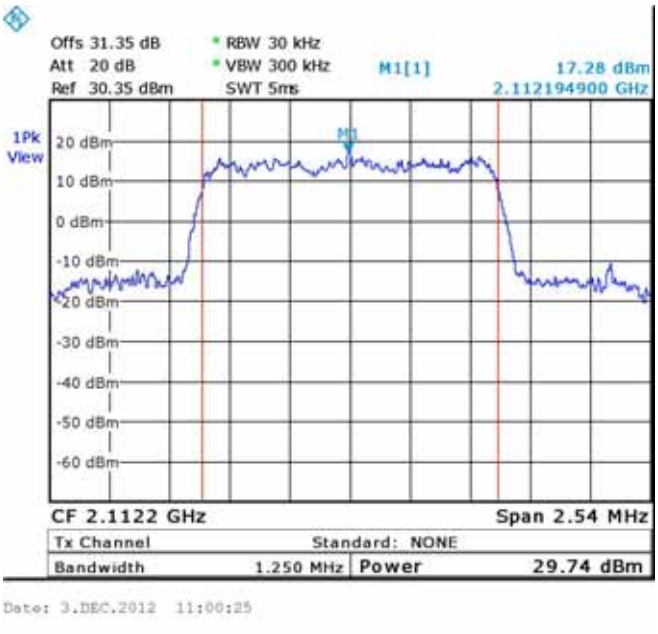


Figure 64.— CDMA (2112.2 MHz)

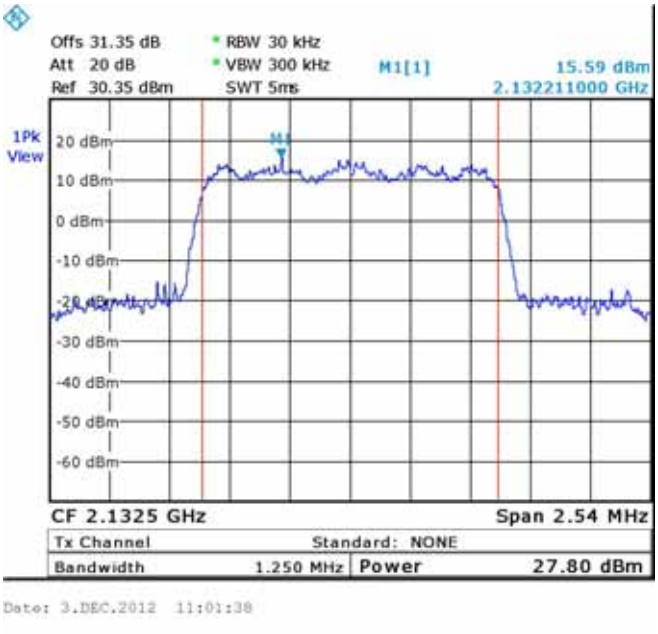


Figure 65.— CDMA (2132.5 MHz)

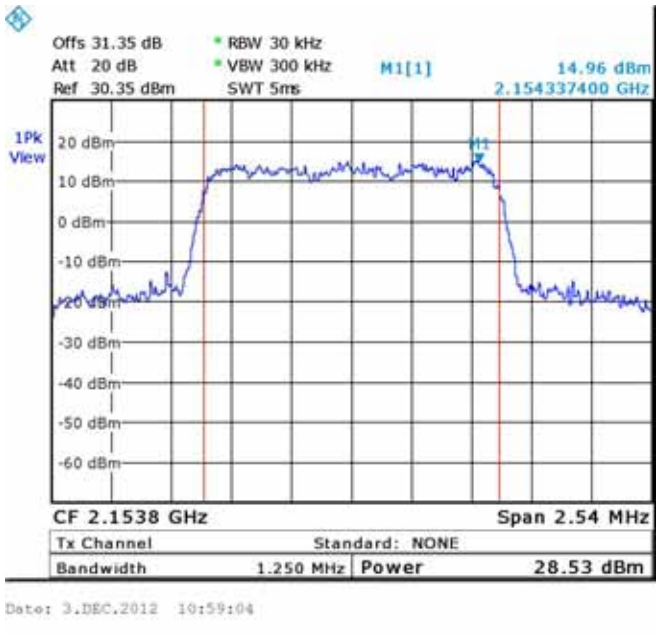


Figure 66.— CDMA (2153.8 MHz)

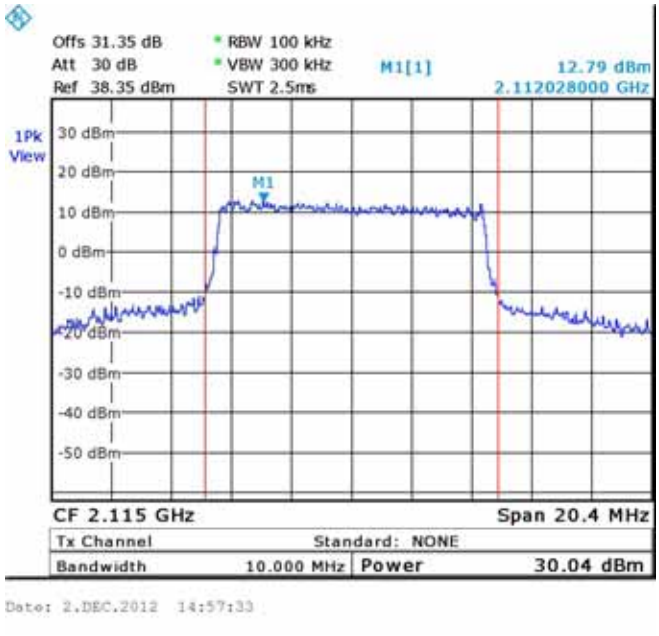


Figure 67.— LTE 64QAM(2115.0 MHz)

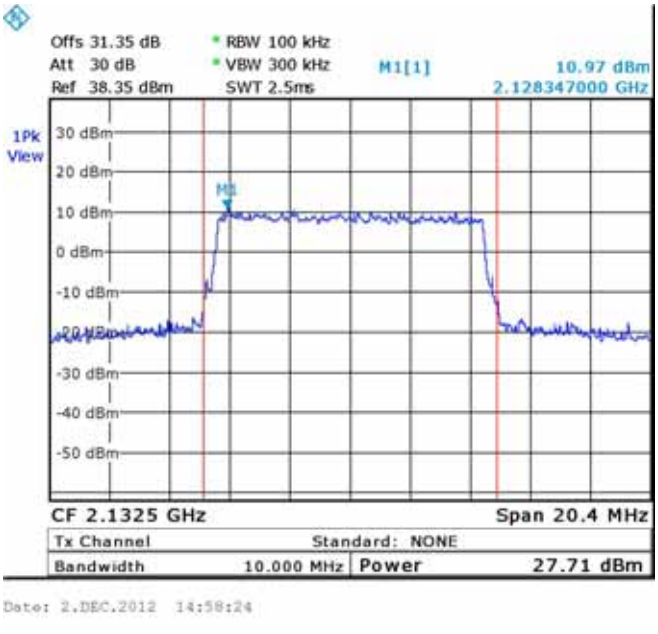


Figure 68.— LTE 64QAM (2132.5 MHz)

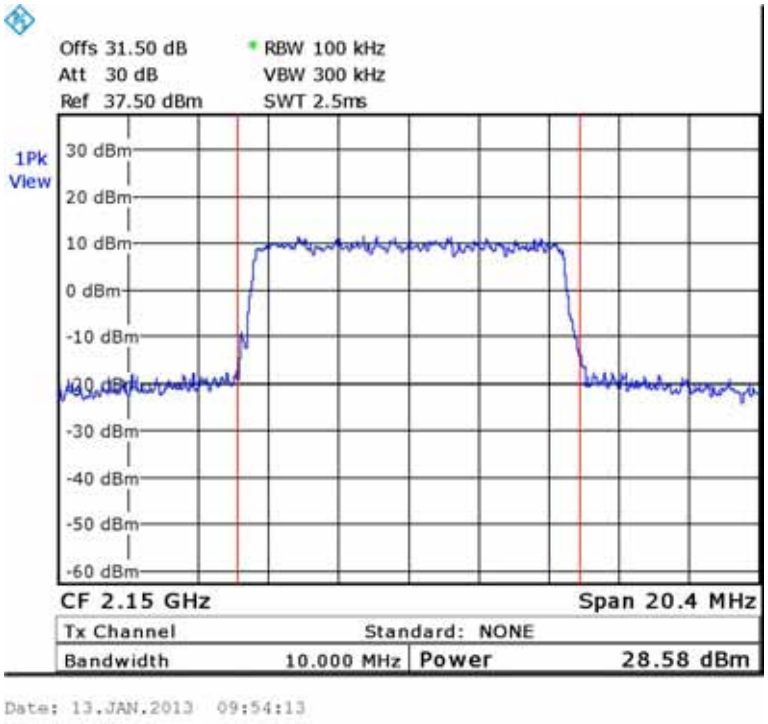


Figure 69.— LTE 64QAM (2150.0 MHz)

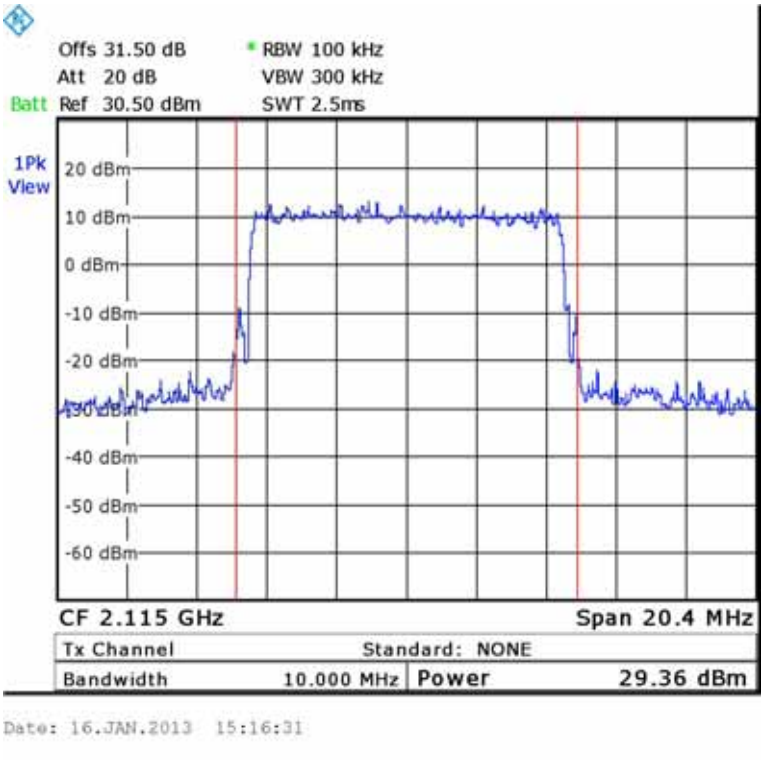


Figure 70.— LTE 16QAM (2115.0 MHz)

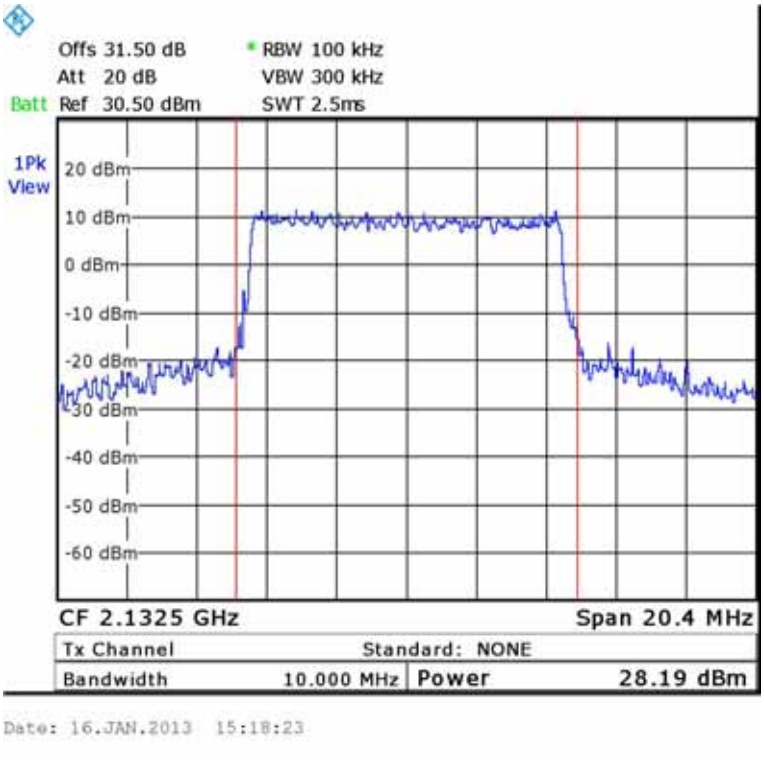


Figure 71.— LTE 16QAM (2132.5 MHz)

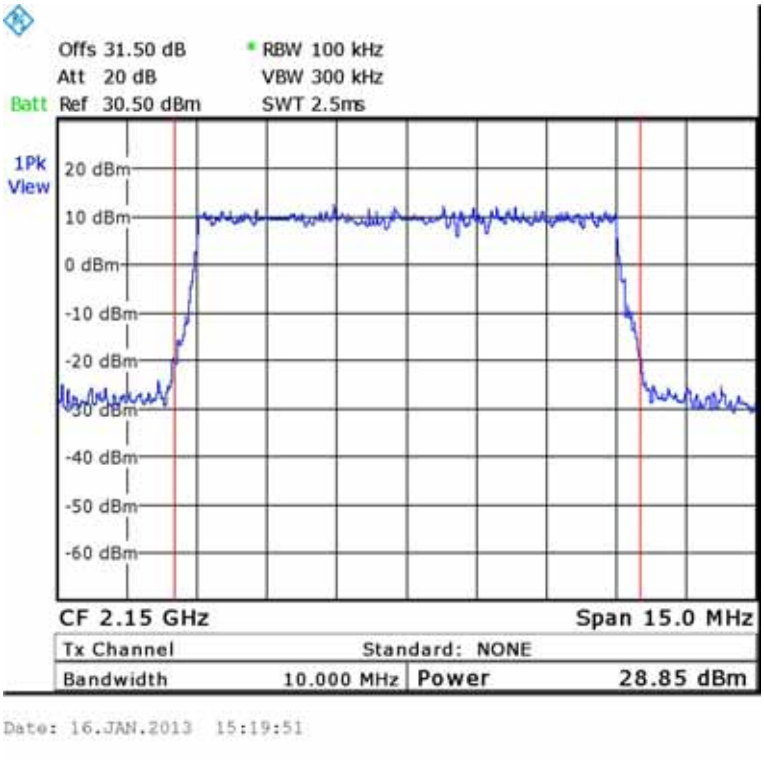


Figure 72.— LTE 16QAM (2150.0 MHz)

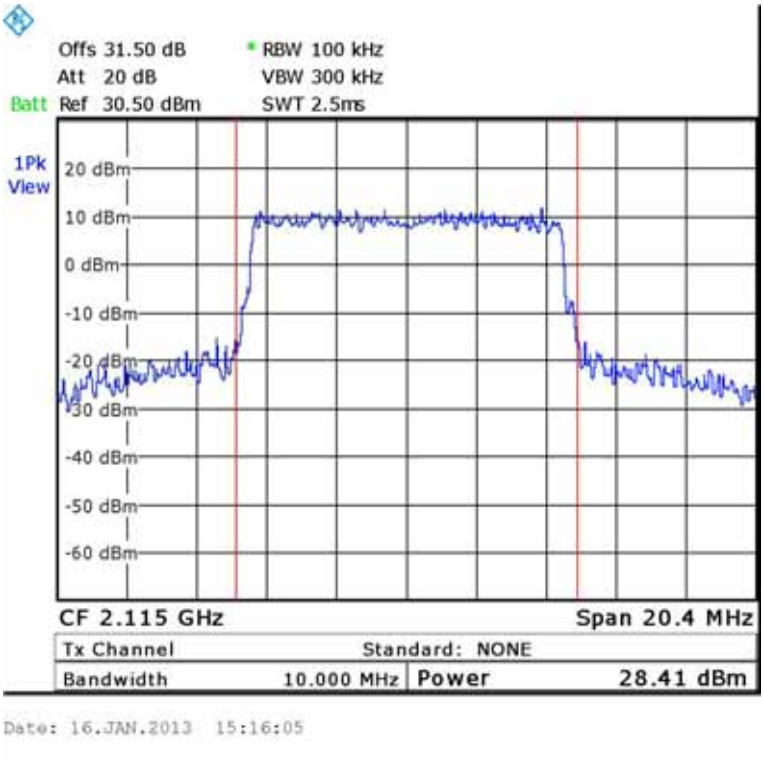


Figure 73.— LTE QPSK (2115.0 MHz)

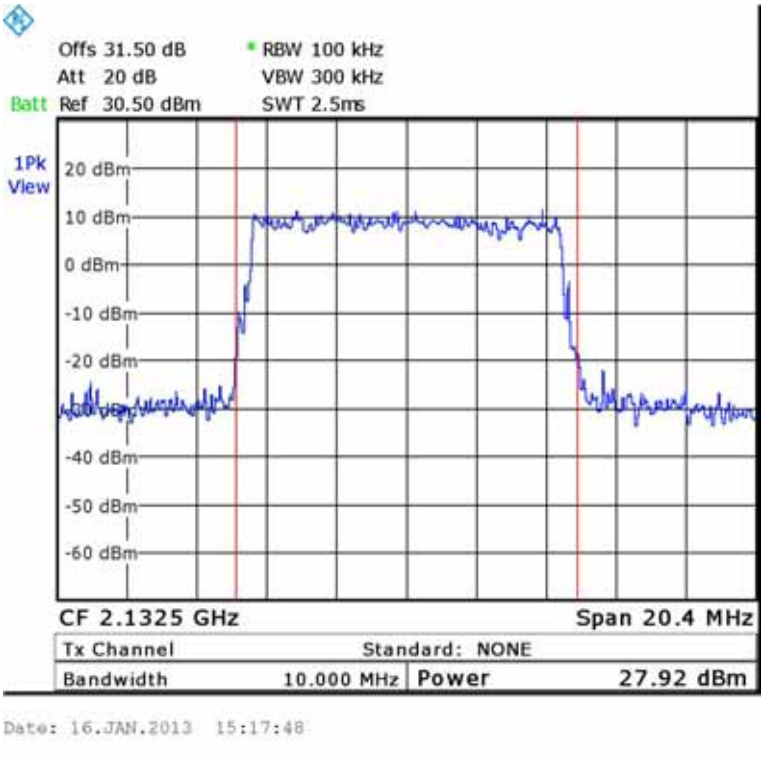


Figure 74.— LTE QPSK (2132.5 MHz)

