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**DATE: 29 August 2013**

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

# FCC Radio Test Report

**for**

# Corning MobileAccess

## Equipment under test:

## ONE Distributed Antenna System

### Remote Extender Unit - RXU

Written by: _____

R. Pinchuck, Documentation

Approved by: _____

A. Sharabi, Test Engineer

Approved by: _____

I. Raz, EMC Laboratory Manager

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# Measurement/Technical Report for

## Corning MobileAccess

## ONE Distributed Antenna System

## Remote Extender Unit - RXU

## (

## FCC ID: OJF1RXU

| | |
|---|---|
| This report concerns: | Original Grant: X |
| | Class II change: |
| | Class I change: |
| Equipment type: | PCB 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

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# 1. General Information

## *1.1 Administrative Information*

| | |
|---|---|
| Manufacturer: | Corning MobileAccess |
| Manufacturer's Address: | 8391 Old Courthouse Rd.<br>Suite #300<br>Vienna, VA 22182<br>U.S.A.<br>Tel: +1-541-758-2880<br>Fax: +1-703-848-0260 |
| Manufacturer's Representative: | Steve Blum |
| Equipment Under Test (E.U.T): | ONE Distributed Antenna System |
| Equipment Model No.: | Remote Extender Unit - RXU |
| Equipment Serial No.: | Not Designated |
| Date of Receipt of E.U.T: | 03.04.13 |
| Start of Test: | 03.04.13 |
| End of Test: | 24.04.13 |
| Test Laboratory Location: | I.T.L (Product Testing) Ltd.<br>1 Batsheva St,<br>Lod,<br>Israel 7116002 |
| 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

RXU is connected to main RAU module through RF and DC Connector. RXU is intended to add two additional frequency bands - LTE (728-757MHz) and AWS (2110-2155MHZ) – for MIMO 2x 2 operations. These two frequency bands are filtered and transmitted through additional antenna port via RF connector.

## 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. 90715, date of listing November 21, 2012).
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 was operated in host ONE – Optical Network Evolution DAS.
All 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 RXU, while the EUT output was connected to the spectrum analyzer.
All channels transmitted during the testing.
The LTE and AWS antenna ports of host unit are MIMO. The RXU provides the MIMO port for the host unit.
All radiated tests were performed in conjunction with ONE – Optical Network Evolution DAS RAU transmitter.
RF input signal level was 0 dBm for all bands.
There is neither an intermediate amplifier nor donor antenna in the uplink. All components included in the UL path are connected by cables.

## 2.2 EUT Exercise Software

The HCM ver. 0.2 build 19 used for commands delivery.