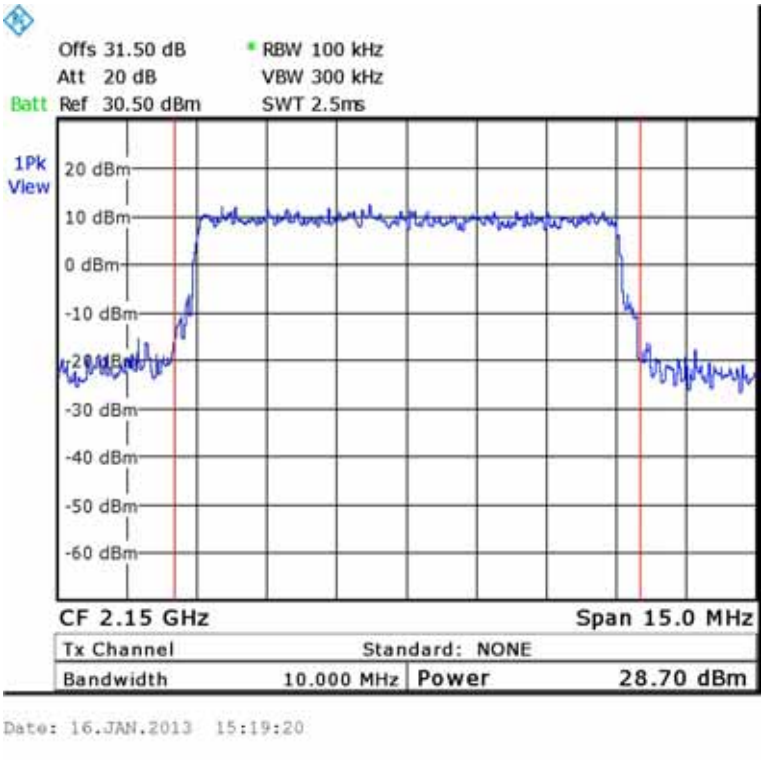


Figure 75.— LTE QPSK (2150.0 MHz)

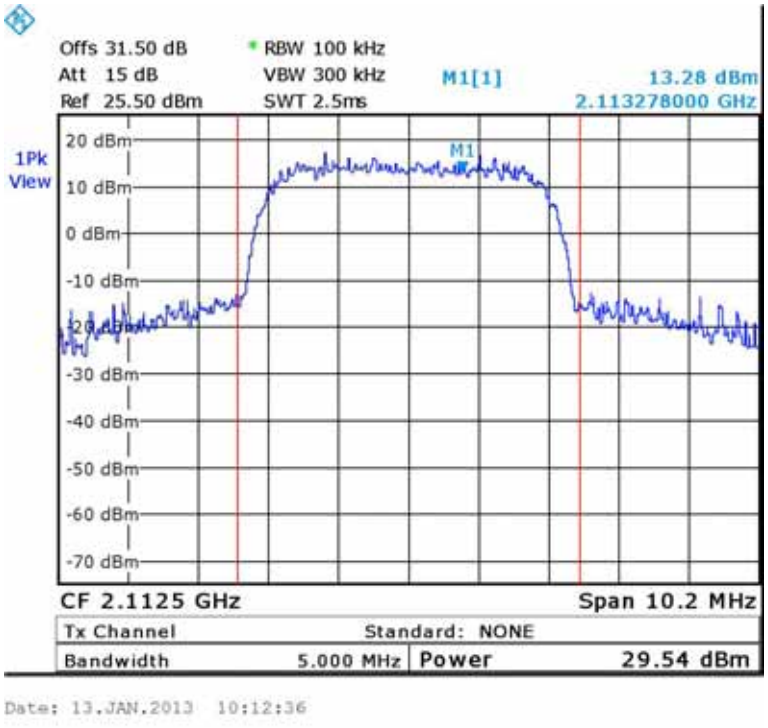


Figure 76.— W-CDMA (2112.5 MHz)

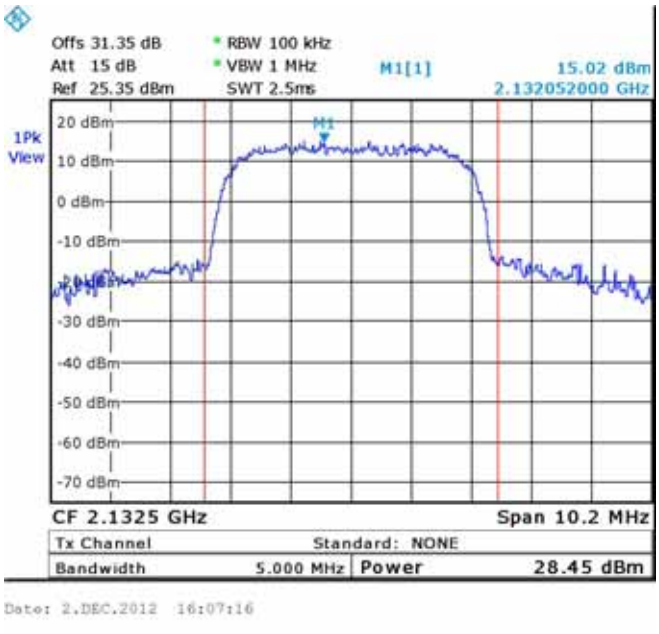


Figure 77.— W-CDMA (2132.5 MHz)

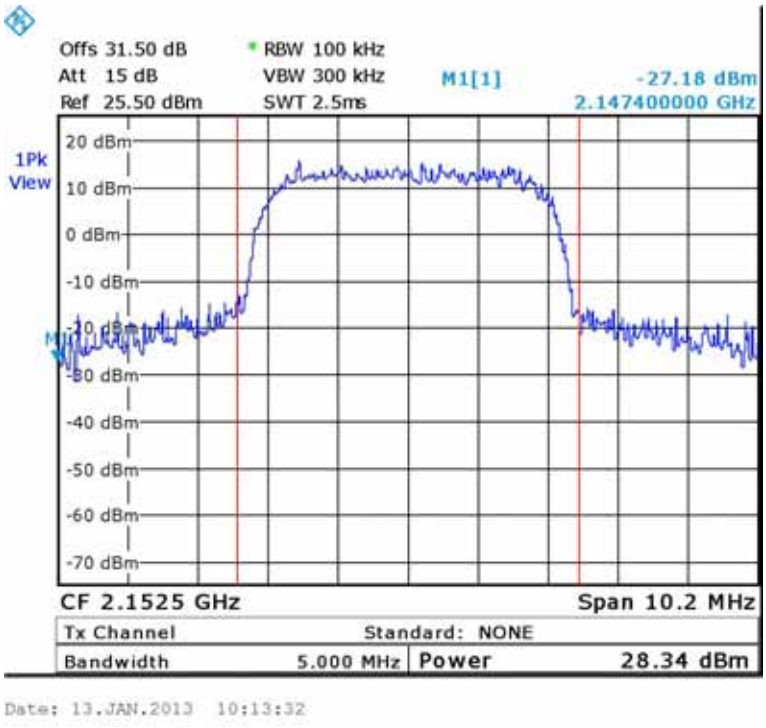


Figure 78.— W-CDMA (2152.5 MHz)

9.4 Test Equipment Used.

RF Power Output AWS

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 79 Test Equipment Used

10. Occupied Bandwidth AWS

10.1 Test Specification

FCC Part 2, Section 1049

10.2 Test Procedure

The E.U.T. was set to the applicable test frequency and 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 proper 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.
Occupied bandwidth measured was repeated in the input terminal of the E.U.T.

10.3 Results

Modulation		Operating Frequency (MHz)	Reading (MHz)
CDMA	Input	2112.2	1.4348
	Output	2112.2	1.4348
	Input	2132.5	1.4449
	Output	2132.5	1.4246
	Input	2153.8	1.4348
	Output	2153.8	1.4348
LTE 64QAM	Input	2115.0	9.7010
	Output	2115.0	9.4910
	Input	2132.5	9.5810
	Output	2132.5	9.6710
	Input	2150.0	9.5810
	Output	2150.0	9.4910
LTE 16QAM	Input	2115.0	9.421
	Output	2115.0	9.381
	Input	2132.5	9.461
	Output	2132.5	9.381
	Input	2150.0	9.341
	Output	2150.0	9.341
LTE QPSK	Input	2115.0	9.421
	Output	2115.0	9.381
	Input	2132.5	9.381
	Output	2132.5	9.381
	Input	2150.0	9.381
	Output	2150.0	9.182
WCDMA	Input	2112.5	4.6220
	Output	2112.5	4.6010
	Input	2132.5	4.5810
	Output	2132.5	4.5600
	Input	2152.0	4.5600
	Output	2152.0	4.5810

Figure 80 Occupied Bandwidth AWS

See additional information in Figure 81 to Figure 110.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: A. Sharabi

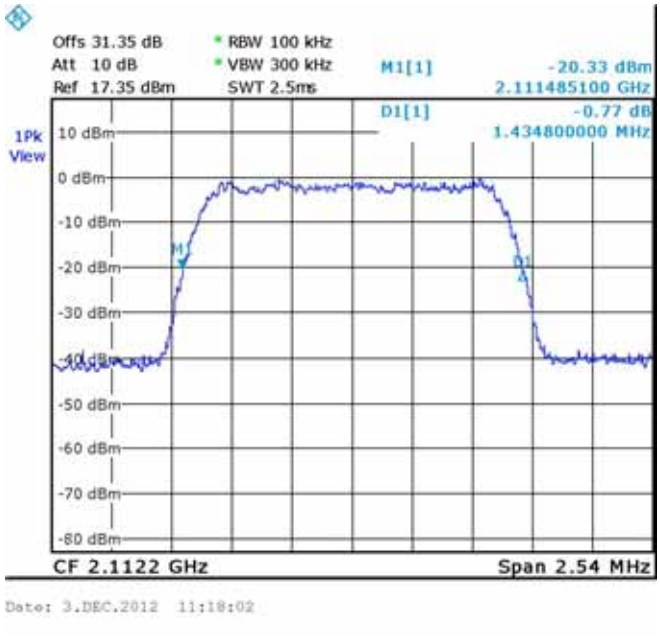


Figure 81.— CDMA (2112.2 MHz) IN

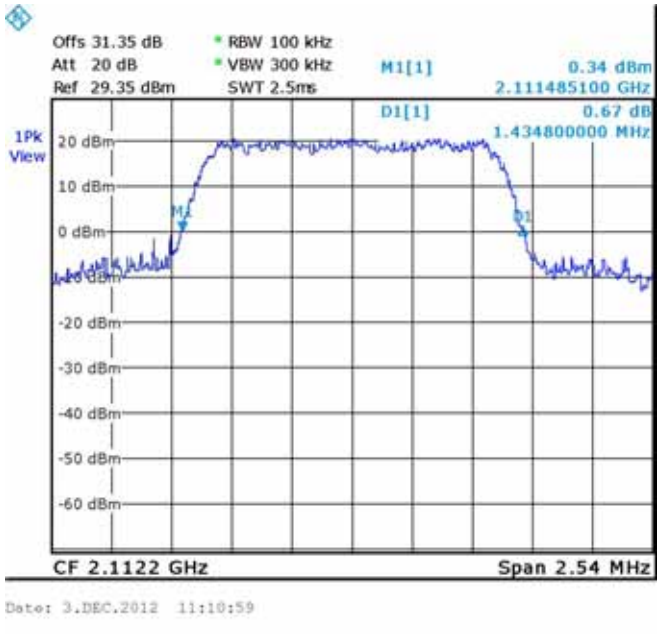


Figure 82.— CDMA (2111.2 MHz) OUT

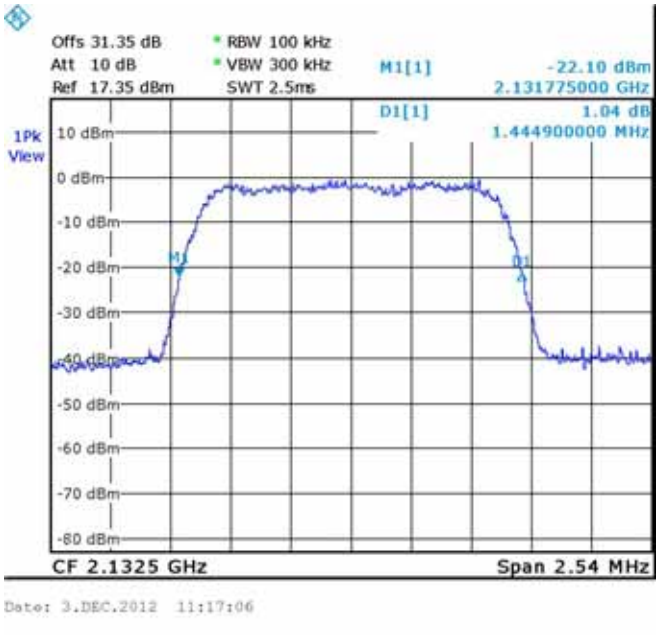


Figure 83.— CDMA (2132.5 MHz) IN

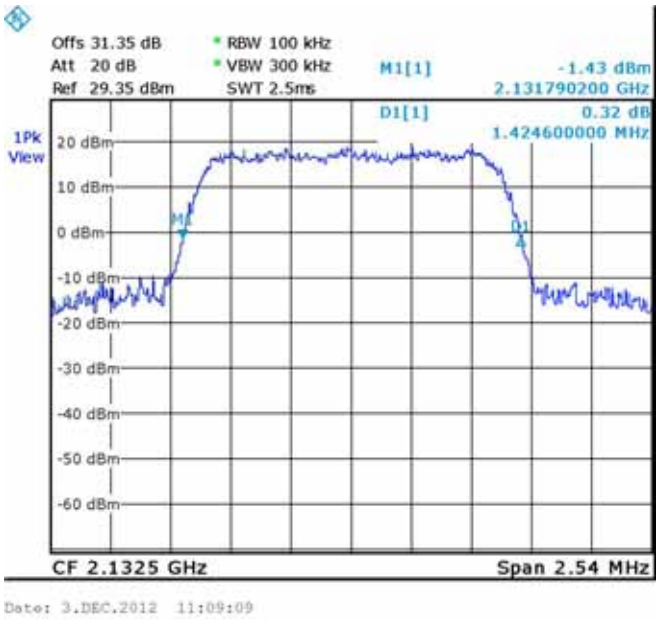


Figure 84.— CDMA (2132.5 MHz) OUT

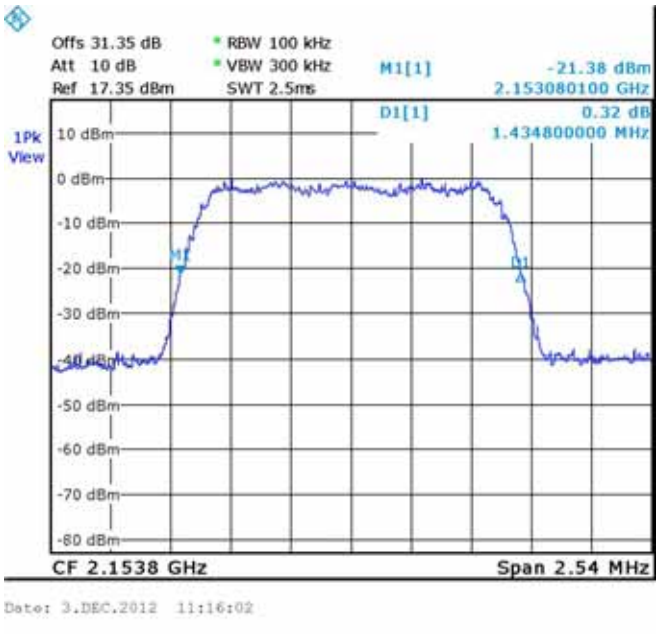


Figure 85.— CDMA (2153.8 MHz) IN

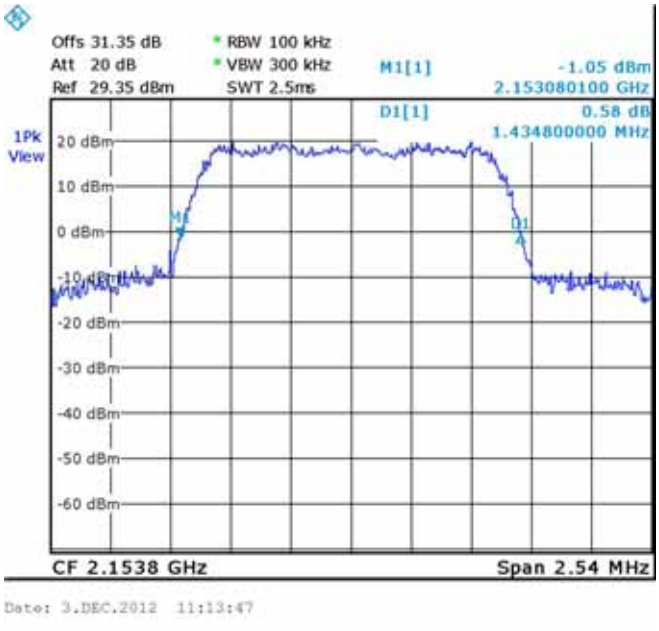


Figure 86.— CDMA (2153.8 MHz) IOUT

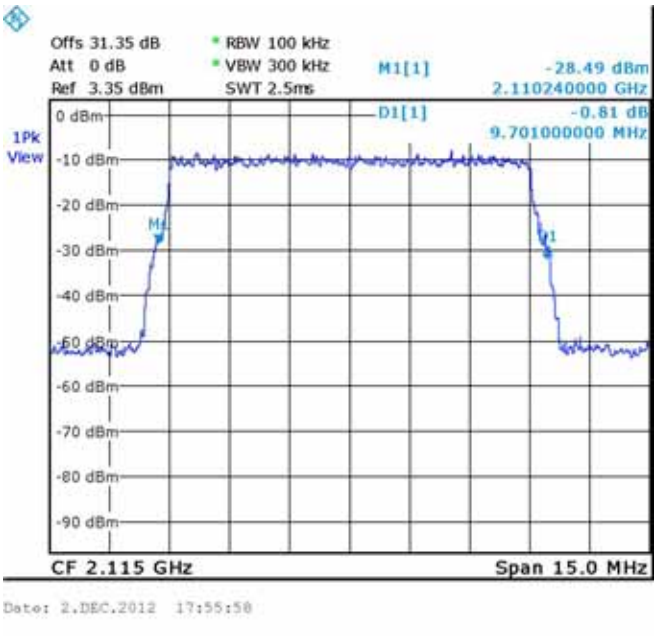


Figure 87.— LTE 64QAM(2115.0 MHz) IN

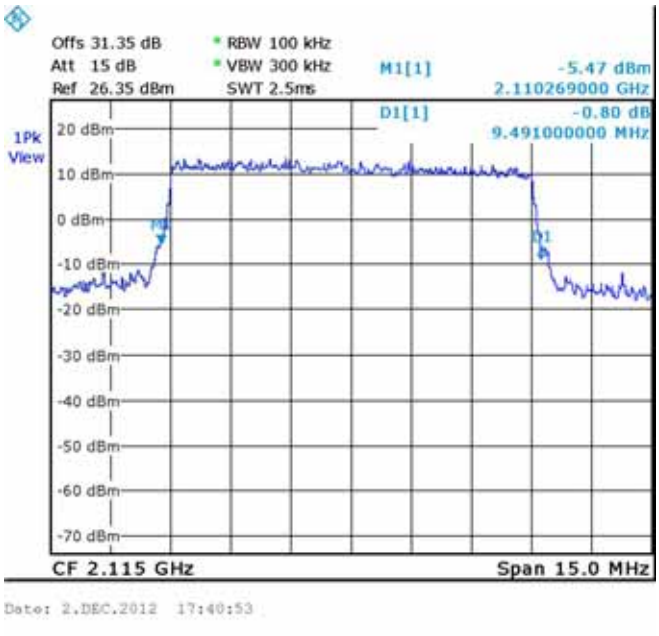


Figure 88.— LTE 64QAM (2115.0 MHz) OUT

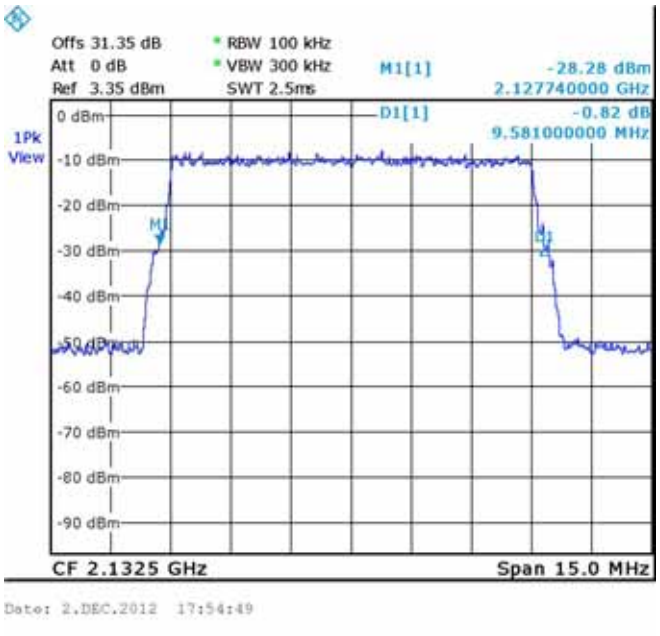


Figure 89.— LTE 64QAM (2132.5 MHz) IN

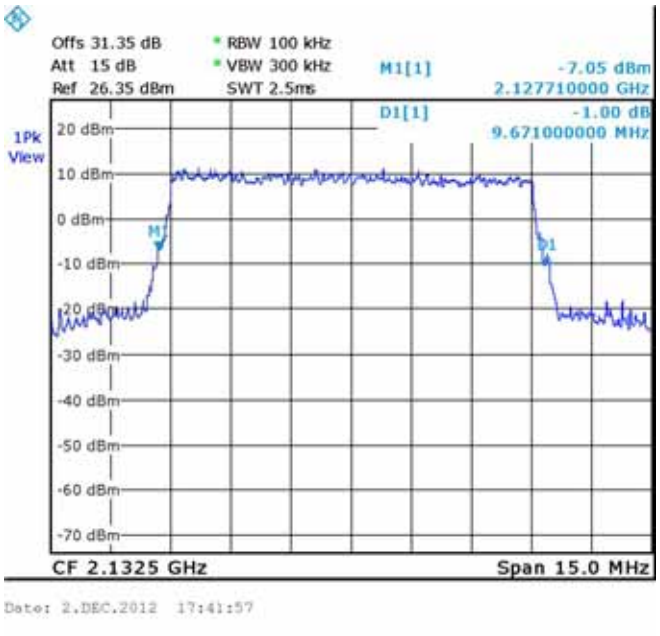


Figure 90.— LTE 64QAM (2132.5 MHz) OUT

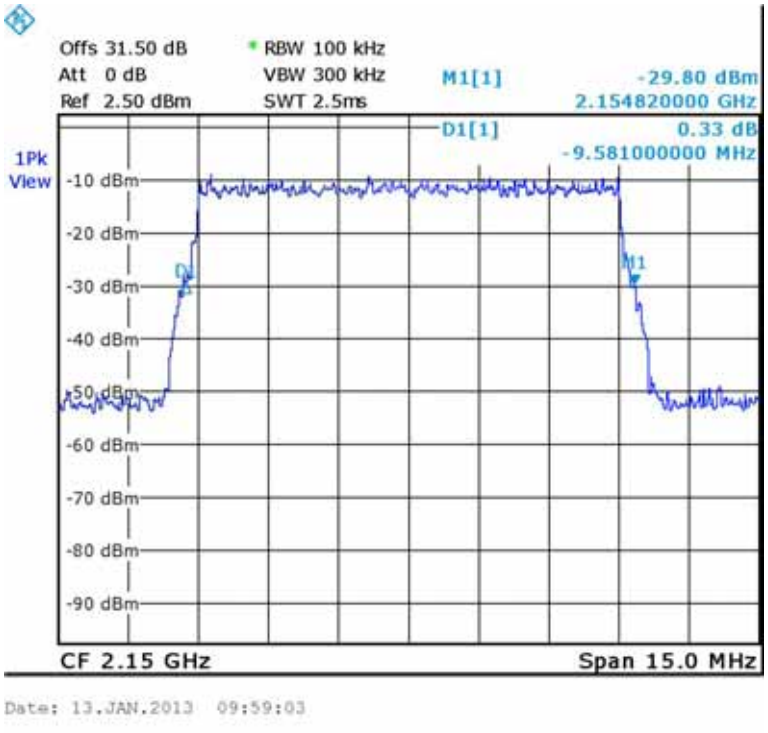


Figure 91.— LTE 64QAM (2150.0 MHz) IN

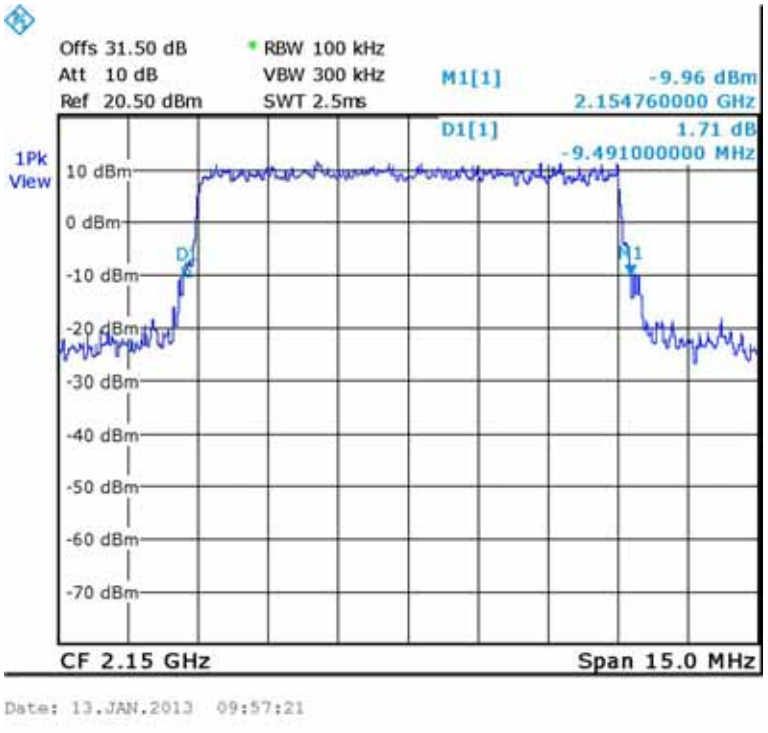


Figure 92.— LTE 64QAM (2150.0 MHz) OUT