**RXU –** RXU_AA00_00.44

## 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

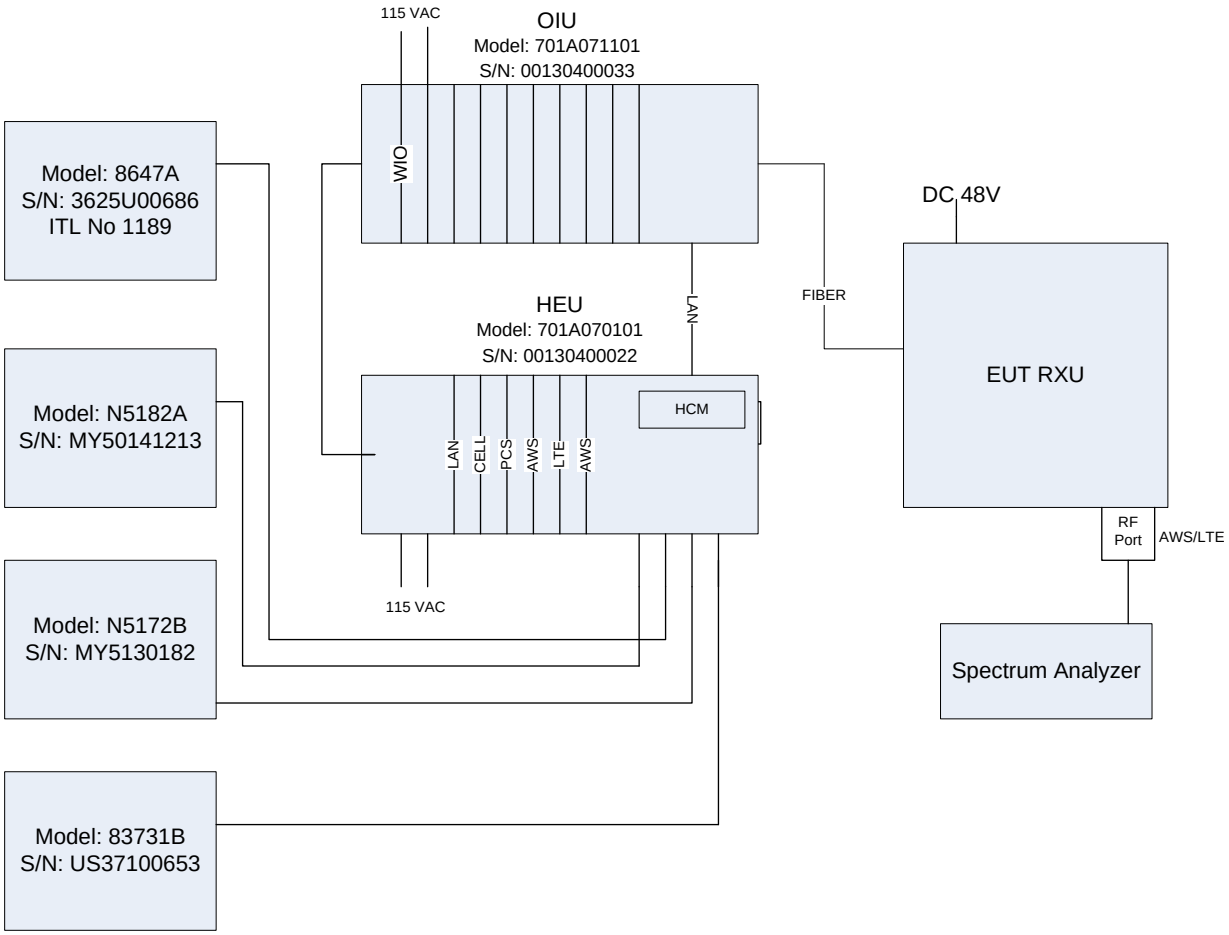


**Figure 1. Test Set-up**

# 3. Test Set-up Photos

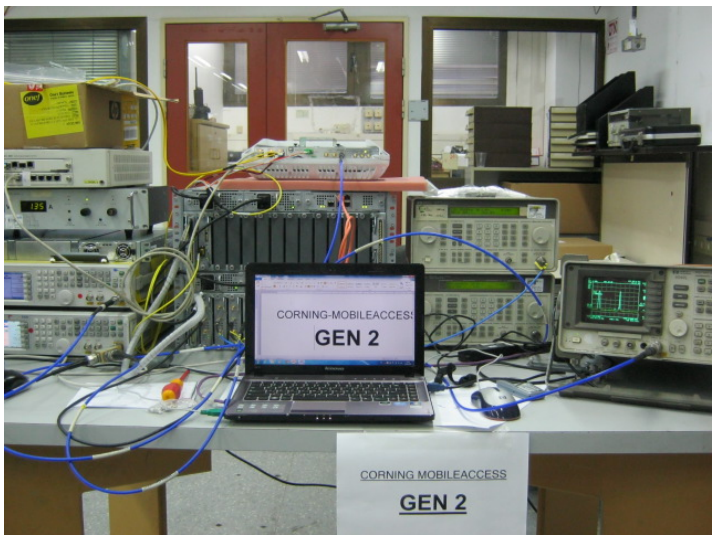


**Figure 2. Conducted Emission From Antenna Port Tests**

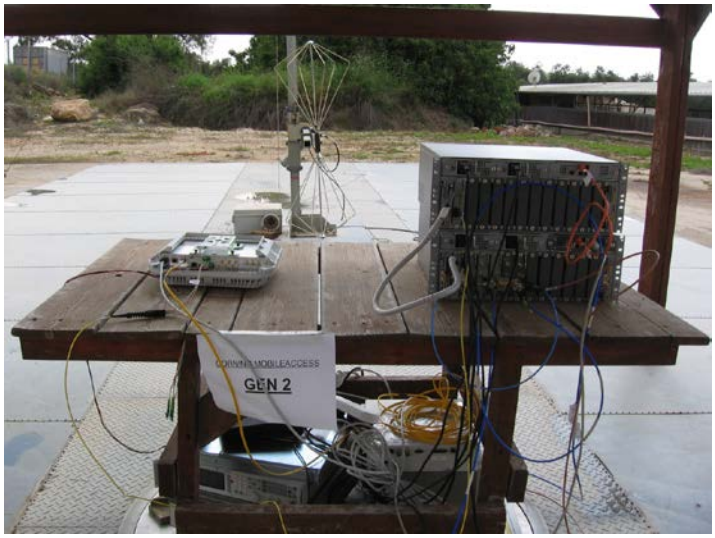


**Figure 3. Radiated Emission Test**


**Figure 4. Radiated Emission Test**

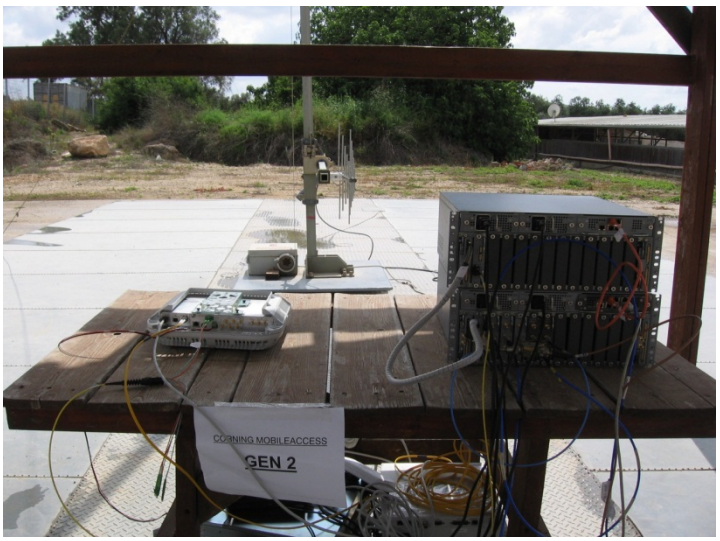


**Figure 5. Radiated Emission Test**

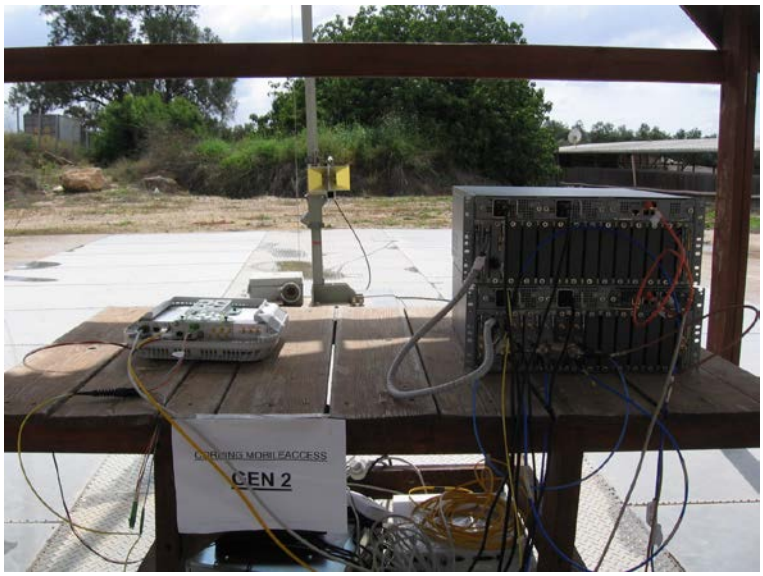


**Figure 6. Radiated Emission Test**

# 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 (30.7 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 | 14.33 |
| LTE 64QAM | 747 | 16.64 |
| LTE 64QAM | 753 | 15.69 |
| LTE 16QAM | 733 | 14.64 |
| LTE 16QAM | 747 | 16.60 |
| LTE 16QAM | 753 | 15.78 |
| LTE QPSK | 733 | 14.88 |
| LTE QPSK | 747 | 16.87 |
| LTE QPSK | 753 | 15.94 |

**Figure 7 RF Power Output LTE**

See additional information in Figure 8 to Figure 16.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13

Typed/Printed Name: A. Sharabi

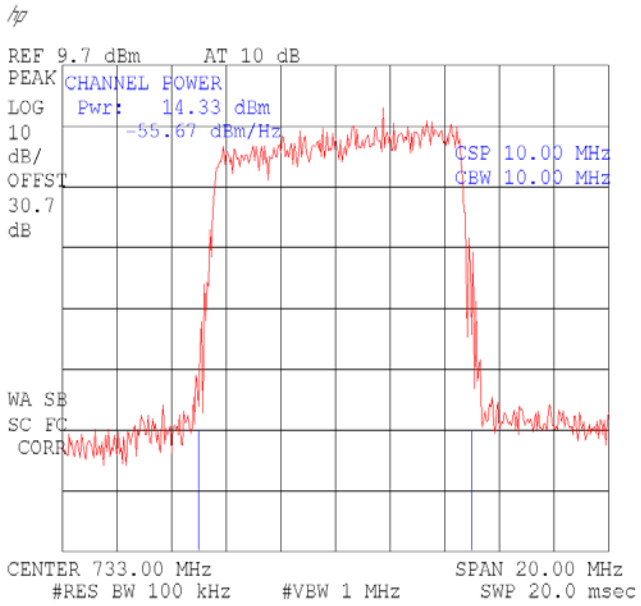


**Figure 8.— 64QAM, 733 MHz**

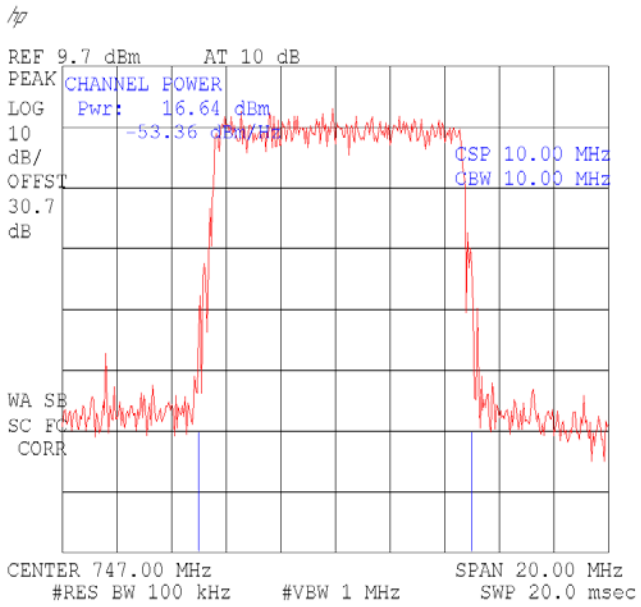


**Figure 9.— 64QAM 747 MHz**

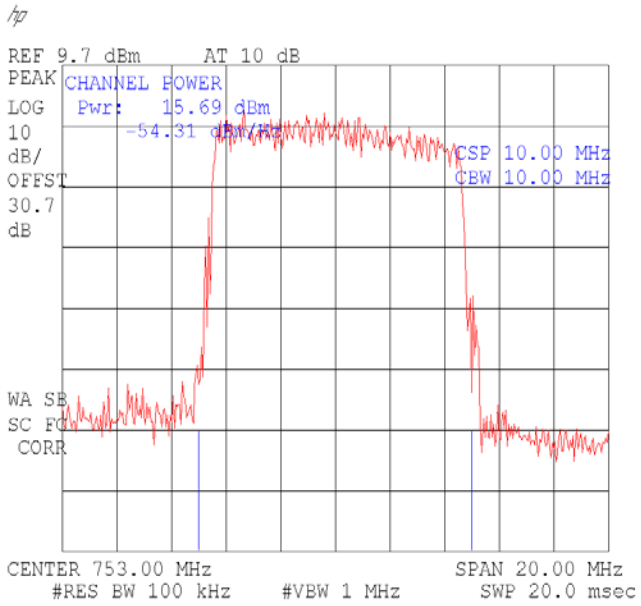


**Figure 10.— 64QAM 753 MHz**

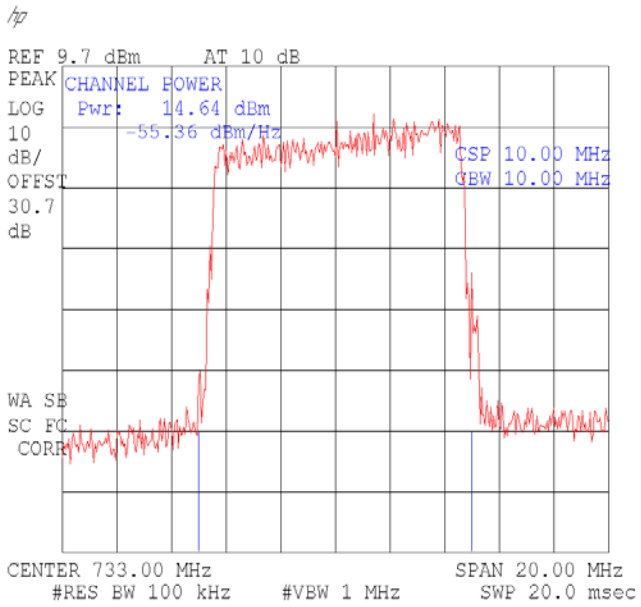


**Figure 11.— 16QAM 733 MHz**

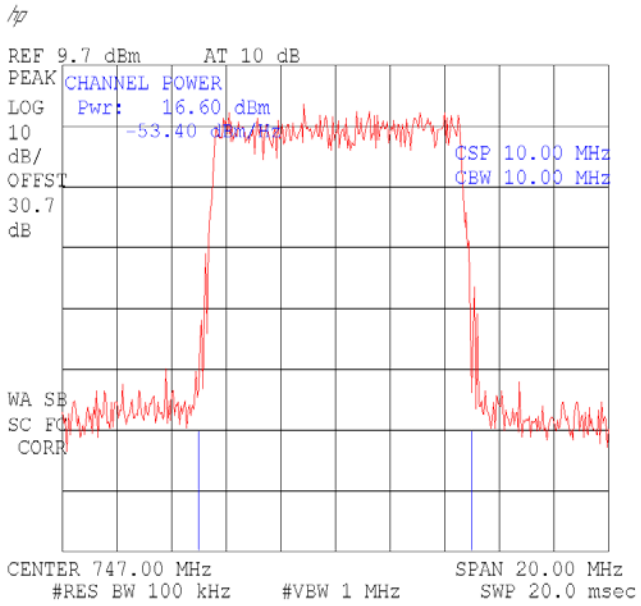


**Figure 12.— 16QAM 747 MHz**

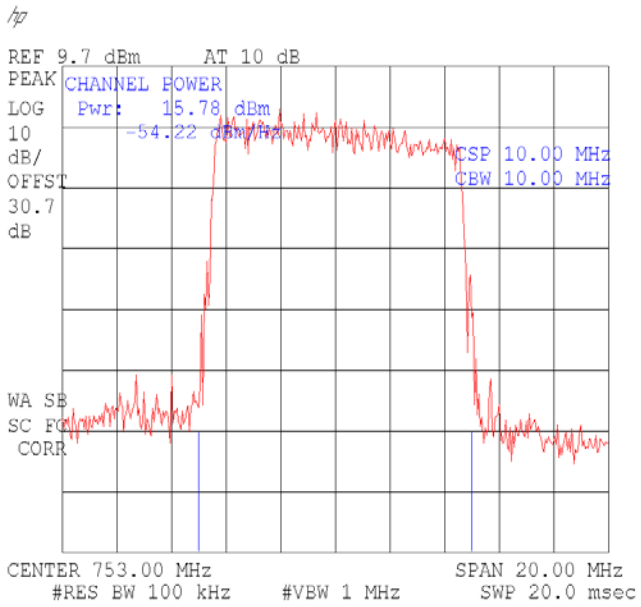


**Figure 13.— 16QAM 753 MHz**

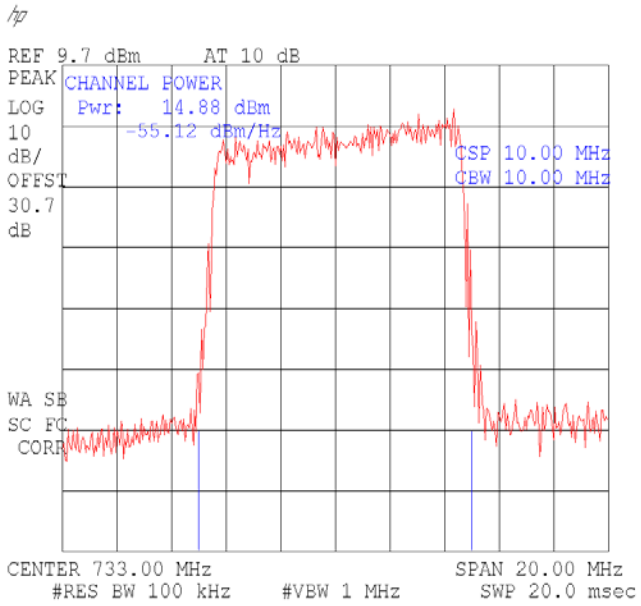


**Figure 14.— QPSK 733 MHz**

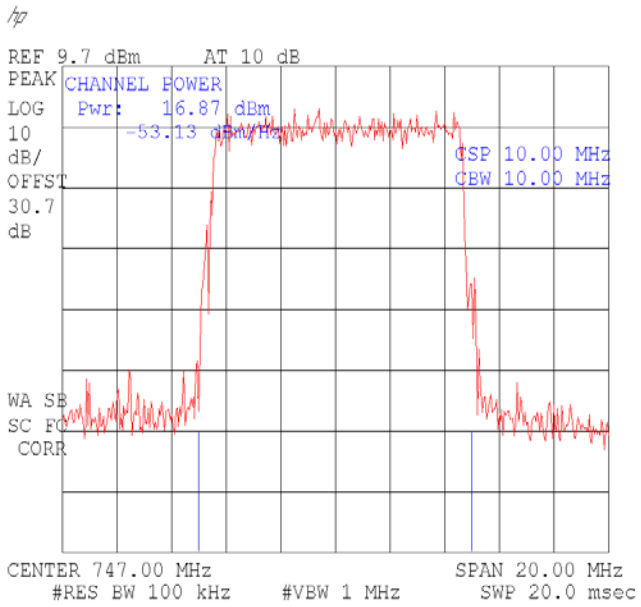


**Figure 15.— QPSK 747 MHz**

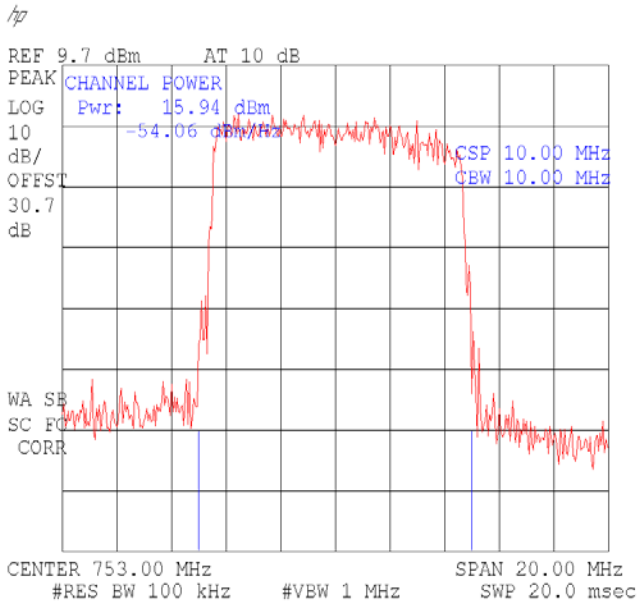


**Figure 16.— QPSK 753 MHz**

### *4.4 Test Equipment Used.*

RF Power Output LTE

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 17 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 (30.7 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 | 9.30 |
| LTE 64QAM | Output | 733 | 9.30 |
| LTE 64QAM | Input | 747 | 9.30 |
| LTE 64QAM | Output | 747 | 9.35 |
| LTE 64QAM | Input | 753 | 9.30 |
| LTE 64QAM | Output | 753 | 9.30 |
| LTE 16QAM | Input | 733 | 9.25 |
| LTE 16QAM | Output | 733 | 9.30 |
| LTE 16QAM | Input | 747 | 9.30 |
| LTE 16QAM | Output | 747 | 9.30 |
| LTE 16QAM | Input | 753 | 9.30 |
| LTE 16QAM | Output | 753 | 9.20 |
| LTE QPSK | Input | 733 | 9.25 |
| LTE QPSK | Output | 733 | 9.30 |
| LTE QPSK | Input | 747 | 9.40 |
| LTE QPSK | Output | 747 | 9.40 |
| LTE QPSK | Input | 753 | 9.35 |
| LTE QPSK | Output | 753 | 9.25 |

**Figure 18 Occupied Bandwidth LTE**

See additional information in Figure 19 to Figure 36.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13