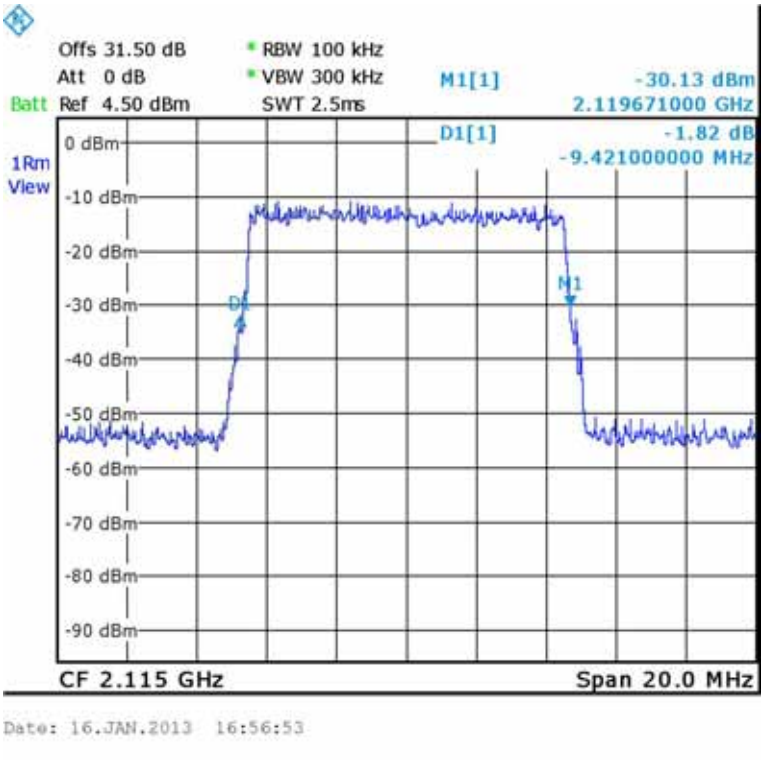


Figure 93.— LTE 16QAM (2115.0 MHz) IN

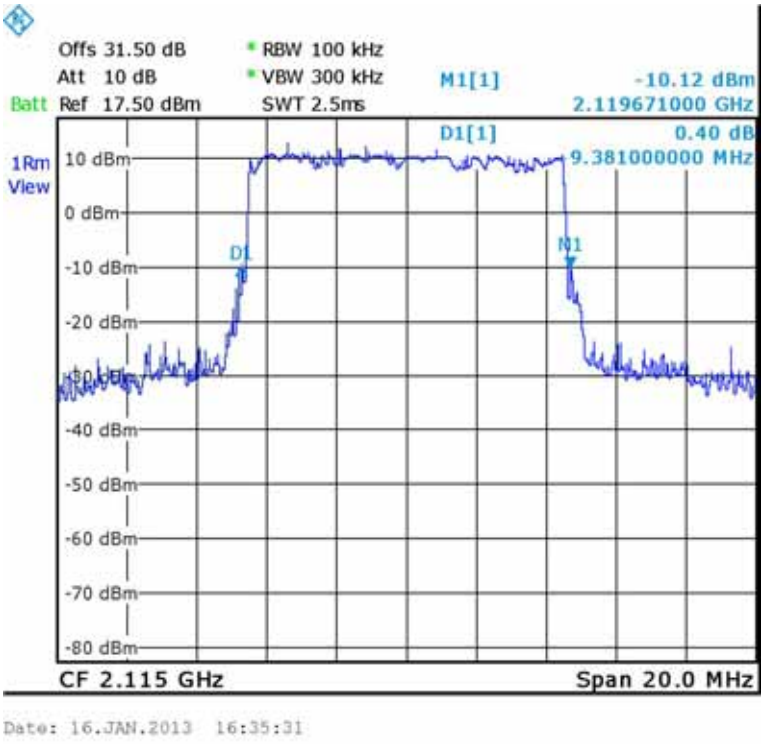


Figure 94.— LTE 16QAM (2115.0 MHz) OUT

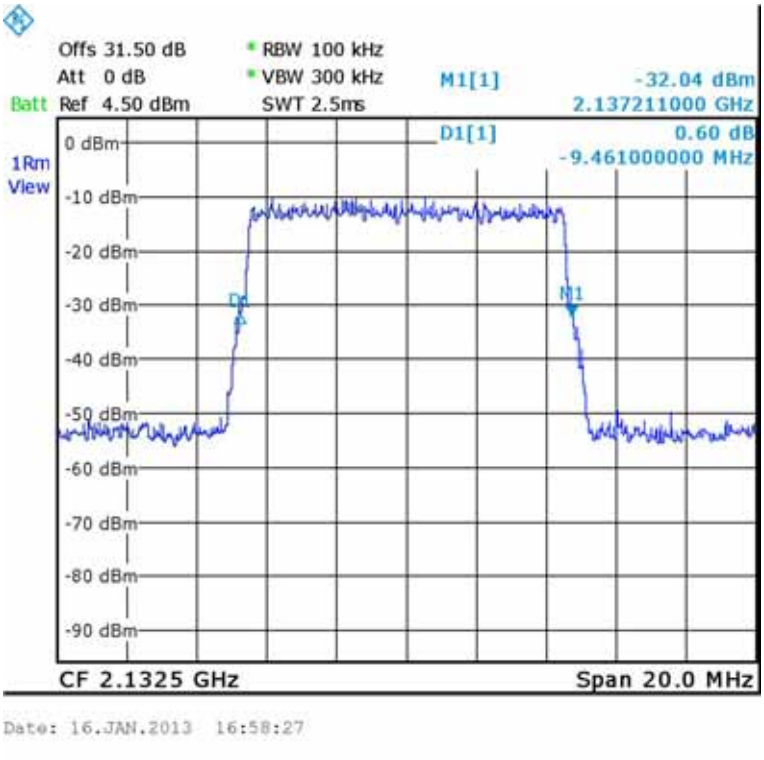


Figure 95.— LTE 16QAM (2132.5 MHz) IN

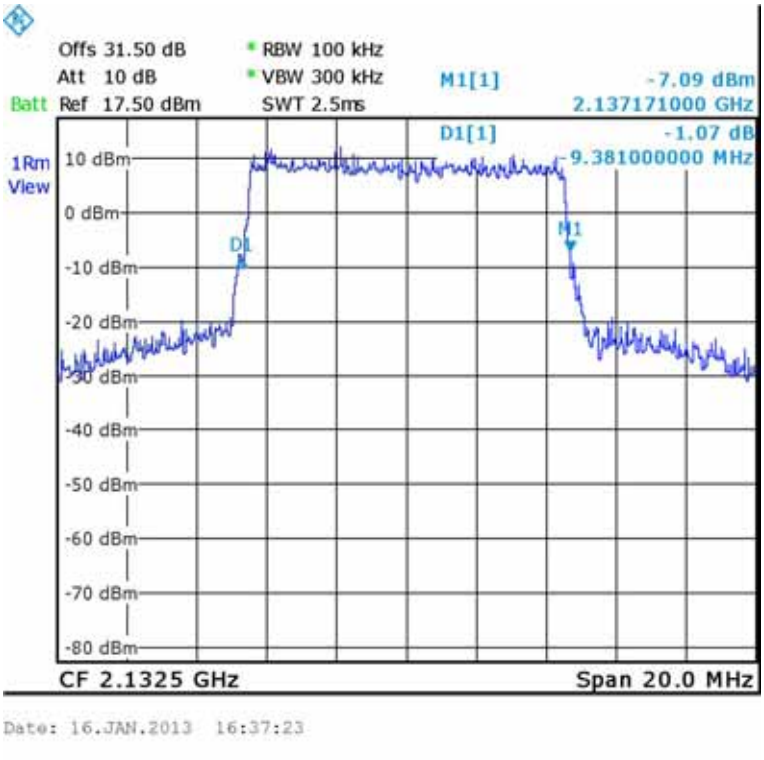


Figure 96.— LTE 16QAM (2132.5 MHz) OUT

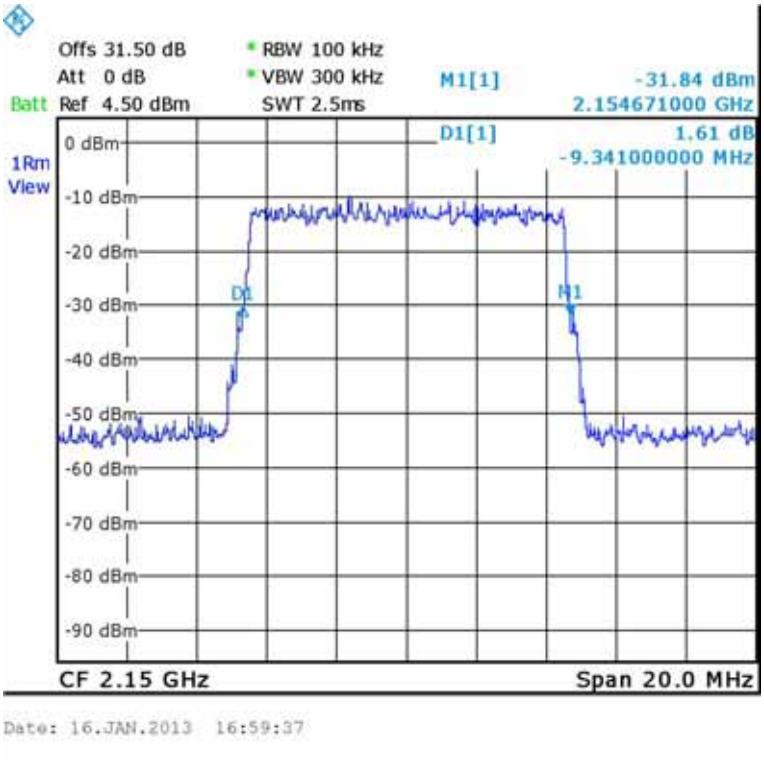


Figure 97.— LTE 16QAM (2150.0 MHz) IN

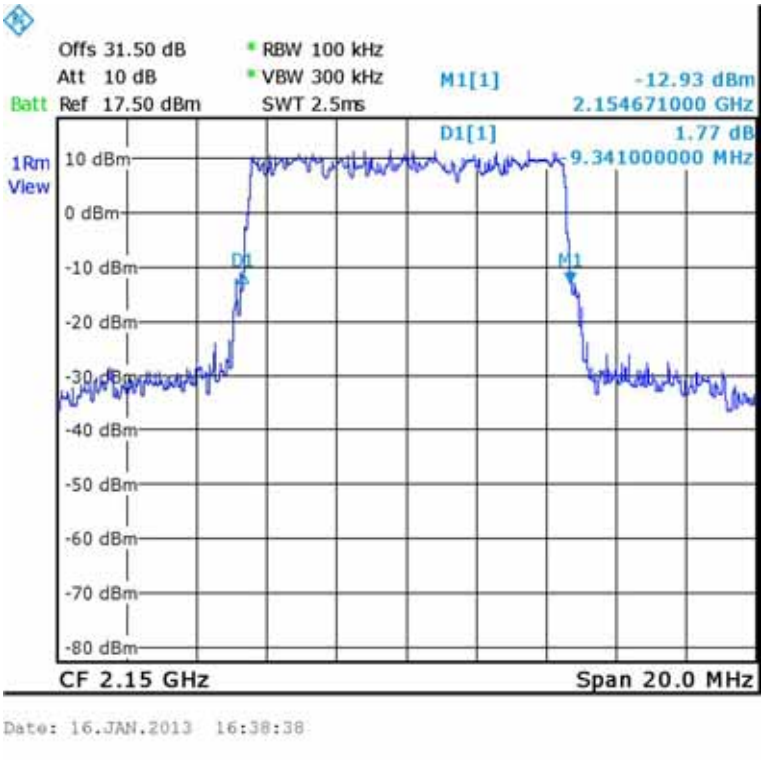


Figure 98.— LTE 16QAM (2150.0 MHz) OUT

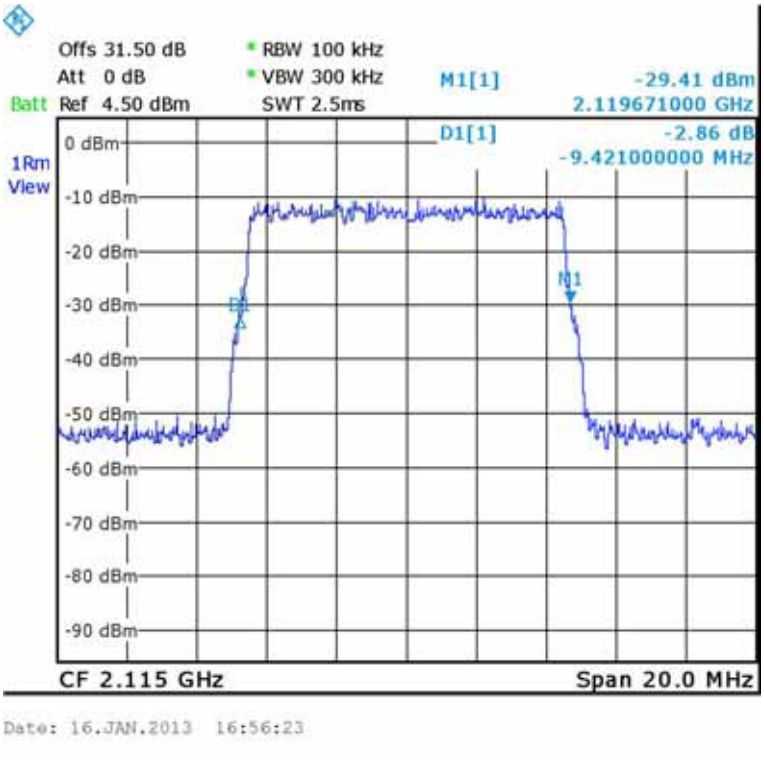


Figure 99.— LTE QPSK (2115.0 MHz) IN

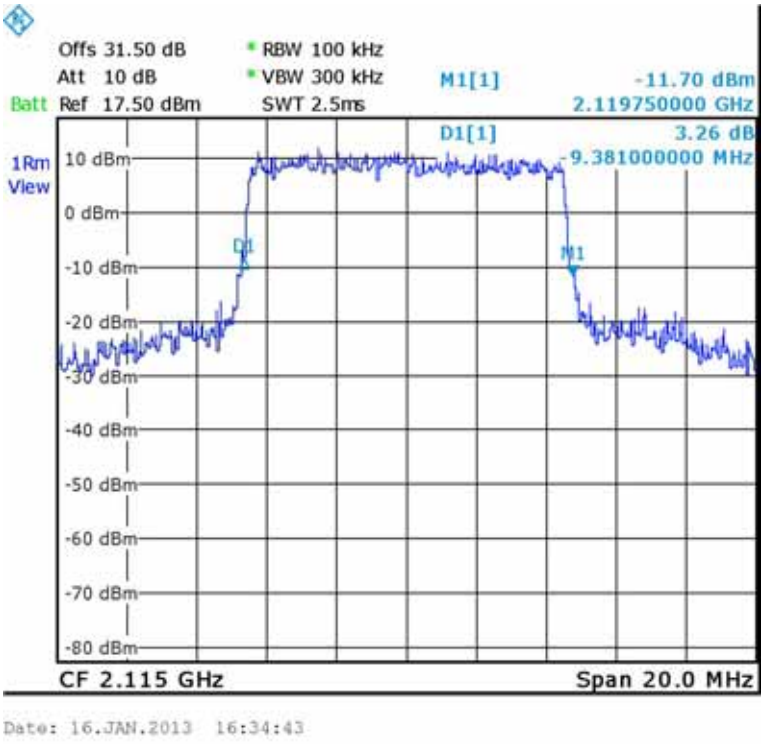


Figure 100.— LTE QPSK (2115.0 MHz) OUT

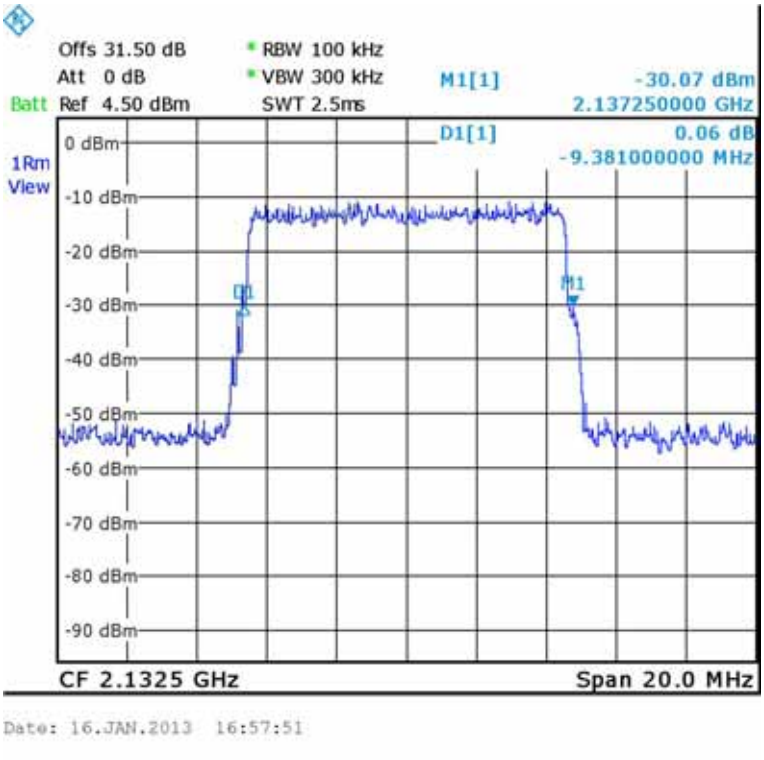


Figure 101.— LTE QPSK (2132.5 MHz) IN

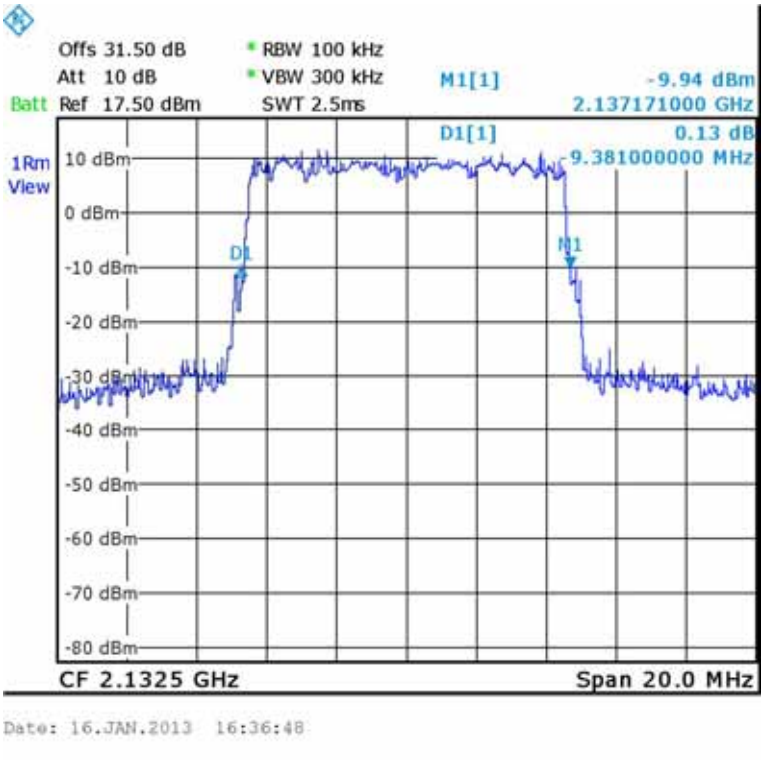


Figure 102.— LTE QPSK (2132.5 MHz) OUT

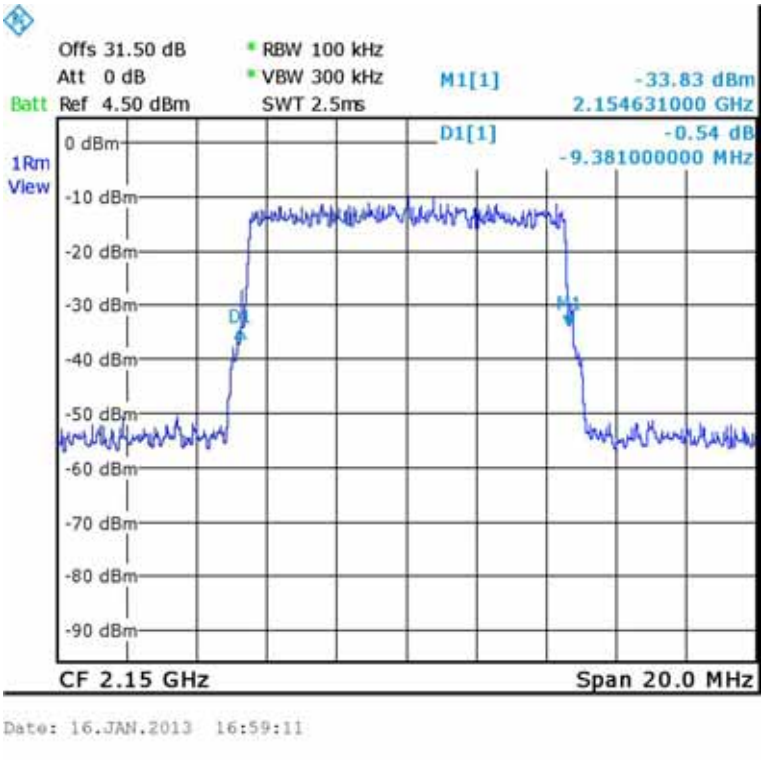


Figure 103.— LTE QPSK (2150.0 MHz) IN

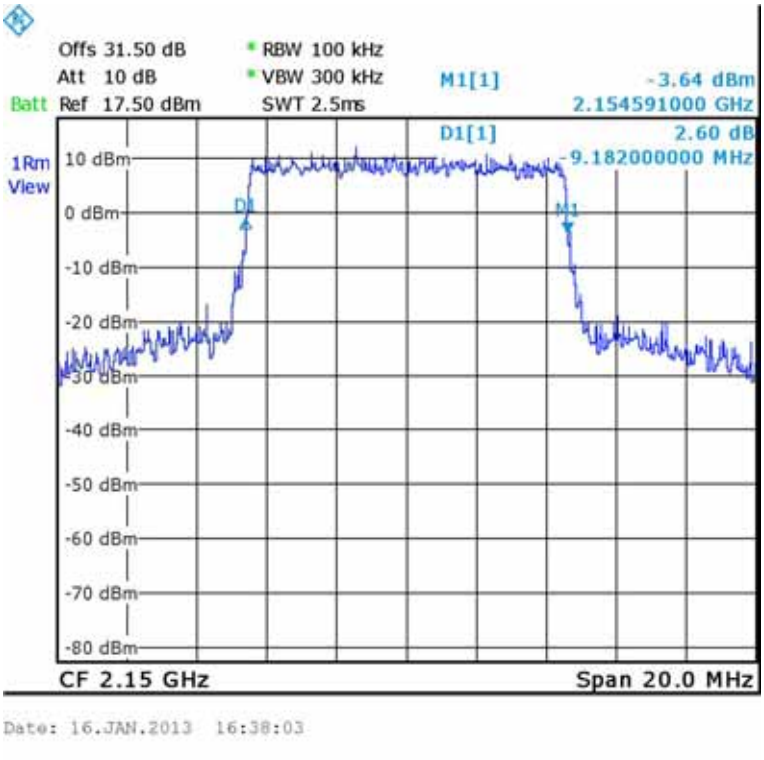