Typed/Printed Name: A. Sharabi

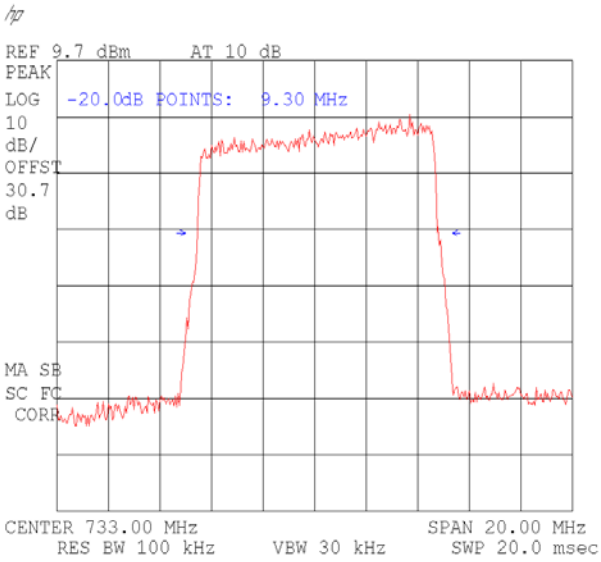


**Figure 19.— 64QAM 733 MHz IN**

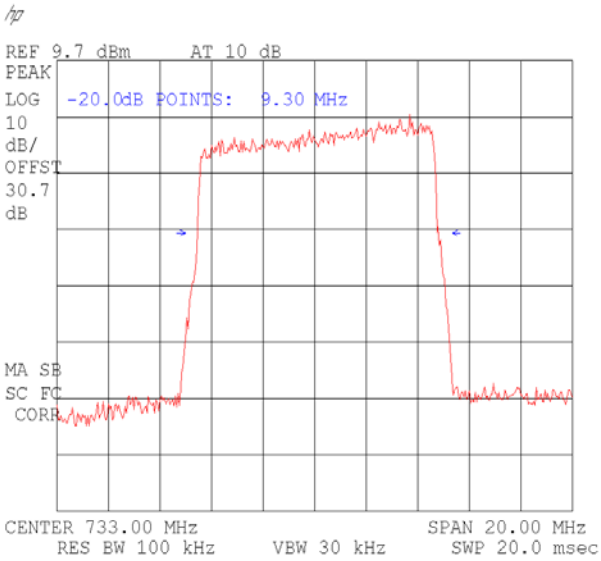


**Figure 20.— 64QAM 733 MHz OUT**

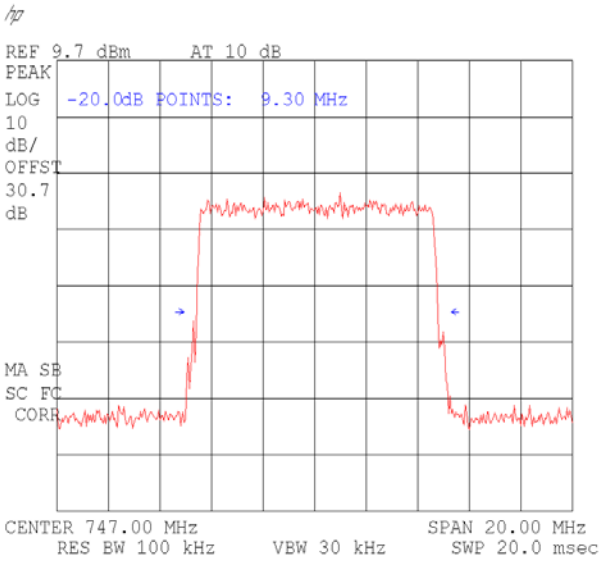


**Figure 21.— 64QAM 747 MHz IN**

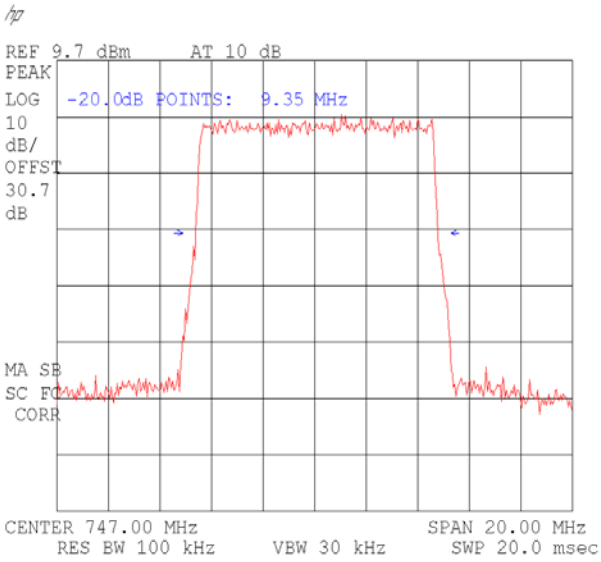


**Figure 22.— 64QAM 747 MHz OUT**

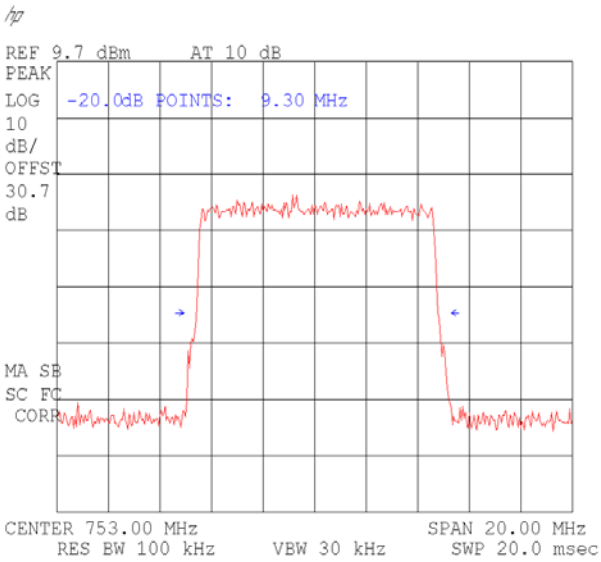


**Figure 23.— 64QAM 753 MHz IN**

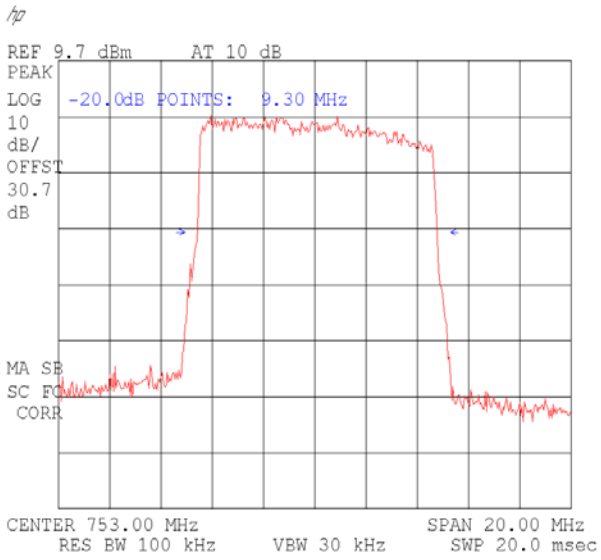


**Figure 24.— 64QAM 753 MHz OUT**

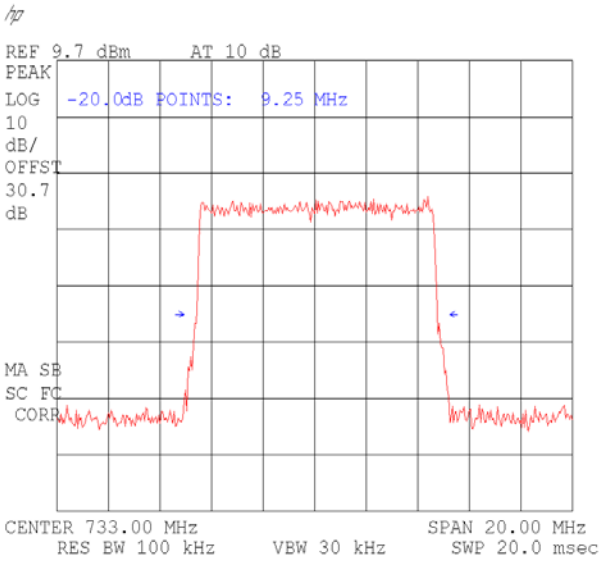


**Figure 25.— 16QAM 733 MHz IN**

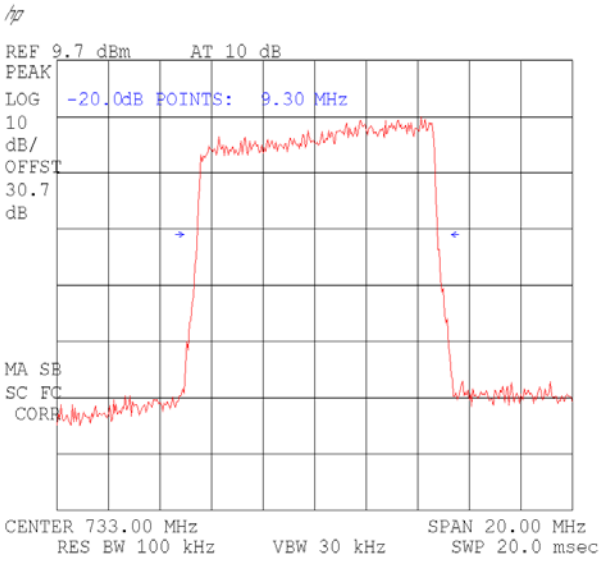


**Figure 26.— 16QAM 733 MHz OUT**

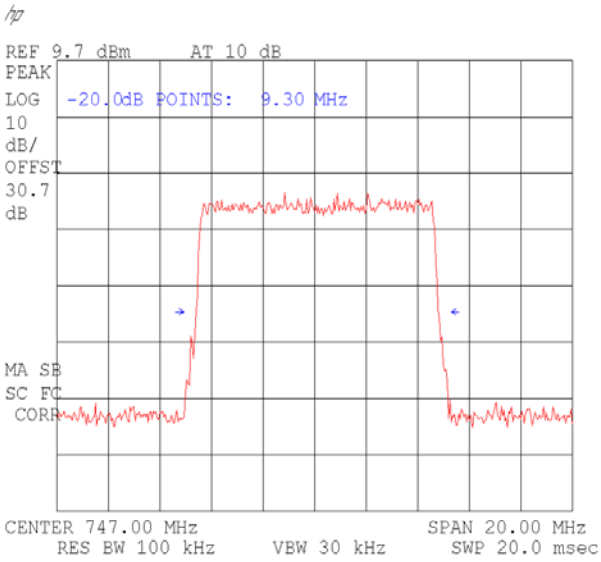


**Figure 27.— 16QAM 747 MHz IN**

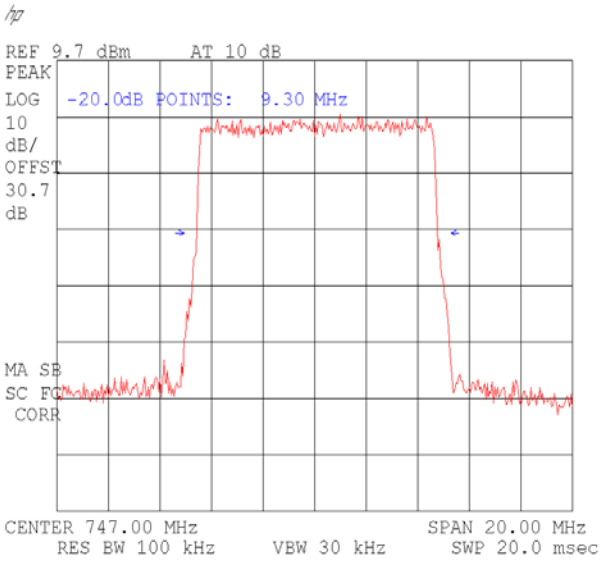


**Figure 28.— 16QAM 747 MHz OUT**

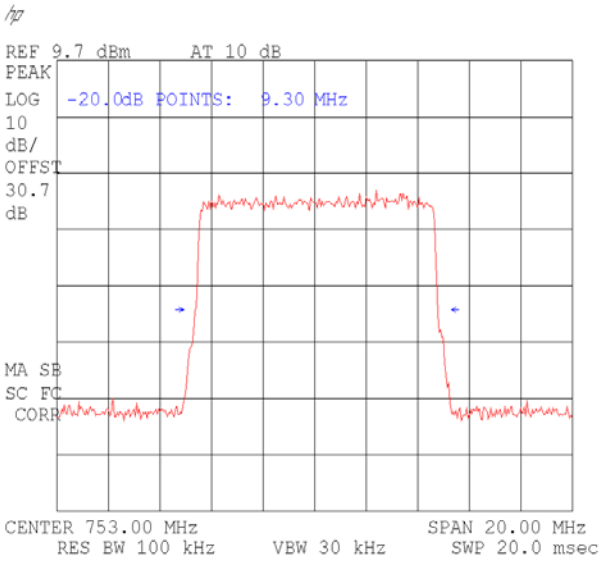


**Figure 29.— 16QAM 753 MHz IN**

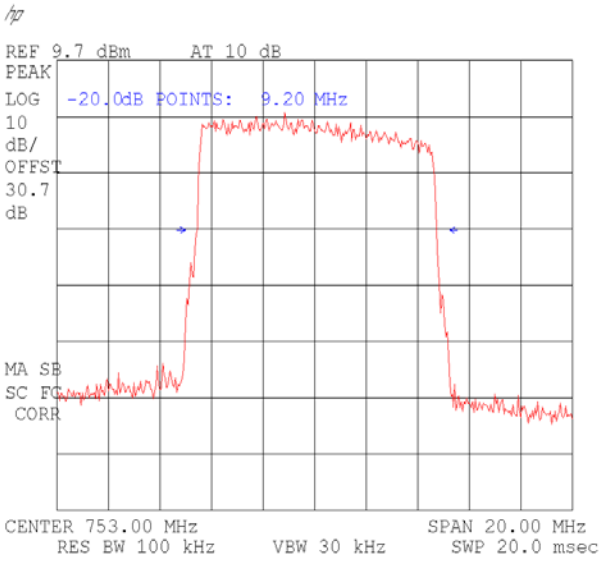