Figure 104.— LTE QPSK (2150.0 MHz) OUT

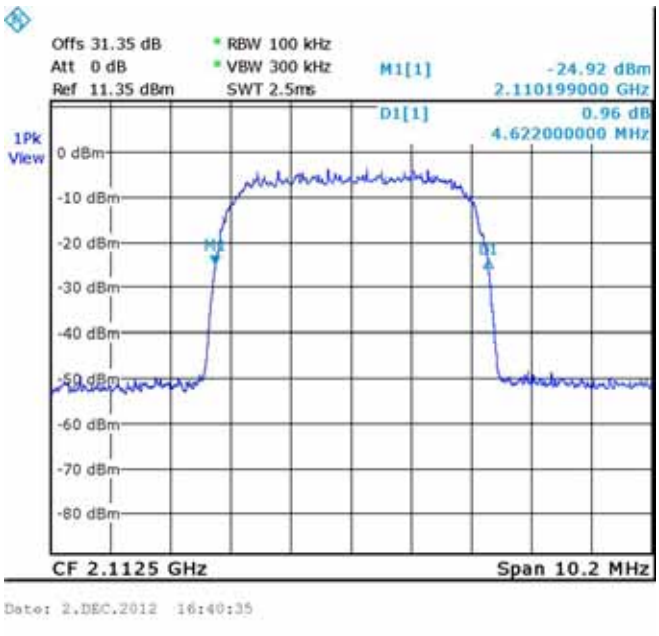


Figure 105.— W-CDMA (2112.5 MHz) IN

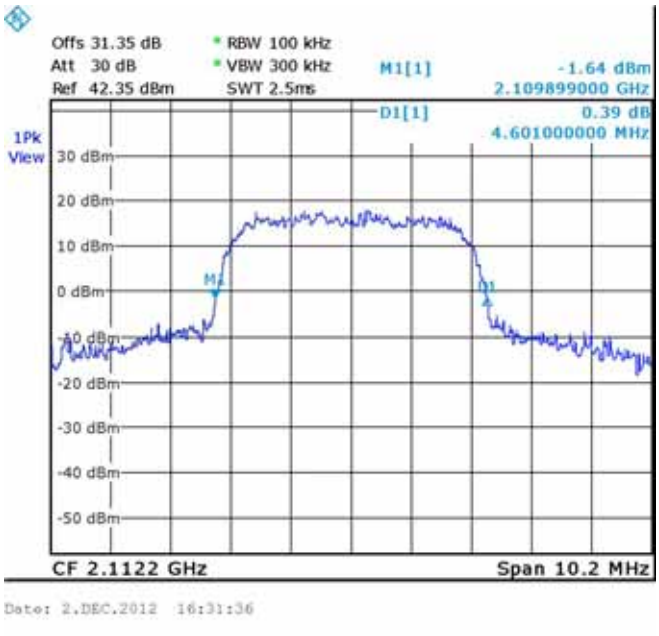


Figure 106.— W-CDMA (2112.5 MHz) OUT

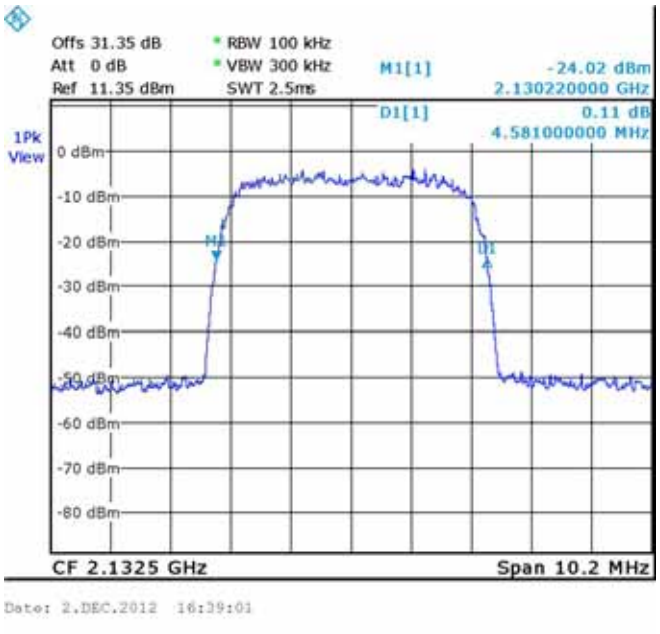


Figure 107.— W-CDMA (2132.5 MHz) IN

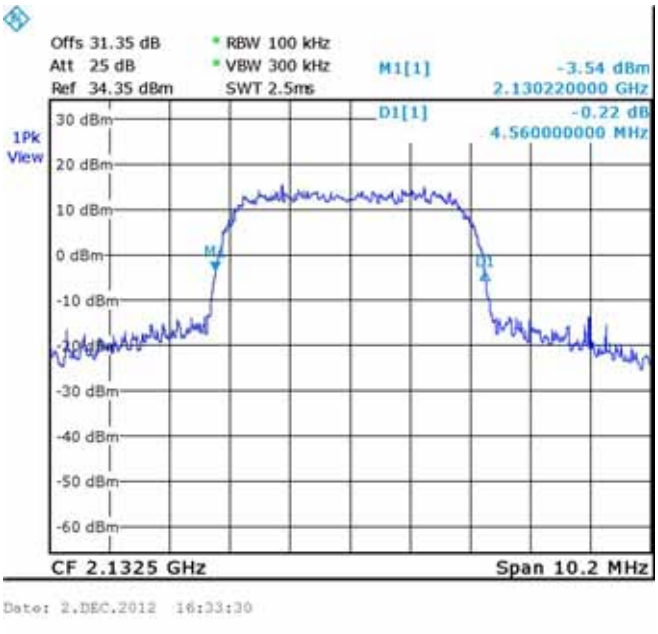


Figure 108.— W-CDMA (2132.5 MHz) OUT

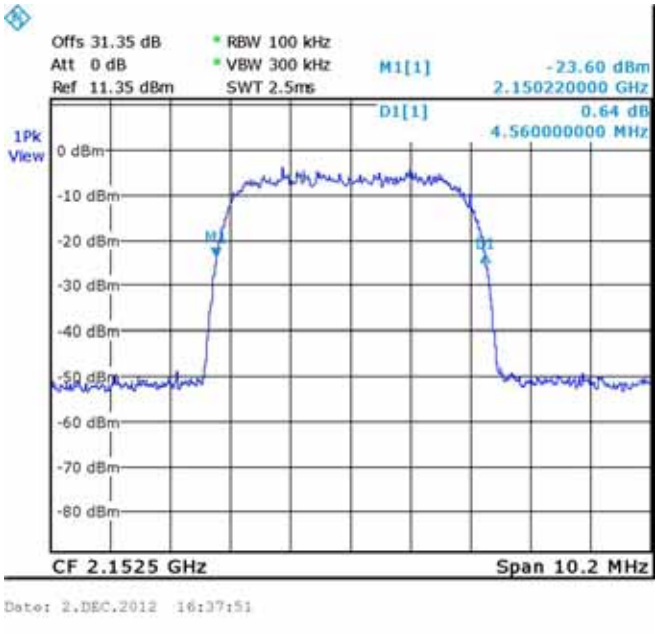


Figure 109.— W-CDMA (2152.0 MHz) IN

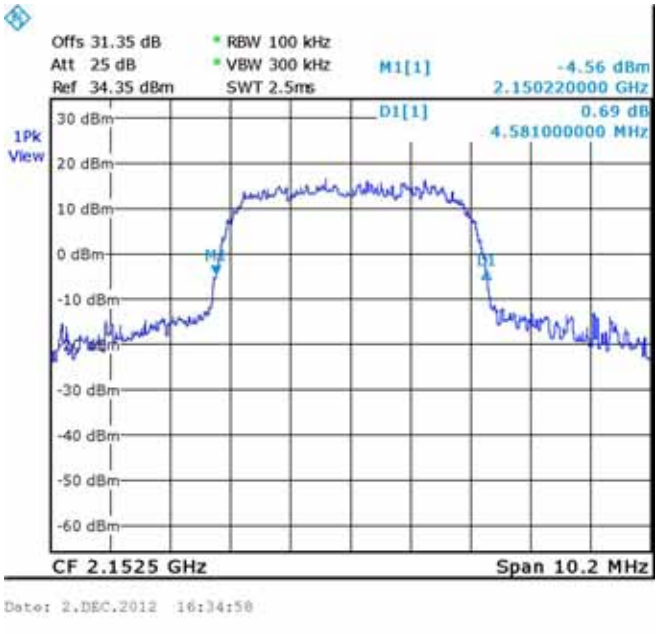


Figure 110.— W-CDMA (2152.0 MHz) OUT

10.4 Test Equipment Used.

Occupied Bandwidth

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 111 Test Equipment Used

11. Spurious Emissions at Antenna Terminals AWS

11.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (g)

11.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 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 (loss = 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 - 22.0 GHz.

11.3 Results

	Operation Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	2112.2	-24.82	-13.0	-11.82
	2132.5	-25.15	-13.0	-12.15
	2153.8	-22.03	-13.0	-9.03
LTE	2115.0	-21.20	-13.0	-8.20
	2132.5	-23.03	-13.0	-10.03
	2150.0	-24.53	-13.0	-11.53
WCDMA	2112.5	-25.37	-13.0	-12.37
	2132.5	-20.87	-13.0	-7.87
	2152.5	-23.03	-13.0	-10.03

Figure 112 Spurious Emissions at Antenna Terminals Results AWS

See additional information in Figure 113 to Figure 175.

JUDGEMENT: Passed by 7.87 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: I. Siboni

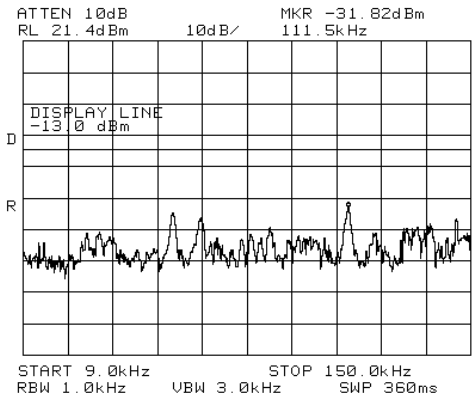


Figure 113.— 2112.20 MHz CDMA

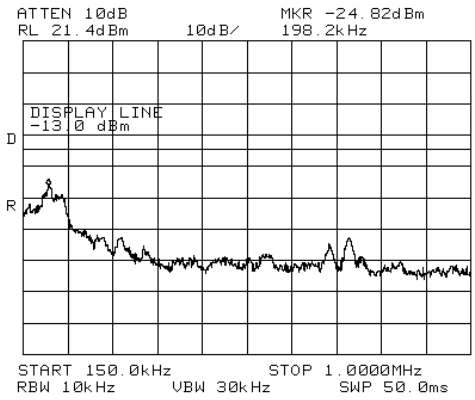


Figure 114.— 2112.20 MHz CDMA

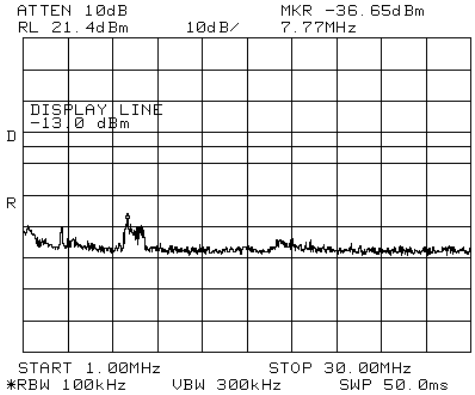


Figure 115.— 2112.20 MHz CDMA

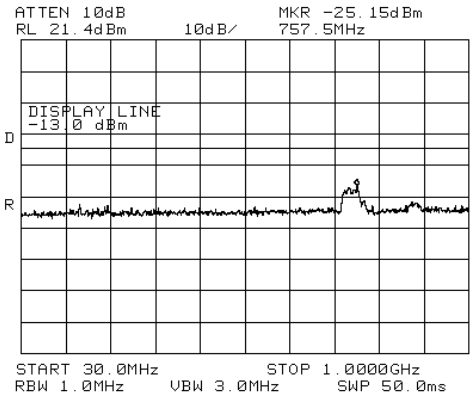


Figure 116.— 2112.20 MHz CDMA

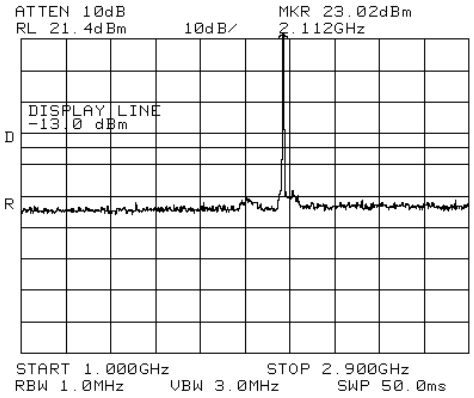


Figure 117.— 2112.20 MHz CDMA

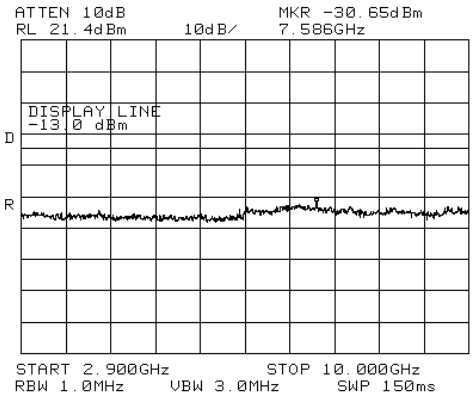


Figure 118.— 2112.20 MHz CDMA

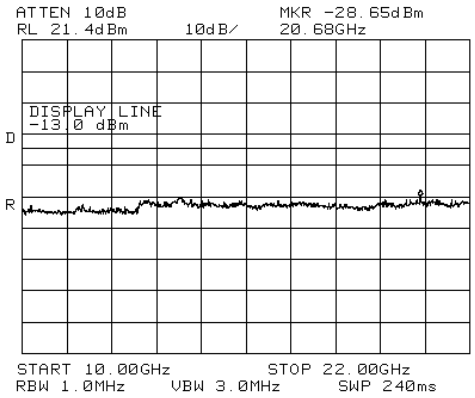


Figure 119.— 2112.20 MHz CDMA

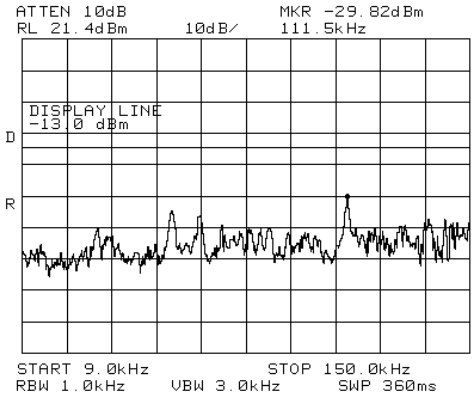


Figure 120.— 2132.50 MHz CDMA

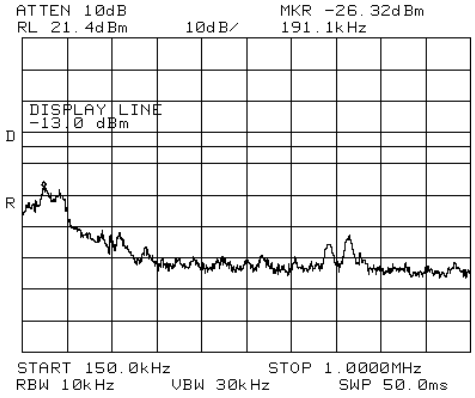


Figure 121.— 2132.50 MHz CDMA

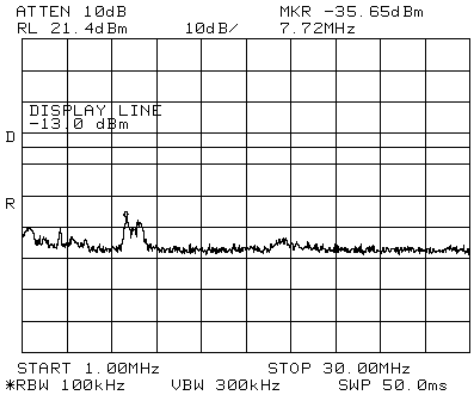


Figure 122.— 2132.50 MHz CDMA

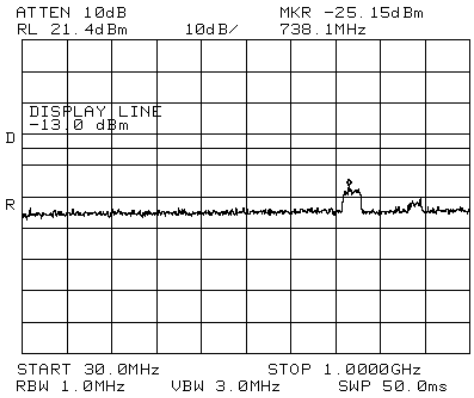


Figure 123.— 2132.50 MHz CDMA

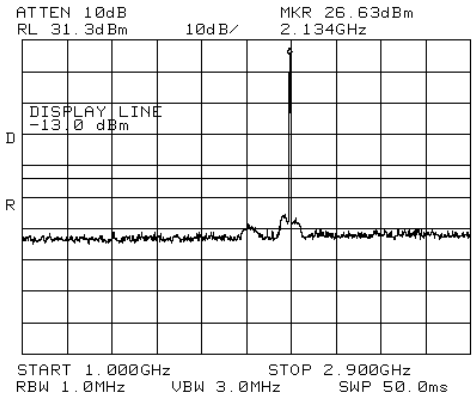


Figure 124.— 2132.50 MHz CDMA

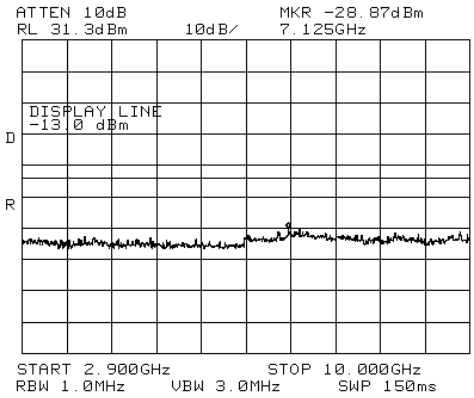


Figure 125.— 2132.50 MHz CDMA

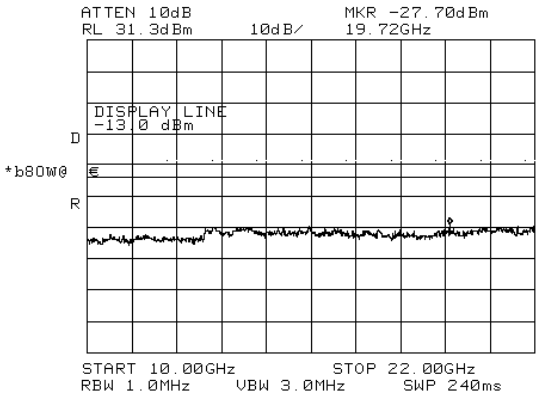


Figure 126.— 2132.50 MHz CDMA

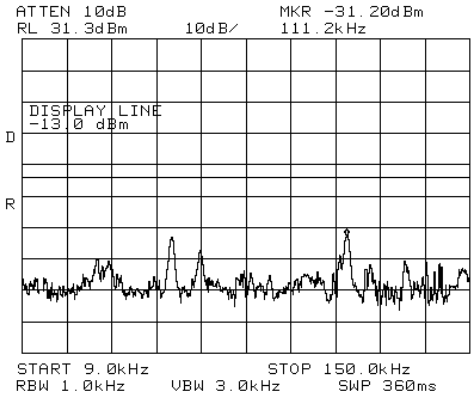


Figure 127.— 2153.80 MHz CDMA

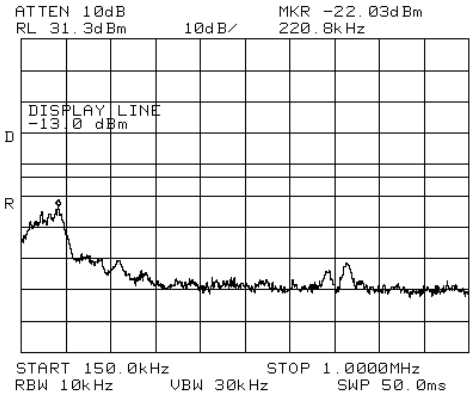


Figure 128.— 2153.80 MHz CDMA

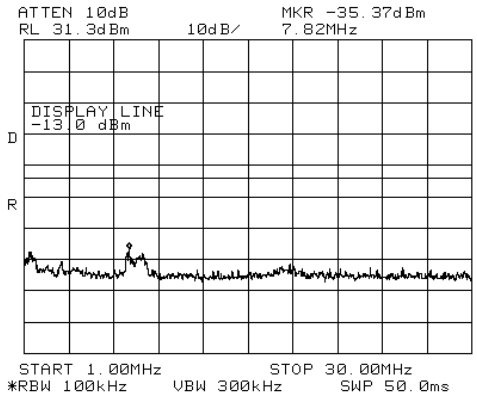


Figure 129.— 2153.80 MHz CDMA

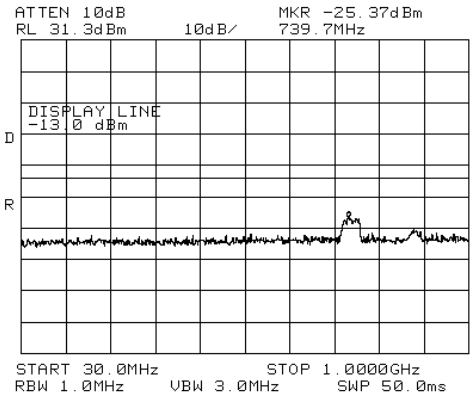


Figure 130.— 2153.80 MHz CDMA

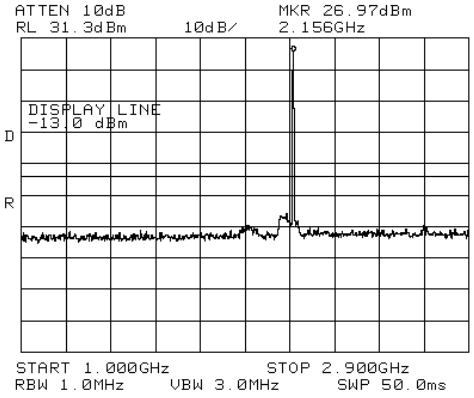


Figure 131.— 2153.80 MHz CDMA

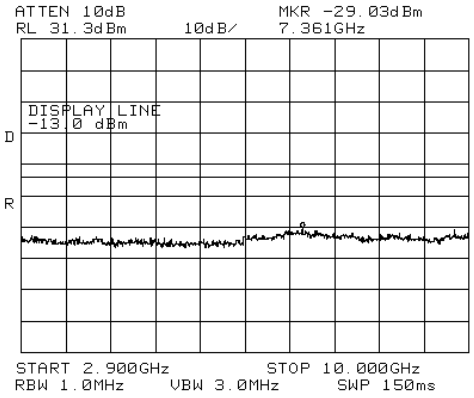


Figure 132.— 2153.80 MHz CDMA

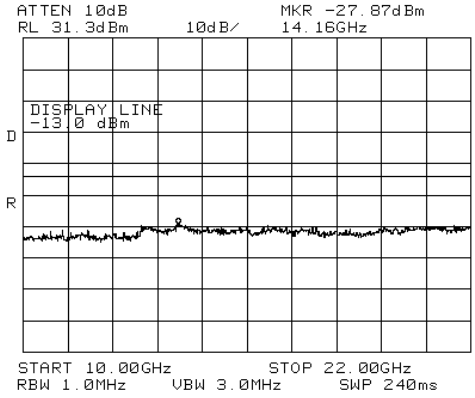


Figure 133.— 2153.80 MHz CDMA

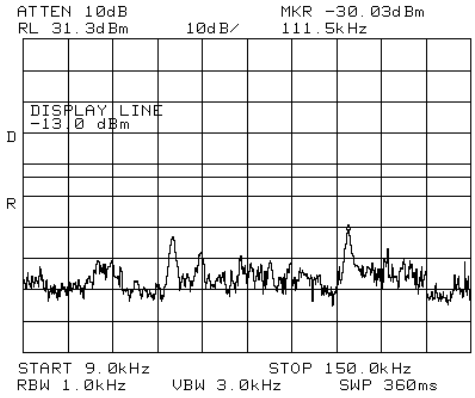


Figure 134.— 2115.00 MHz LTE

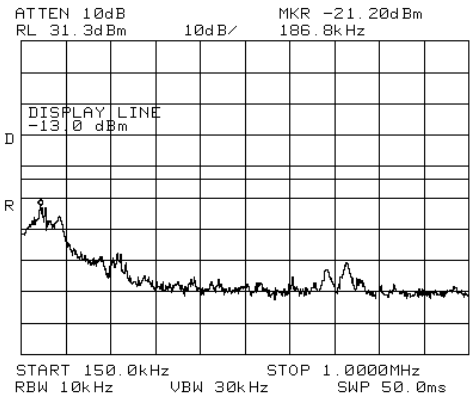


Figure 135.— 2115.00 MHz LTE

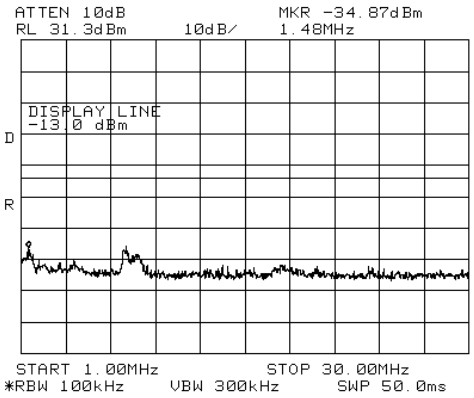


Figure 136.— 2115.00 MHz LTE

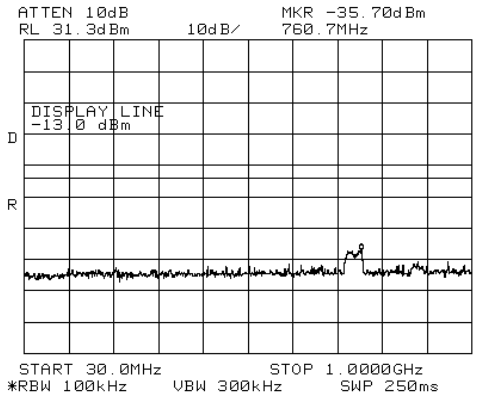


Figure 137.— 2115.00 MHz LTE

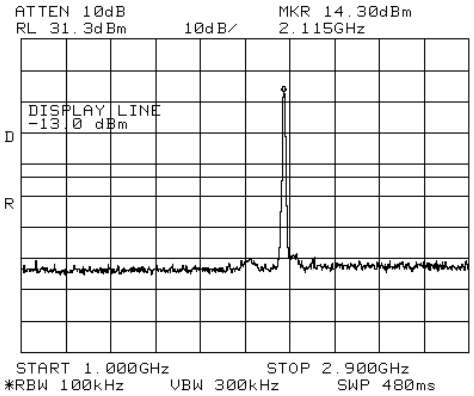


Figure 138.— 2115.00 MHz LTE

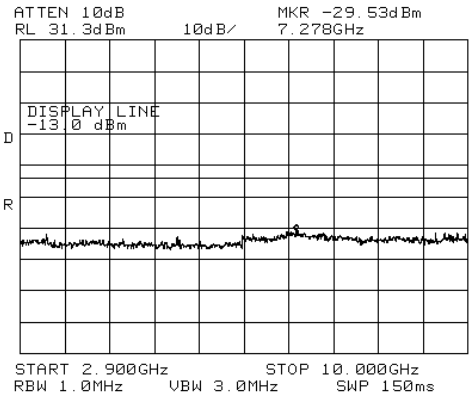


Figure 139.— 2115.00 MHz LTE

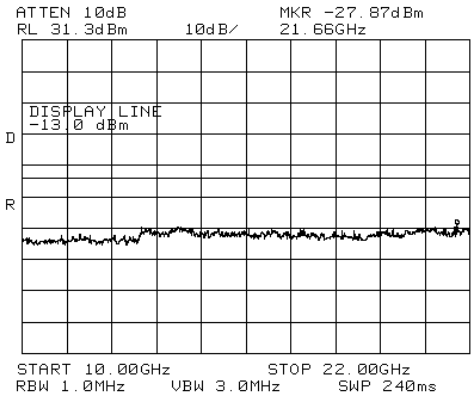


Figure 140.— 2115.00 MHz LTE

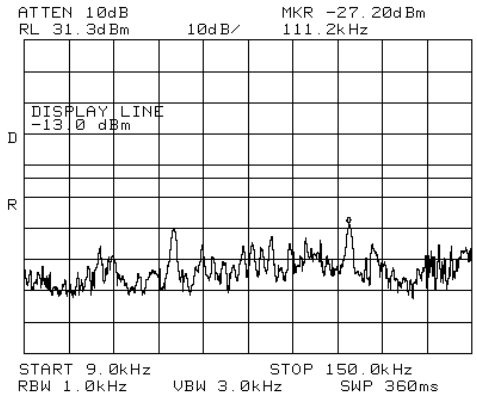


Figure 141.— 2132.50 MHz LTE

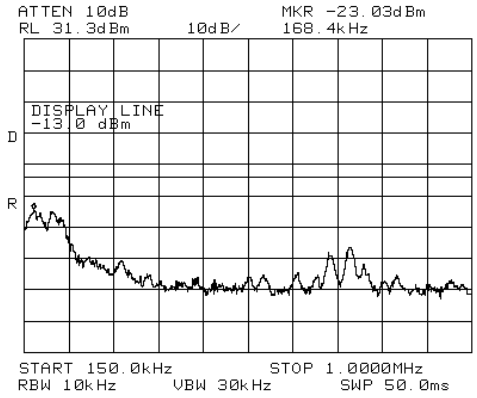


Figure 142.— 2132.50 MHz LTE

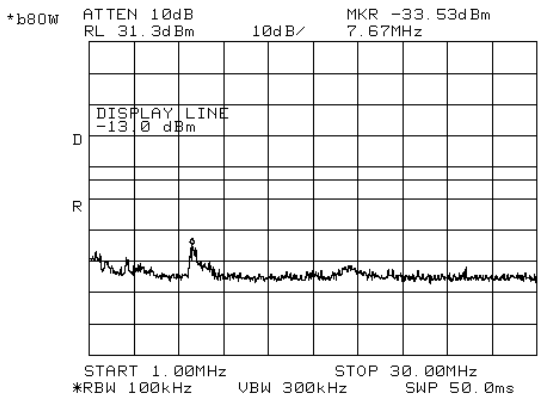


Figure 143.— 2132.50 MHz LTE

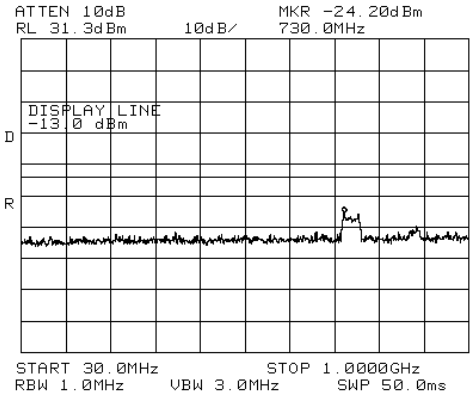


Figure 144.— 2132.50 MHz LTE

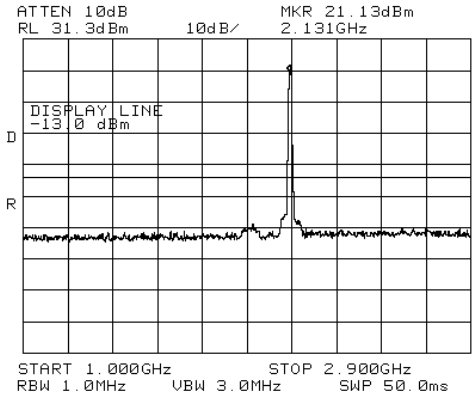


Figure 145.— 2132.50 MHz LTE

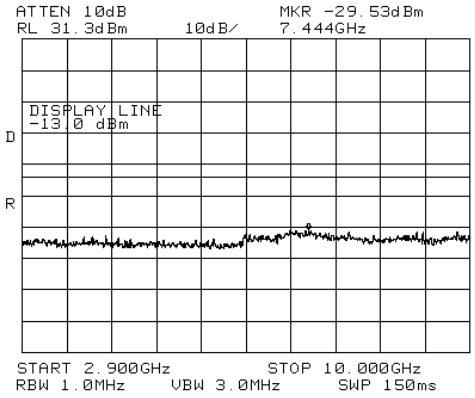


Figure 146.— 2132.50 MHz LTE

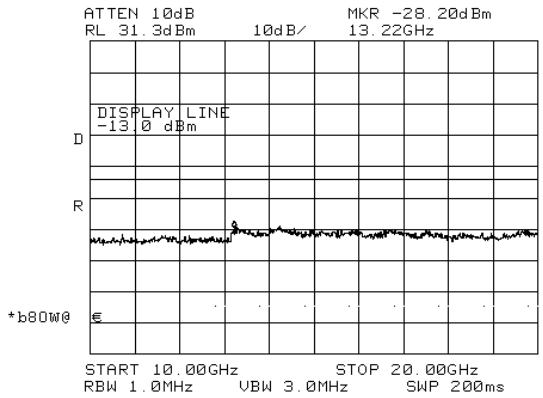


Figure 147.— 2132.50 MHz LTE

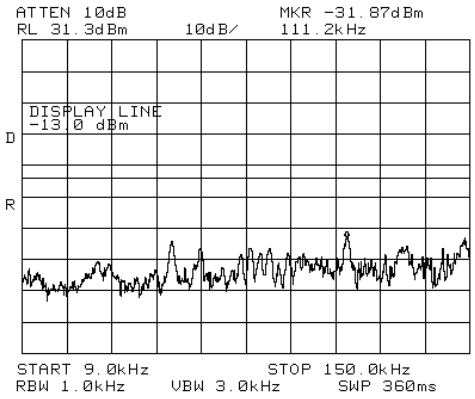


Figure 148.— 2150.00 MHz LTE