**Figure 30.— 16QAM 753 MHz OUT**

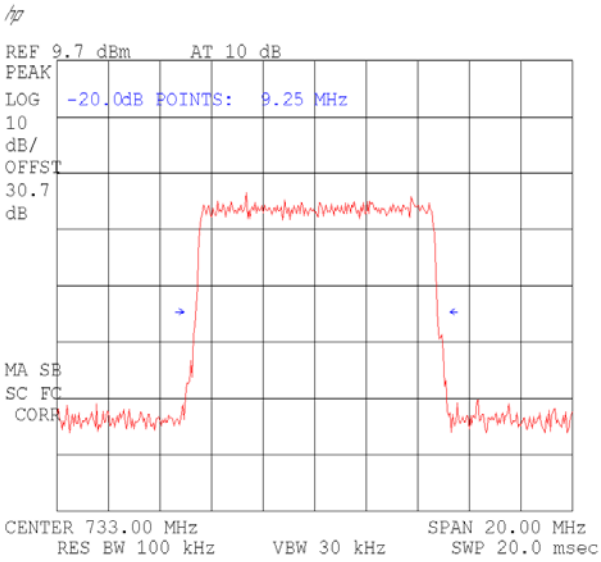


**Figure 31.— QPSK 733 MHz IN**

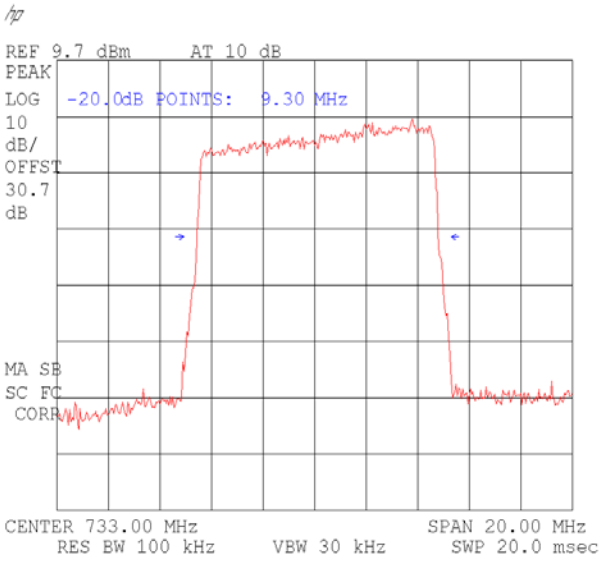


**Figure 32.— QPSK 733 MHz OUT**

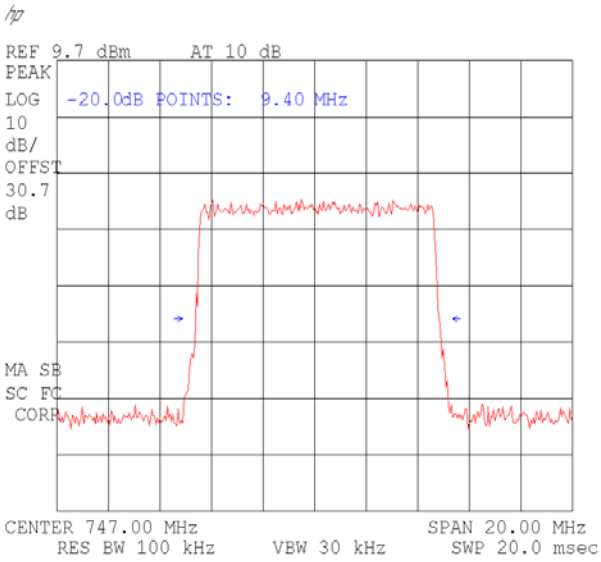


**Figure 33.— QPSK 747 MHz IN**

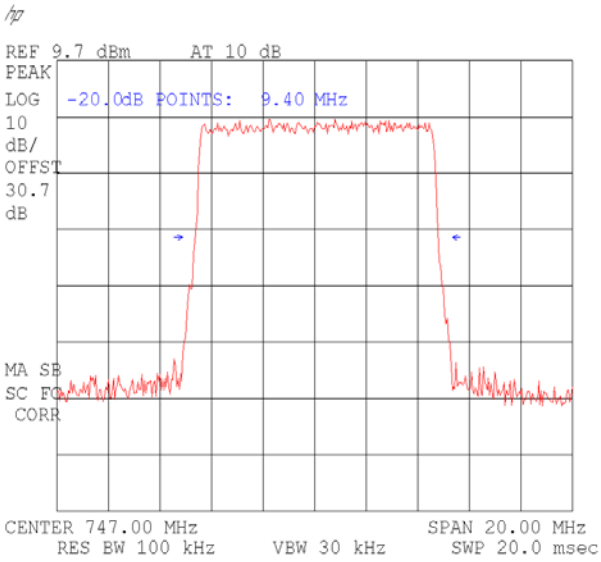


**Figure 34.— QPSK 747 MHz OUT**

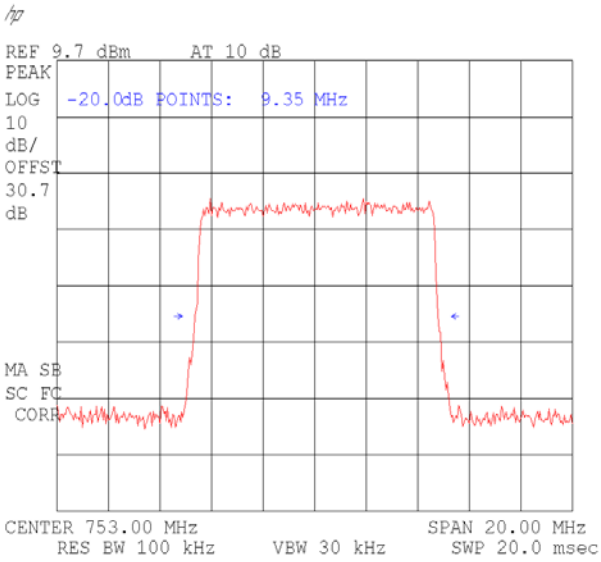


**Figure 35.— QPSK 753 MHz IN**

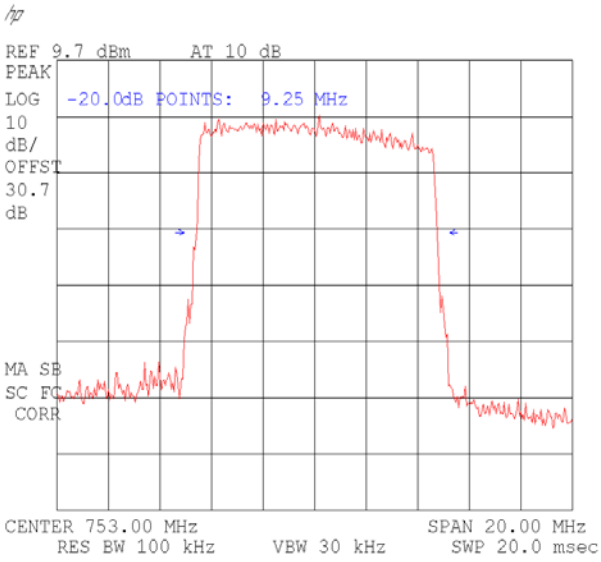


**Figure 36.— QPSK 753 MHz OUT**

## 5.4 Test Equipment Used.

Occupied Bandwidth LTE

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 37 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 (31.0dB). 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
1GHz - 22.0 GHz.

## 6.3 Test Results

See additional information in Figure 38 to Figure 46.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13