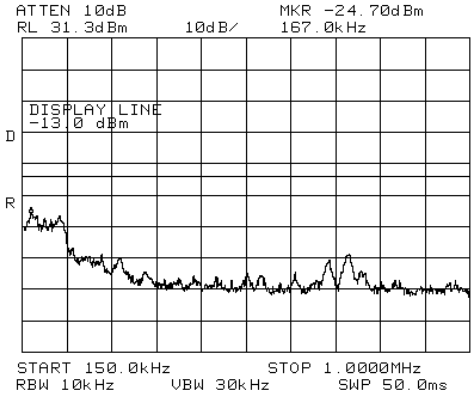


Figure 149.— 2150.00 MHz LTE

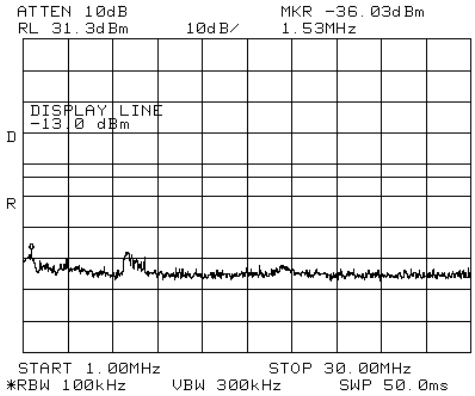


Figure 150.— 2150.00 MHz LTE

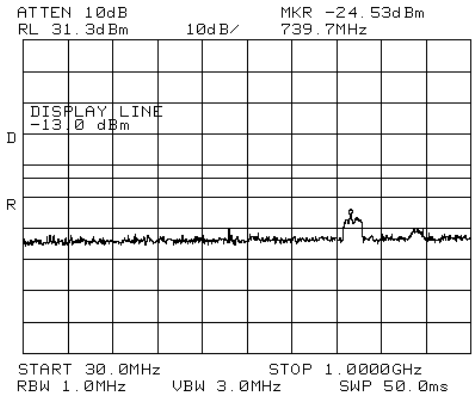


Figure 151.— 2150.00 MHz LTE

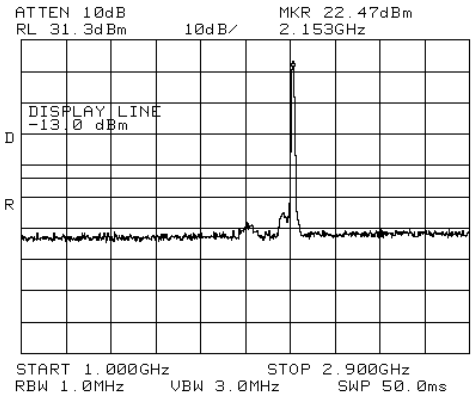


Figure 152.— 2150.00 MHz LTE

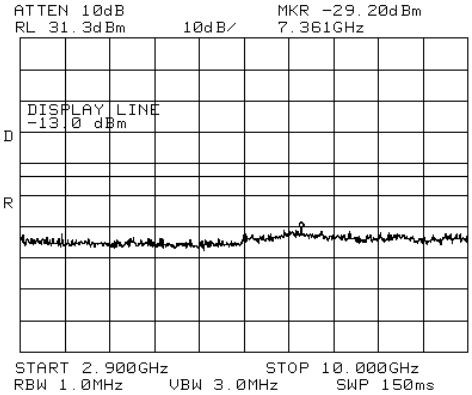


Figure 153.— 2150.00 MHz LTE

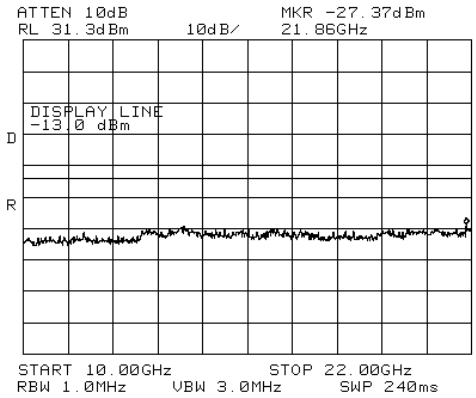


Figure 154.— 2150.00 MHz LTE

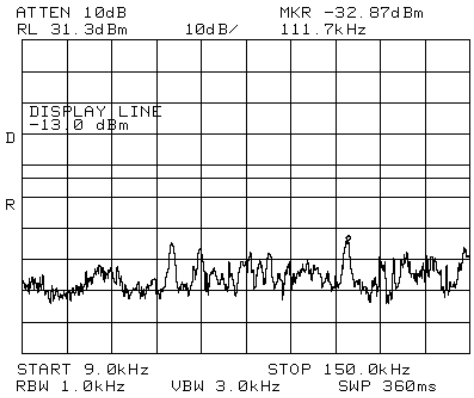


Figure 155.— 2112.50 MHz W-CDMA

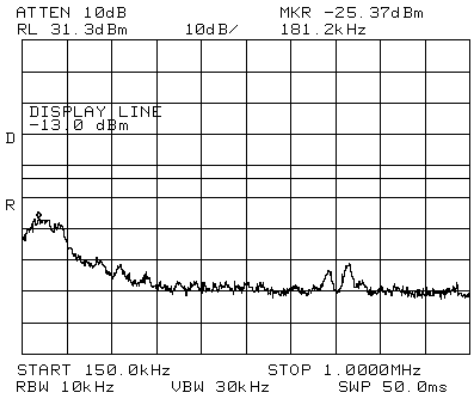


Figure 156.— 2112.50 MHz W-CDMA

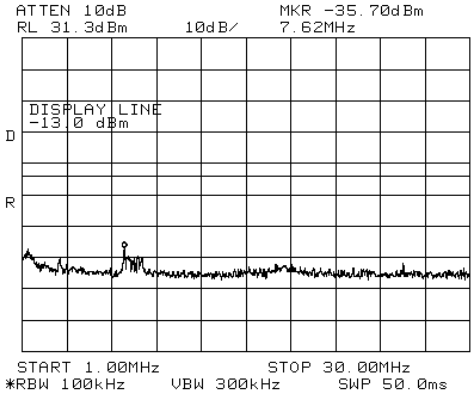


Figure 157.— 2112.50 MHz W-CDMA

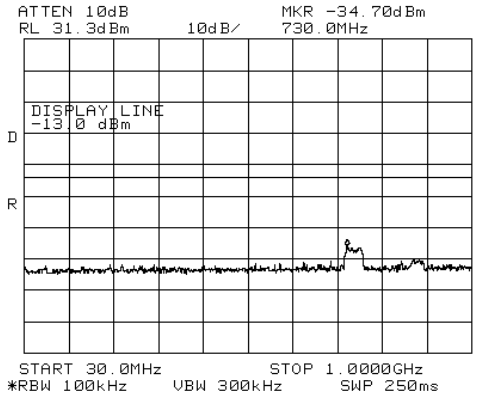


Figure 158.— 2112.50 MHz W-CDMA

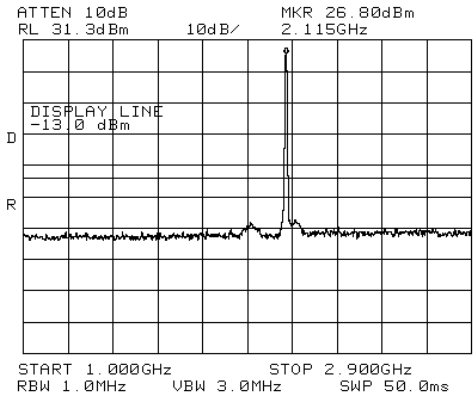


Figure 159.— 2112.50 MHz W-CDMA

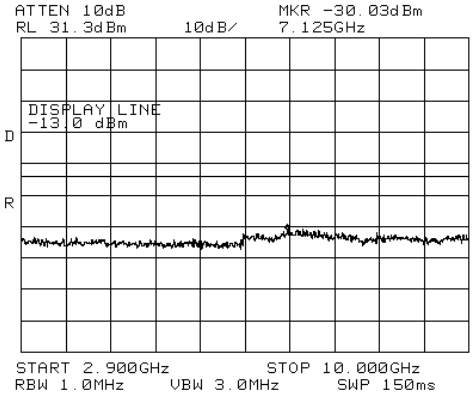


Figure 160.— 2112.50 MHz W-CDMA

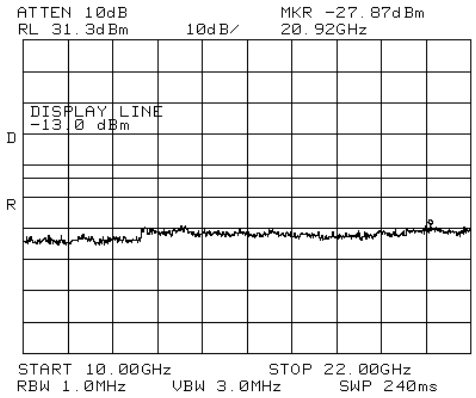


Figure 161.— 2112.50 MHz W-CDMA

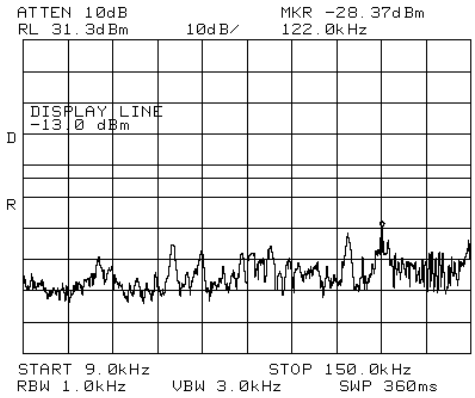


Figure 162.— 2132.50 MHz W-CDMA

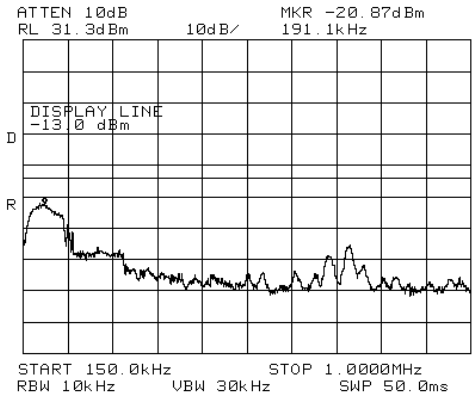


Figure 163.— 2132.50 MHz W-CDMA

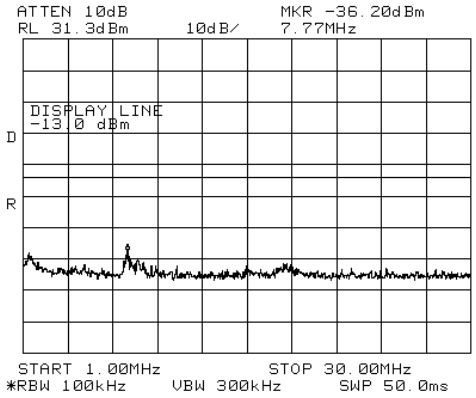


Figure 164.— 2132.50 MHz W-CDMA

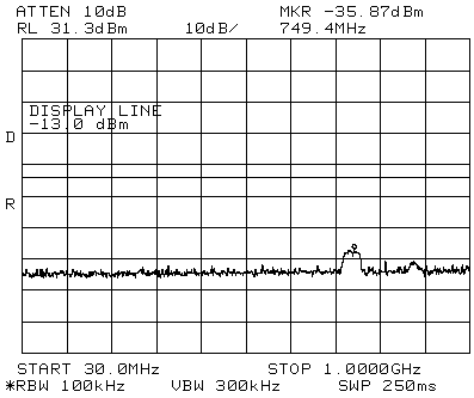


Figure 165.— 2132.50 MHz W-CDMA

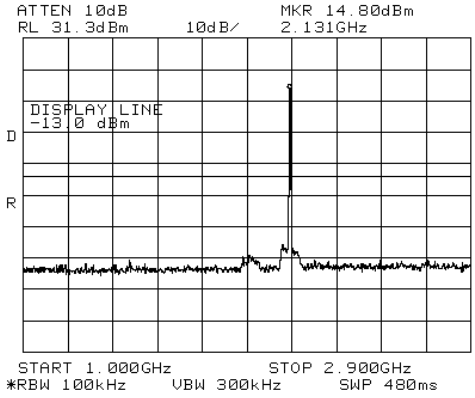


Figure 166.— 2132.50 MHz W-CDMA

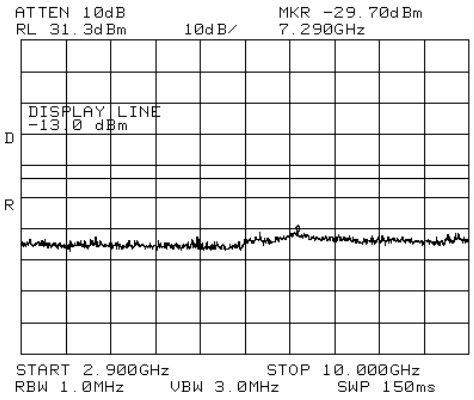


Figure 167.— 2132.50 MHz W-CDMA

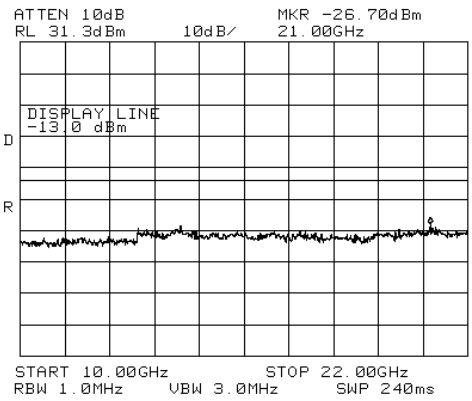


Figure 168.— 2132.50 MHz W-CDMA

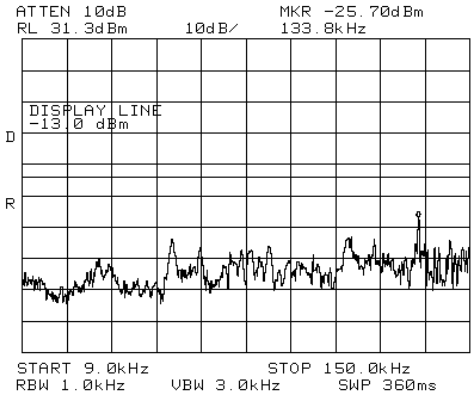


Figure 169.— 2152.50 MHz W-CDMA

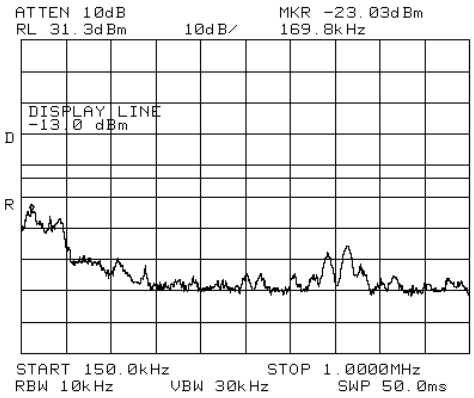


Figure 170.— 2152.50 MHz W-CDMA

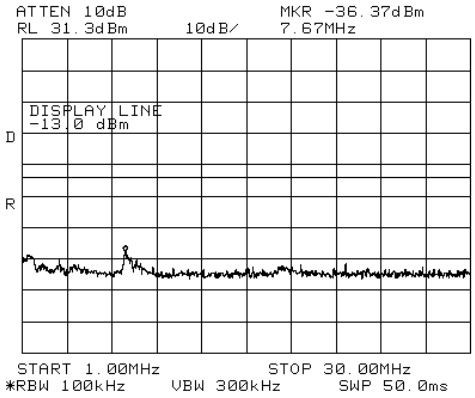


Figure 171.— 2152.50 MHz W-CDMA

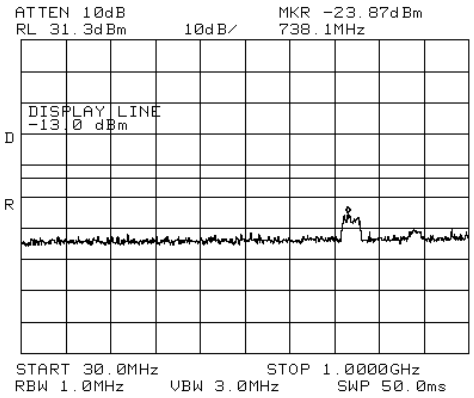


Figure 172.— 2152.50 MHz W-CDMA

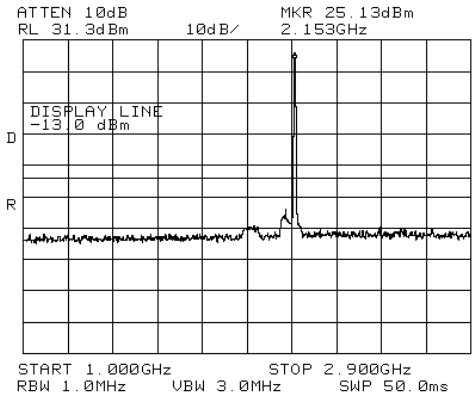


Figure 173.— 2152.50 MHz W-CDMA

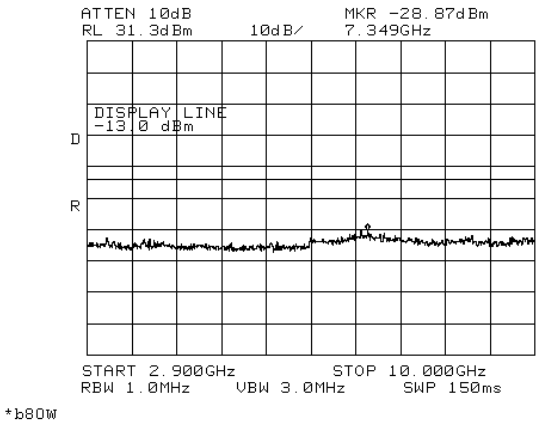


Figure 174.— 2152.50 MHz W-CDMA

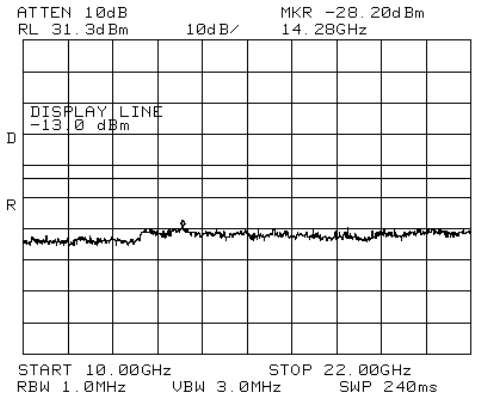


Figure 175.— 2152.50 MHz W-CDMA

11.4 Test Equipment Used.

Spurious Emissions at Antenna Terminals AWS

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 176 Test Equipment Used

12. Band Edge Spectrum AWS

12.1 Test Specification

FCC Part 27, Subpart C, Section 27.53 (m 4-6)

12.2 Test procedure

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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 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 (loss = 31.35 dB).

12.3 Test Results

Modulation	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
CDMA	2112.2	2110.00	-26.22	-13.0	-13.22
CDMA	2153.8	2155.00	-17.53	-13.0	-4.53
LTE 64QAM	2115.0	2110.00	-19.54	-13.0	-6.54
LTE 64QAM	2150.0	2155.00	-23.20	-13.0	-10.20
LTE 16QAM	2115.0	2110.00	-23.31	-13.0	-10.31
LTE 16QAM	2150.0	2155.00	-24.81	-13.0	-11.81
LTE QPSK	2115.0	2110.00	-27.79	-13.0	-14.79
LTE QPSK	2150.0	2155.00	-24.91	-13.0	-11.91
W-CDMA	2112.5	2110.00	-16.96	-13.0	-3.96
W-CDMA	2152.5	2155.00	-22.16	-13.0	-9.16

Figure 177 Band Edge Spectrum Results AWS

See additional information in Figure 178 to Figure 187.

JUDGEMENT: Passed by 3.96 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.013