Typed/Printed Name: A. Sharabi

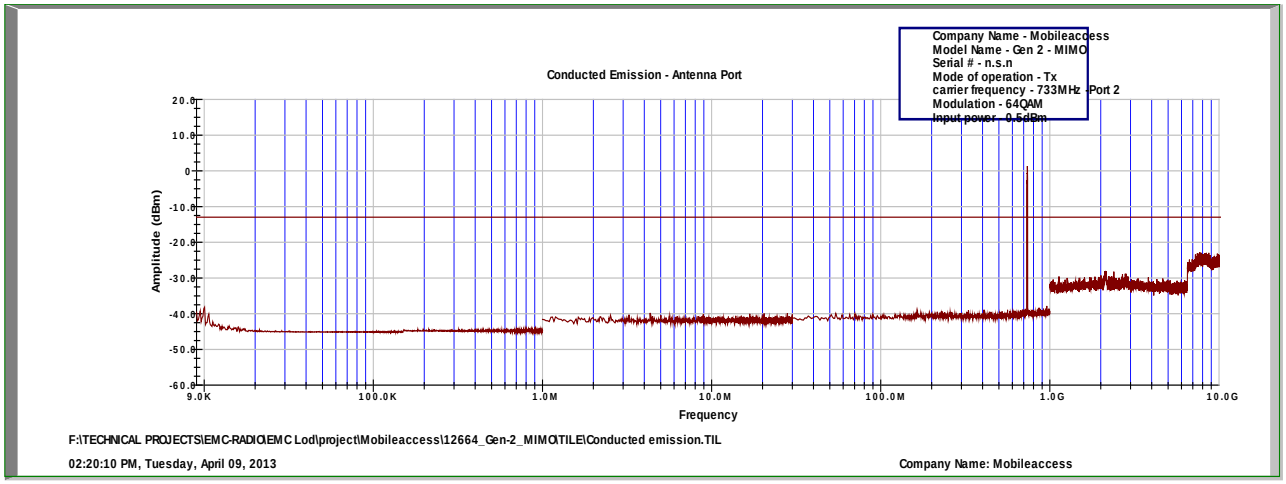


**Figure 38 Spurious Emissions at Antenna Terminals 64QAM, 733MHz**

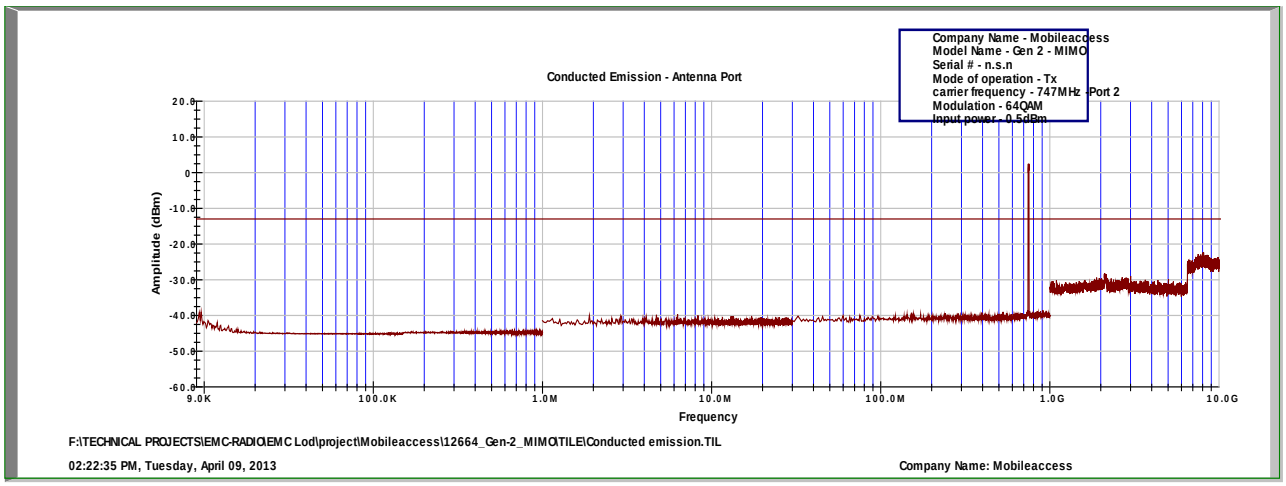


**Figure 39 Spurious Emissions at Antenna Terminals 64QAM, 747MHz**

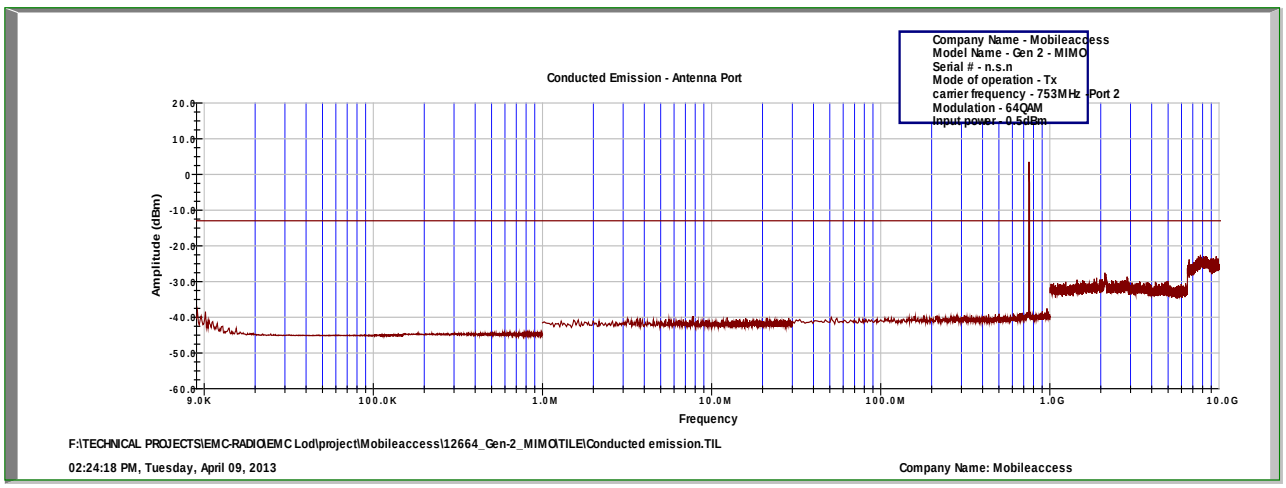


**Figure 40 Spurious Emissions at Antenna Terminals 64QAM, 753MHz**

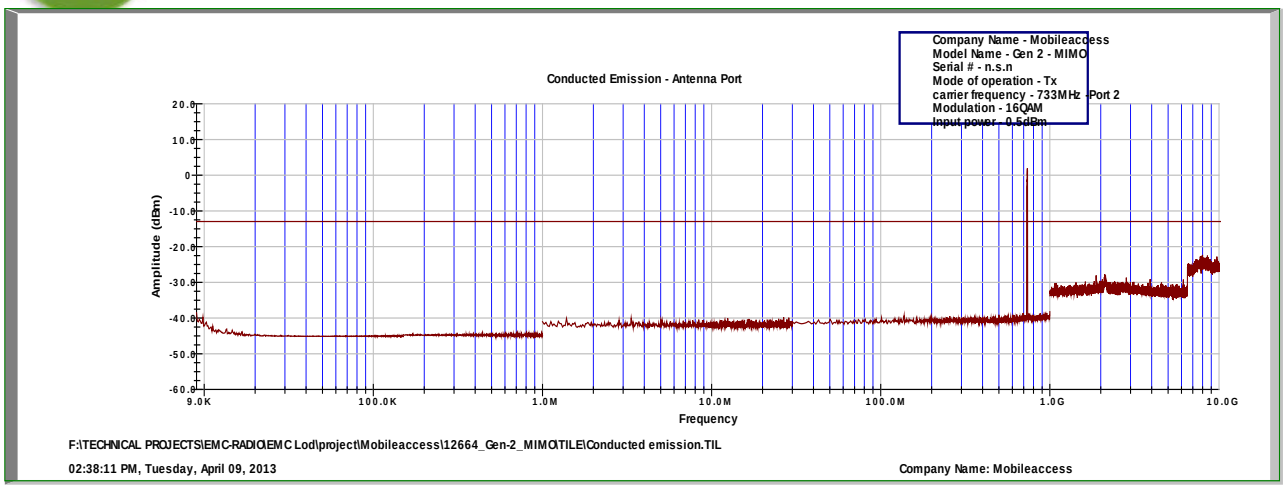


**Figure 41 Spurious Emissions at Antenna Terminals 16QAM, 733MHz**

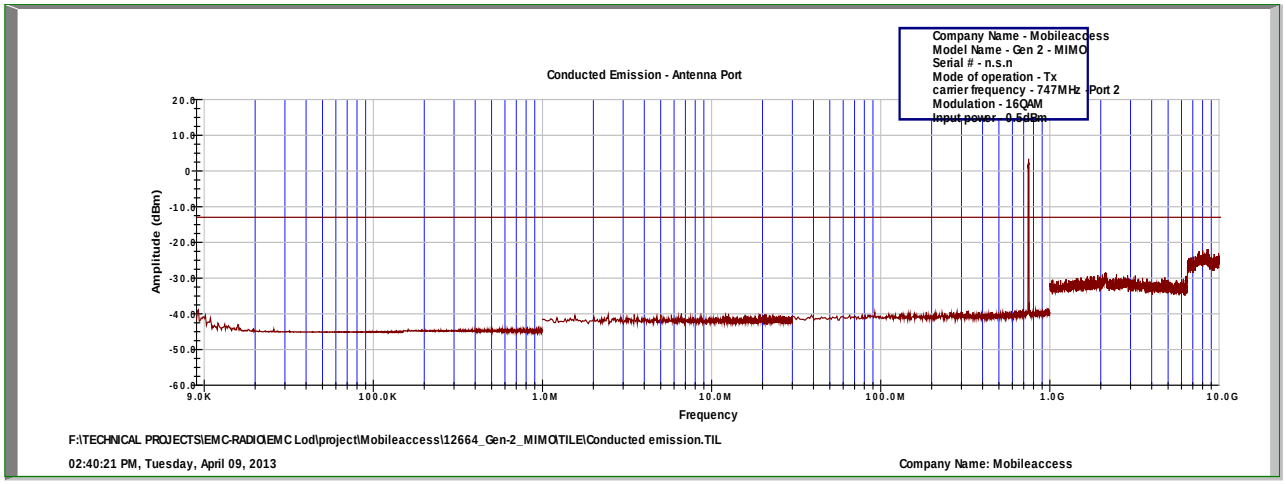


**Figure 42 Spurious Emissions at Antenna Terminals 16QAM, 747MHz**

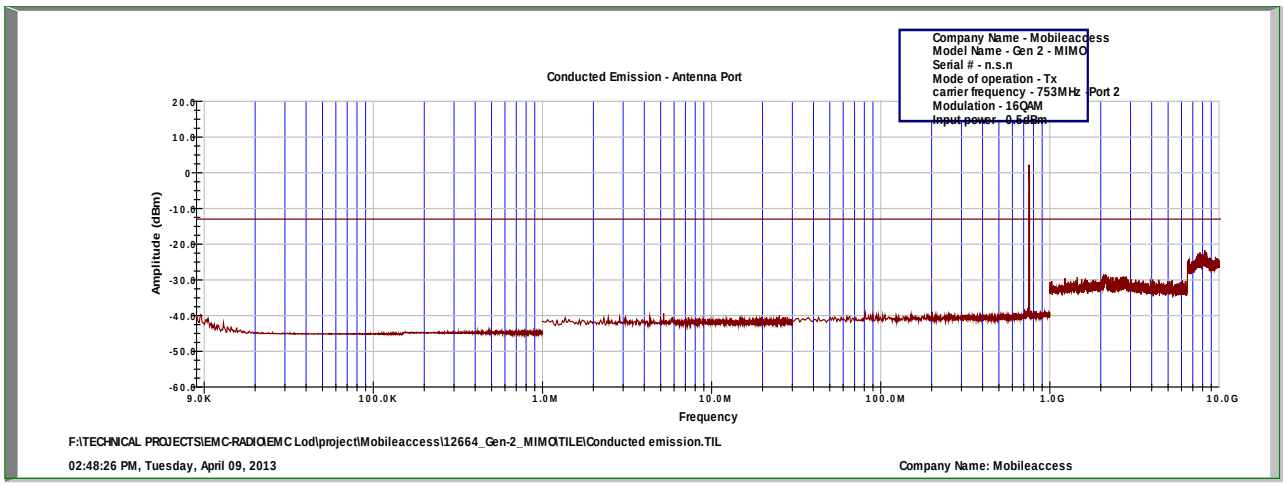


**Figure 43 Spurious Emissions at Antenna Terminals 16QAM, 753MHz**

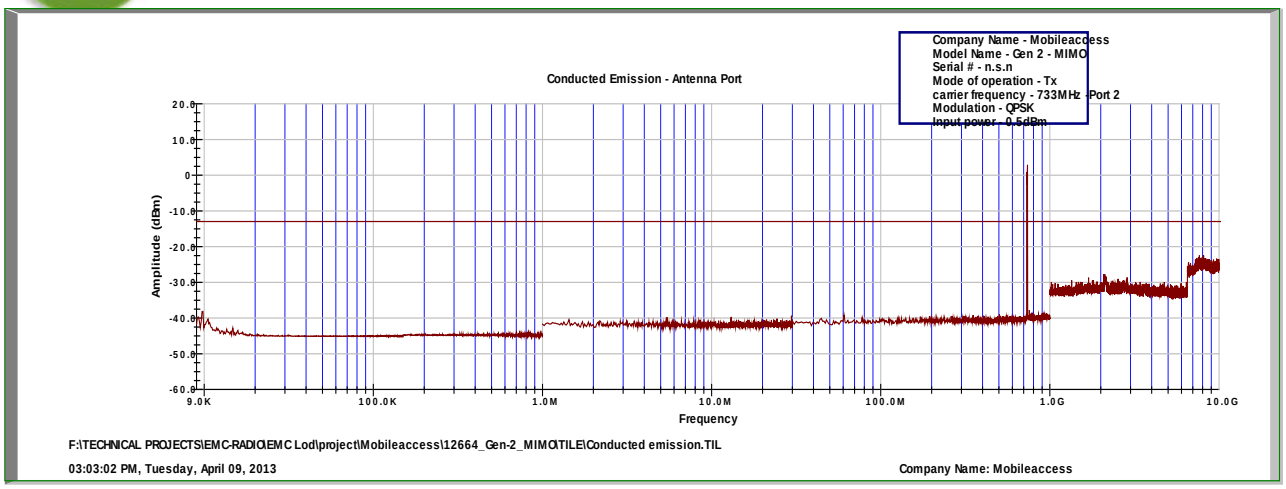


**Figure 44 Spurious Emissions at Antenna Terminals QPSK, 733MHz**

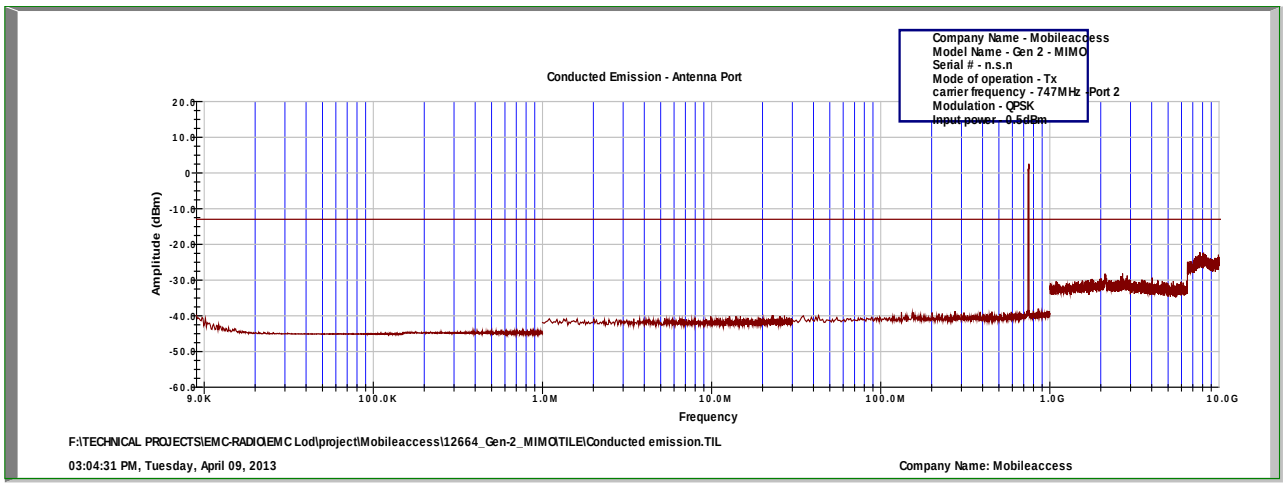


**Figure 45 Spurious Emissions at Antenna Terminals QPSK, 747MHz**

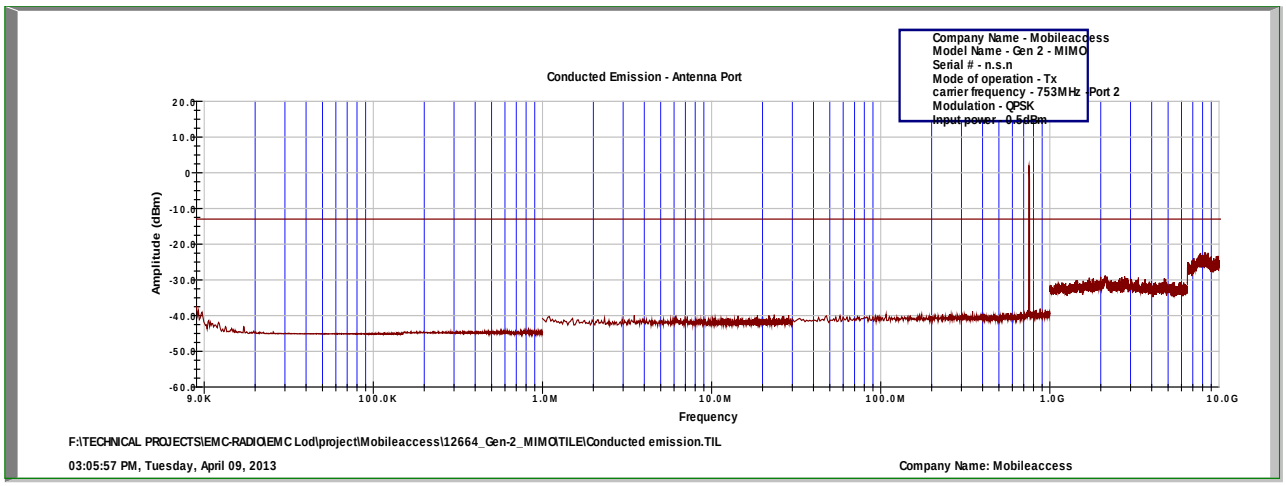


**Figure 46 Spurious Emissions at Antenna Terminals QPSK, 753MHz**

## 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 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 47 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 (30.7 dB).
The spectrum analyzer was set to 30 kHz R.B.W.

## 7.3 Results

| | Operation Frequency (MHz) | Band Edge Frequency (MHz) | Reading (dBm) | Specification (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| LTE64QAM | 733.00 | 728.00 | -39.32 | -13.0 | -26.32 |
| LTE64QAM | 753.00 | 758.00 | -40.64 | -13.0 | -27.64 |
| LTE16QAM | 733.00 | 728.00 | -40.61 | -13.0 | -27.61 |
| LTE16QAM | 753.00 | 758.00 | -42.04 | -13.0 | -29.04 |
| LTEQPSK | 733.00 | 728.00 | -42.38 | -13.0 | -29.38 |
| LTEQPSK | 753.00 | 758.00 | -41.78 | -13.0 | -28.78 |

**Figure 48 Band Edge Spectrum Results LTE**

JUDGEMENT: Passed by 26.32 dB

See additional information in Figure 49 to Figure 54.

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13.