Typed/Printed Name: I. Siboni

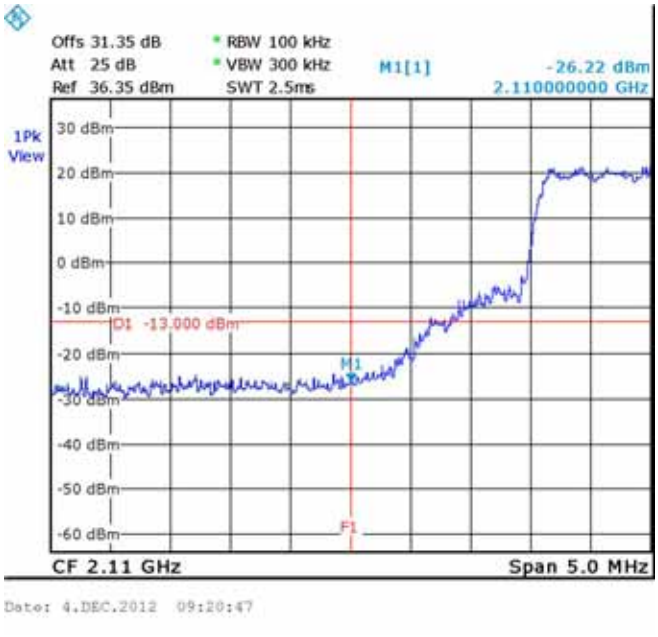


Figure 178.— CDMA 2112.20 MHz

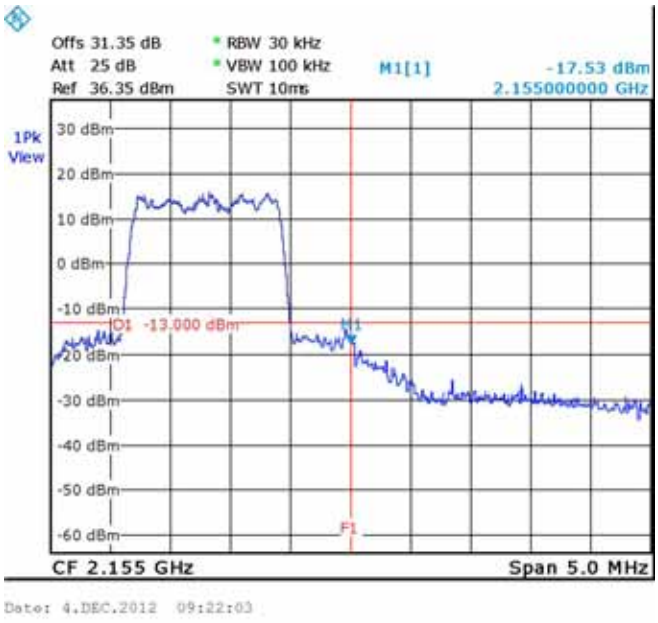


Figure 179.— CDMA 2153.80 MHz

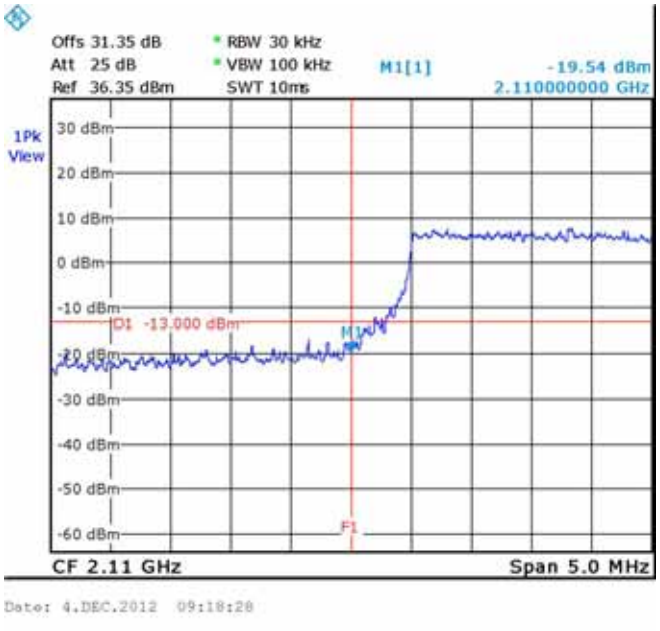


Figure 180.— LTE 64QAM 2115.00 MHz

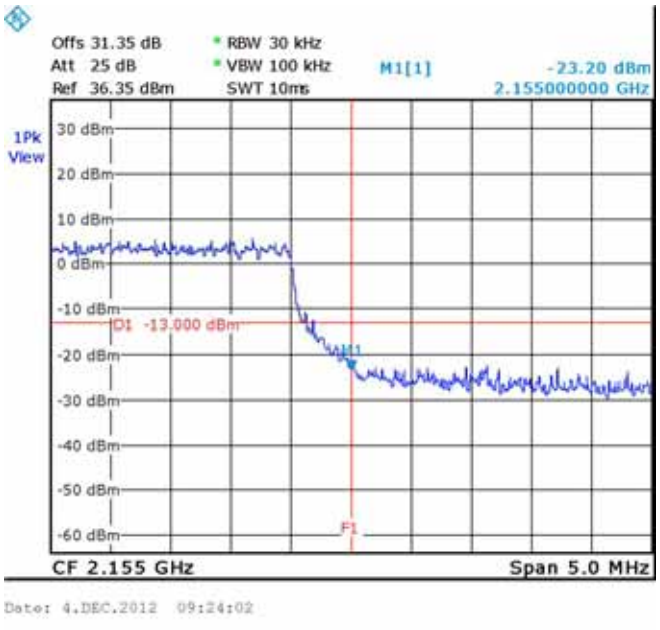


Figure 181.— LTE 64QAM 2150.00 MHz

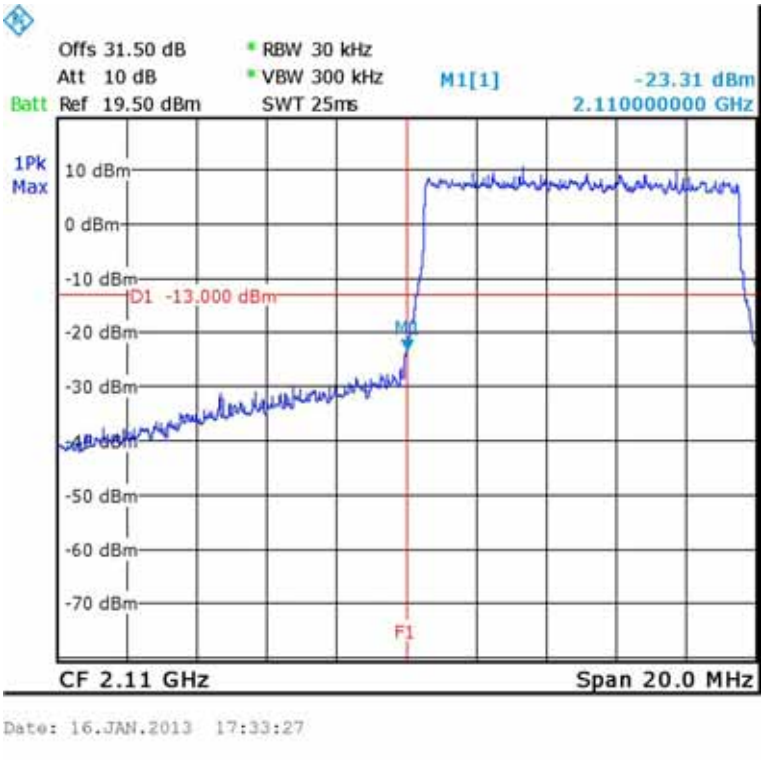


Figure 182.— LTE 16QAM 2115.00 MHz

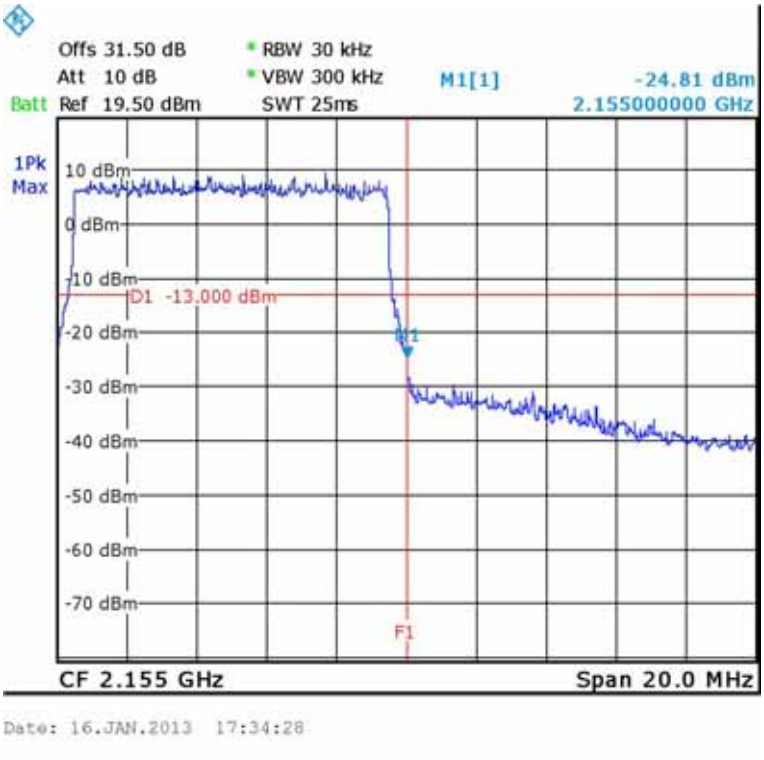


Figure 183.— LTE 16QAM 2150.00 MHz

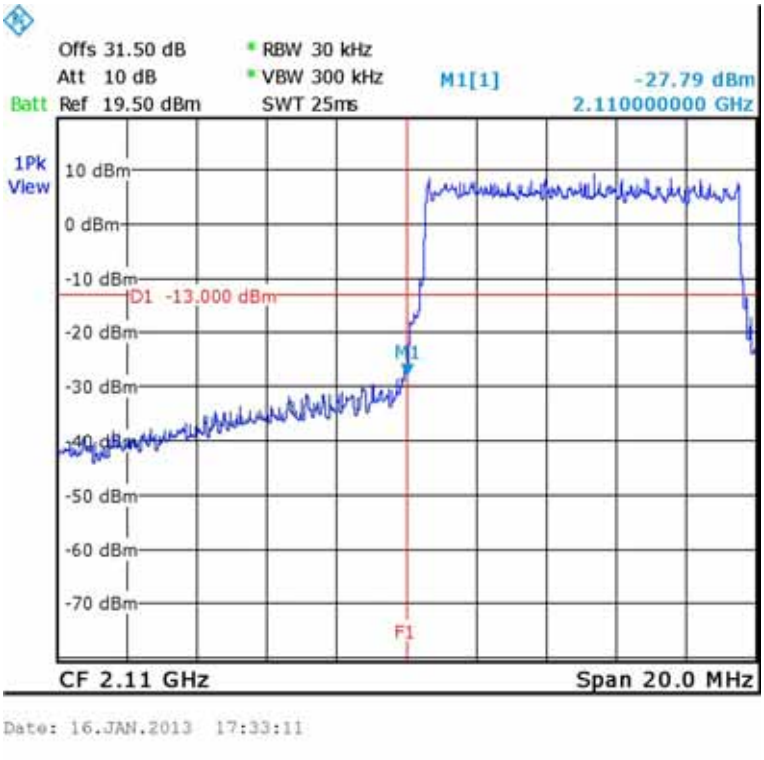


Figure 184.— LTE QPSK 2115.00 MHz

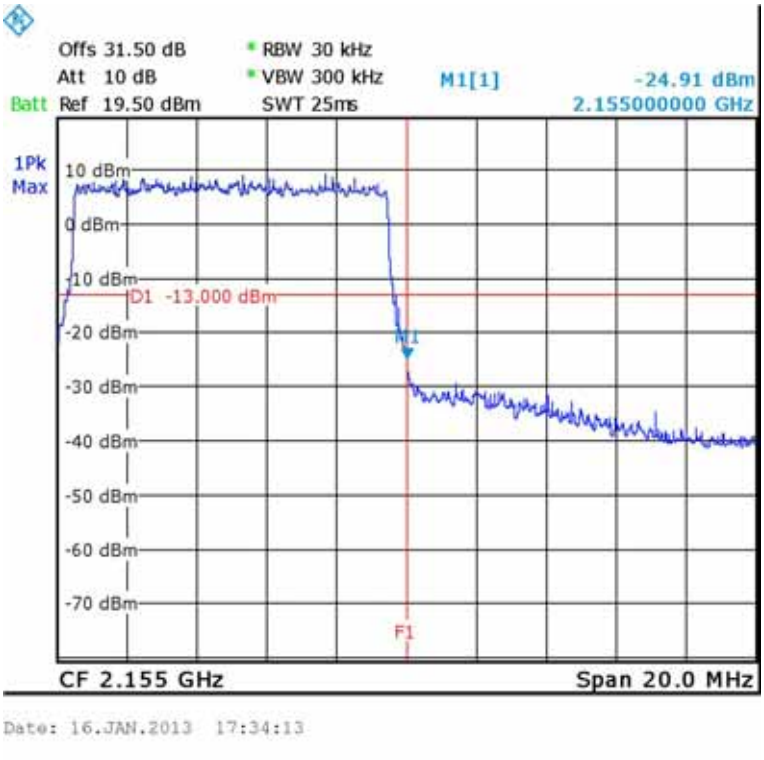


Figure 185.— LTE QPSK 2150.00 MHz

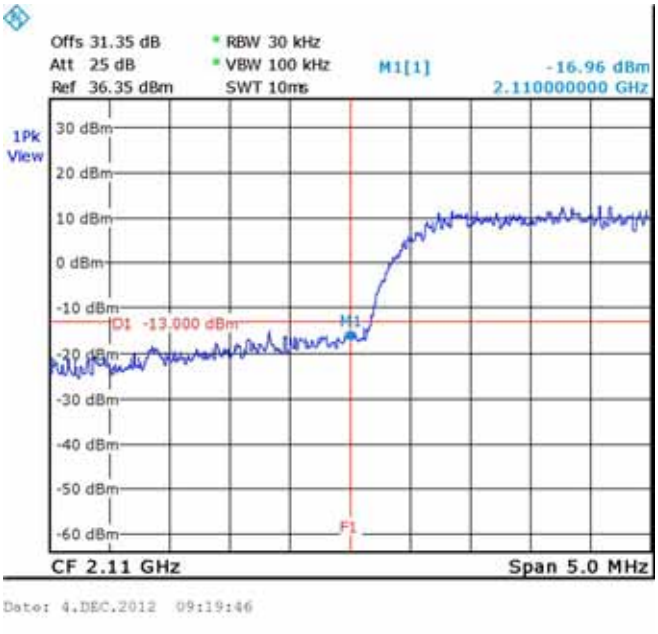


Figure 186.— W-CDMA 2112.50 MHz

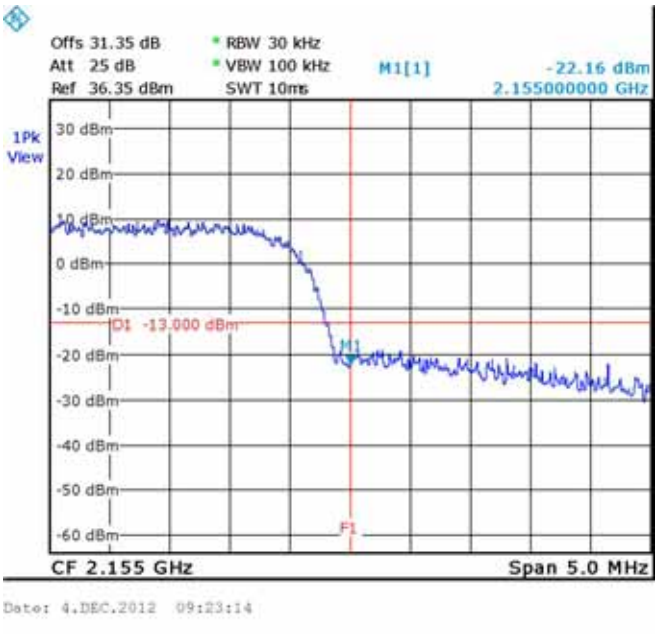


Figure 187.— W-CDMA 2152.50 MHz

12.4 Test Equipment Used.

Band Edge Spectrum AWS

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 188 Test Equipment Used

13. Spurious Radiated Emission AWS

13.1 Test Specification

FCC, Part 27, Subpart C Section 27.53 (g)

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 (2110-2155 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 frequency range 9 kHz-20 GHz was scanned, and the list of the highest emissions was verified and updated accordingly.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

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

13.3 Test Results

JUDGEMENT: Passed by 14.5 dB

The E.U.T met the requirements of the FCC, Part 27, Subpart C, Section 27.53 (g) specifications.

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: I. Siboni

Carrier Channel (MHz)	Freq. (MHz)	Antenna Pol.	Maximum Peak Level (dBµV/m)	Signal Generator RF Output (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Effective Radiated Power Level (dBm)	Spec. (dBm)	Margin (dB)
2111.20	4222.4	V	66.4	-30.0	11.2	9.5	-31.7	-13.0	-18.7
2111.20	4222.4	H	66.7	-30.1	11.2	8.6	-32.7	-13.0	-19.7
2135.00	4270	V	68.4	-27.5	11.2	9.5	-29.2	-13.0	-16.2
2135.00	4270	H	71.3	-25.3	11.2	8.6	-27.9	-13.0	-14.9
2153.80	4307.6	V	70.1	-25.8	11.2	9.5	-27.5	-13.0	-14.5
2153.80	4307.6	H	70.4	-26.2	11.2	8.6	-28.8	-13.0	-15.8

13.4 Test Instrumentation Used, Radiated Measurements AWS

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 = 31.5 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 - 22.0 GHz.

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

LTE 747 MHz QPSK 0 dBm

CELL 811 MHz GSM 00 dBm

PCS 1960 MHz CW 00 dBm

AWS: 2135 MHz W-CDMA 00 dBm

The frequency range of 9 kHz – 26.0GHz was scanned for unwanted signals.

14.2 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 20.01.13

Typed/Printed Name: I. Siboni

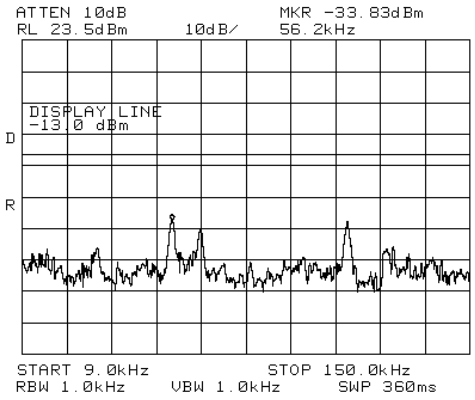


Figure 189 Intermodulation

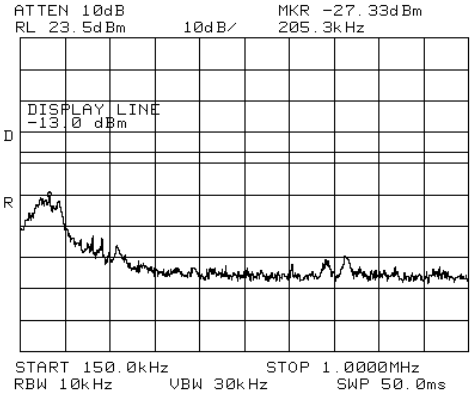


Figure 190 Intermodulation

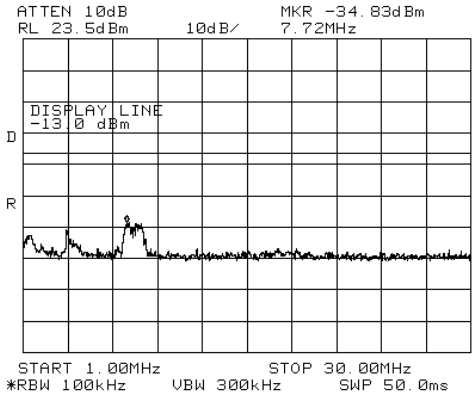


Figure 191 Intermodulation

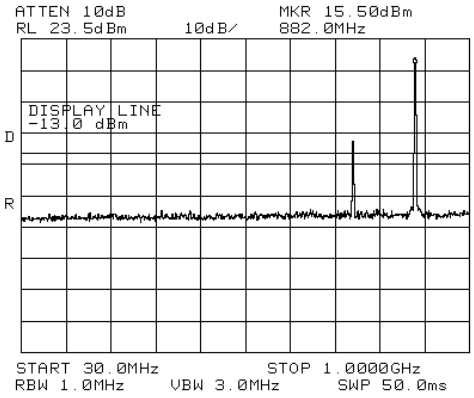


Figure 192 Intermodulation

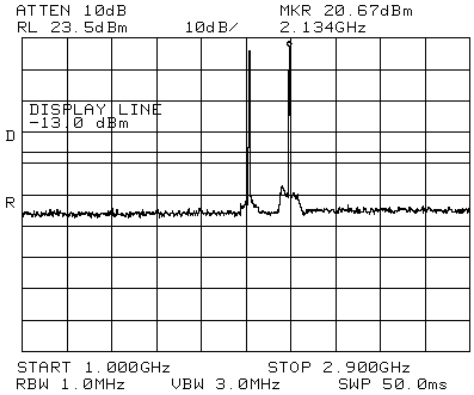


Figure 193 Intermodulation

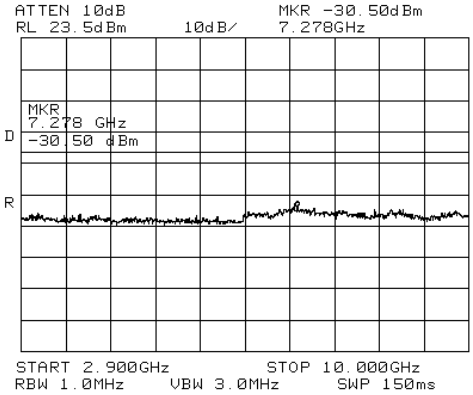


Figure 194 Intermodulation

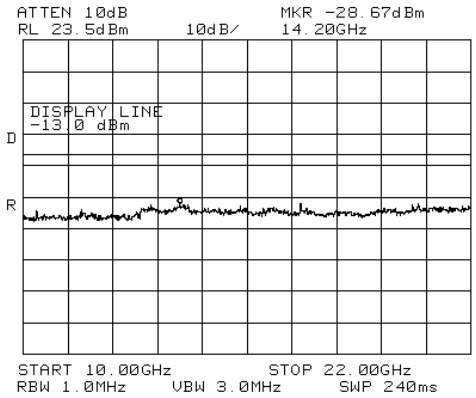


Figure 195 Intermodulation

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	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
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 196 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 (728-758; 869-894; 1930-1990; 2110-2155 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.

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

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 (dBµV/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	V	63.4	-32.1	9.0	7.7	-33.4	-13.0	-20.4
2*747+881	2375	H	63.5	-33.6	9.0	8.5	-34.1	-13.0	-21.1
2*747-881	613	V	35.9	-59.7	4.2	1.6	-62.3	-13.0	-46.3
2*747-881	613	H	38.4	-58.9	4.2	1.6	-61.6	-13.0	-48.6
2*881-747	1015	V	53.1	-45.1	5.4	5.4	-45.1	-13.0	-32.1
2*881-747	1015	H	52.7	-45.9	5.4	5.8	-45.5	-13.0	-32.5
2*881+747	2509	V	64.2	-32.4	9.4	8.4	-33.4	-13.0	-20.4
2*881+747	2509	H	62.9	-35.8	9.4	9.7	-35.5	-13.0	-22.5
3*747-2*881	579	V	37.8	-57.8	4.2	1.6	-60.4	-13.0	-47.4
3*747-2*881	579	H	37.8	-59.5	4.2	1.6	-62.2	-13.0	-49.2
3*881-2*747	1149	V	55.2	-45.1	5.4	5.4	-45.1	-13.0	-32.1
3*881-2*747	1149	H	55.5	-43.2	5.4	5.8	-42.8	-13.0	-29.8
2*1960-2135	1785	V	60.7	-36.7	6.7	7.6	-35.8	-13.0	-22.8
2*1960-2135	1785	H	60.8	-37.4	6.7	8.0	-36.1	-13.0	-23.1
2*2135-1960	2310	V	62.5	-34.3	9.0	7.7	-35.6	-13.0	-22.6
2*2135-1960	2310	H	63.1	-34.7	9.0	8.5	-35.2	-13.0	-22.3
3*2135-2*1960	2485	V	64.1	-32.5	9.4	8.4	-33.5	-13.0	-20.5
3*2135-2*1960	2485	H	62.7	-36.0	9.4	9.7	-35.7	-13.0	-22.7
2*2135-3*1960	1610	V	57.7	-42.2	6.7	7.6	-41.3	-13.0	-28.3
2*2135-3*1960	1610	H	58.9	-39.8	6.7	8.0	-38.5	-13.0	-25.5

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
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	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 197 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	
10K	-30	-29.8	-30.2	0.4
15K	-30	-29.5	-29.7	0.2
20K	-30	-29.7	-29.9	0.2
30K	-30	-29.6	-29.9	0.3
50K	-30	-29.7	-30.0	0.3
75K	-30	-29.7	-30.0	0.3
100K	-30	-29.8	-30.0	0.2
150K	-30	-29.8	-30.0	0.2
200K	-30	-29.9	-30.2	0.3
500K	-30	-29.9	-30.3	0.4
1M	-30	-30.1	-30.5	0.4
1.5M	-30	-30.1	-30.6	0.5
2M	-30	-30.2	-30.7	0.5
5M	-30	-30.3	-30.9	0.6
10M	-30	-30.2	-31.0	0.8
15M	-30	-30.2	-31.1	0.9
20M	-30	-30.5	-31.3	0.8

FRQ	S.G.	REF	A	
			AMP	
50M	-30	-30.5	-31.7	1.2
100M	-30	-30.5	-32.2	0.7
150M	-30	-30.4	-32.5	2.1
200M	-30	-30.5	-32.8	2.3
300M	-30	-30.4	-33.3	2.9
500M	-30	-30.5	-34.3	3.8
750M	-30	-30.7	-35.3	4.8
1G	-30	-30.9	-36.3	5.4
1.5G	-15	-15.7	-22.4	6.7
2G	-15	-15.9	-24.9	9.0
2.5G	-15	-16.3	-25.7	9.4
3G	-15	-16.5	-26.4	9.9
3.5G	-15	-16.7	-26.9	10.2
4G	-15	-16.3	-27.5	11.2
4.5G	-15	-16.6	-28.7	12.1
5G	-15	-16.8	-29.9	13.1
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 (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (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 (MHz)	Antenna Factor (dB/m)	FREQUENCY (MHz)	Antenna Factor (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		

16.4 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**

16.5 Correction factors forACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(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