Typed/Printed Name: Azriel Sharabi

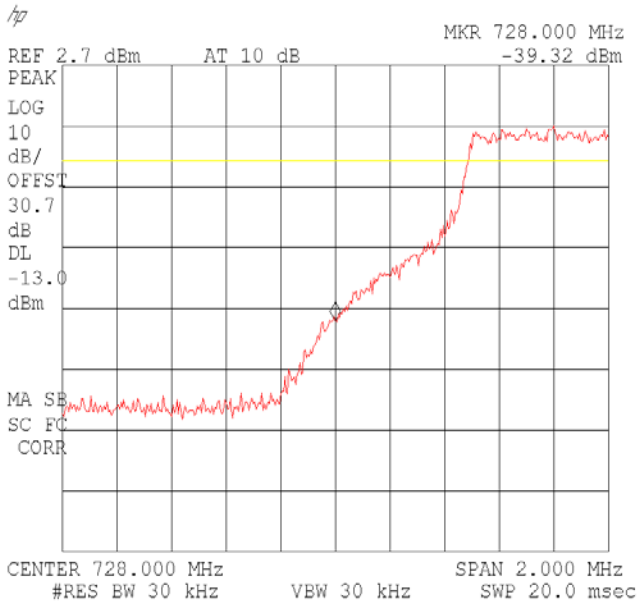


**Figure 49.—64QAM 733.0 MHz**

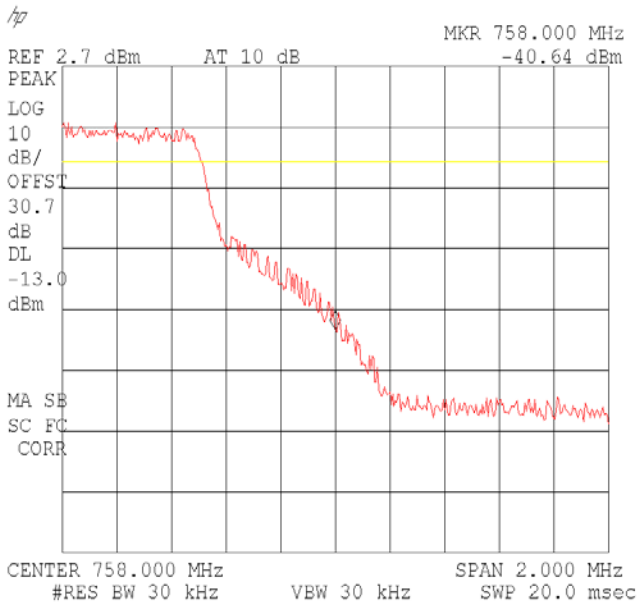


**Figure 50.— 64QAM 753.0 MHz**

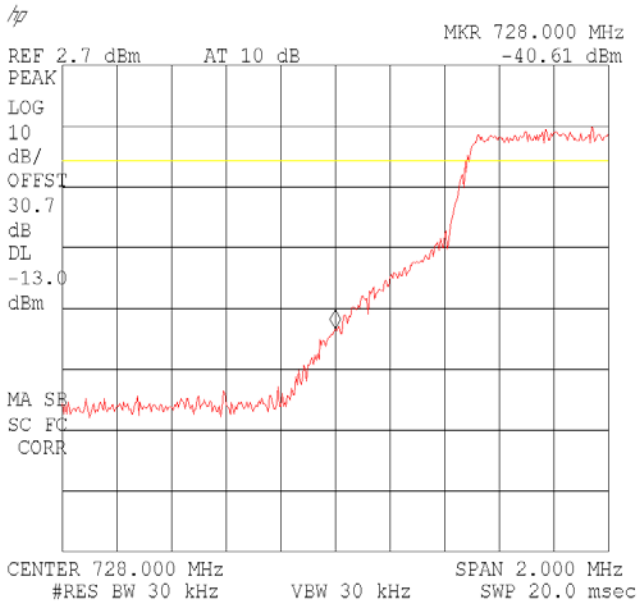


**Figure 51.—16QAM 733.0 MHz**

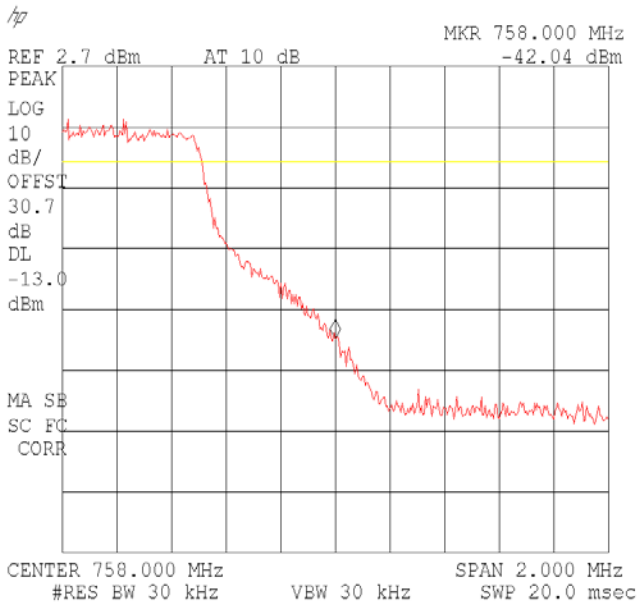


**Figure 52.— 16QAM 753.0 MHz**

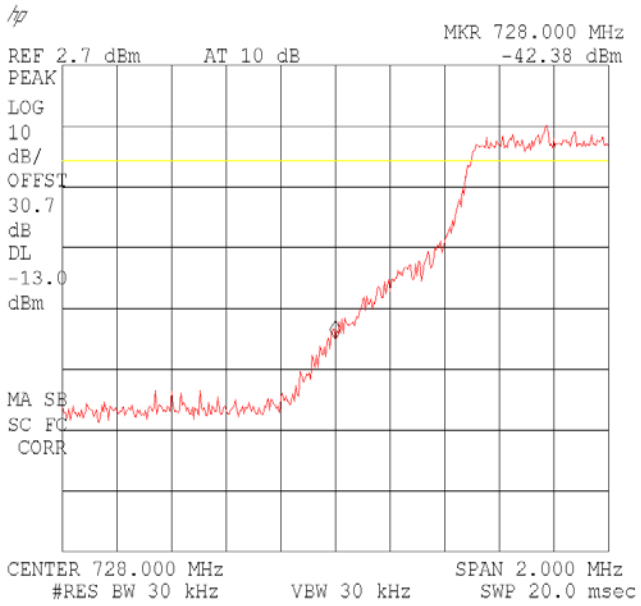


**Figure 53.— QPSK 733.0 MHz**

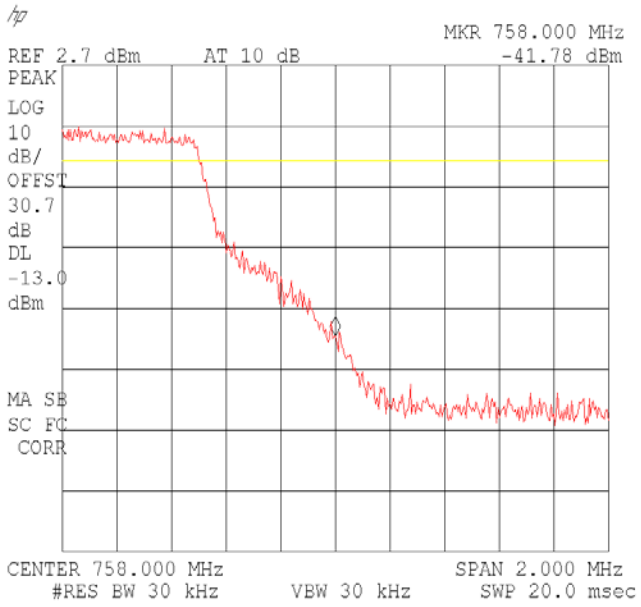


**Figure 54.—QPSK 753.0 MHz**

## 7.4 Test Equipment Used.

Band Edge Spectrum

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 55 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*

| 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 | 48.0 | -53.29 | 5.15 | 7.6 | -50.84 | -13.00 | -37.84 |
| 733.00 | 1466 | H | 49.7 | -51.73 | 5.15 | 7.6 | -49.28 | -13.00 | -36.28 |
| 747.00 | 1494 | V | 50.6 | -50.69 | 5.15 | 7.6 | -48.24 | -13.00 | -35.24 |
| 747.00 | 1494 | H | 49.7 | -51.73 | 5.15 | 7.6 | -49.28 | -13.00 | -36.28 |
| 753.00 | 1506 | V | 47.8 | -53.49 | 5.15 | 7.6 | -51.04 | -13.00 | -38.04 |
| 753.00 | 1506 | H | 47.9 | -51.73 | 5.15 | 7.6 | -49.28 | -13.00 | -36.28 |

**Figure 56 Spurious Radiated emission LTE**

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

JUDGEMENT: Passed by 35.24 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.013

Typed/Printed Name: A. Sharabi

### *8.4 Test Instrumentation Used, Radiated Measurements*

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|---|---|---|---|---|---|
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Signal Generator | Agilent | N5182A | MY50141213 | July 9, 2012 | 1 year |
| Signal Generator | Agilent | 83731B | US37100653 | October 23, 2012 | 1 year |
| Signal Generator | Agilent | 8647A | 3625U00686 | March 5, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | 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 = 30.7 dB). The E.U.T. RF output was modulated as follows:

CDMA , LTE ,WCDMA and GSM.

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

## 9.3 Results

| Modulation | Operation Frequency (MHz) | Reading (dBm) |
|---|---|---|
| CDMA | 2111.2 | 20.63 |
| CDMA | 2132.5 | 19.70 |
| CDMA | 2153.8 | 17.24 |
| GSM | 2111.2 | 22.93 |
| GSM | 2132.5 | 21.93 |
| GSM | 2153.8 | 18.98 |
| LTE 64QAM | 2115.0 | 20.93 |
| LTE 64QAM | 2132.5 | 19.73 |
| LTE 64QAM | 2150.0 | 18.48 |
| WCDMA | 2112.5 | 21.64 |
| WCDMA | 2132.5 | 20.43 |
| WCDMA | 2152.5 | 18.42 |

**Figure 57 RF Power Output AWS**

See additional information in Figure 58 to Figure 69.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13

Typed/Printed Name: A. Sharabi

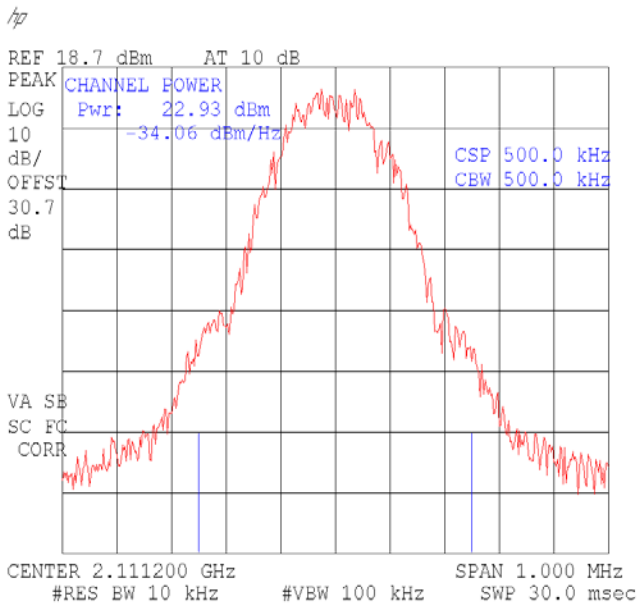


**Figure 58.— GSM (2111.2 MHz)**

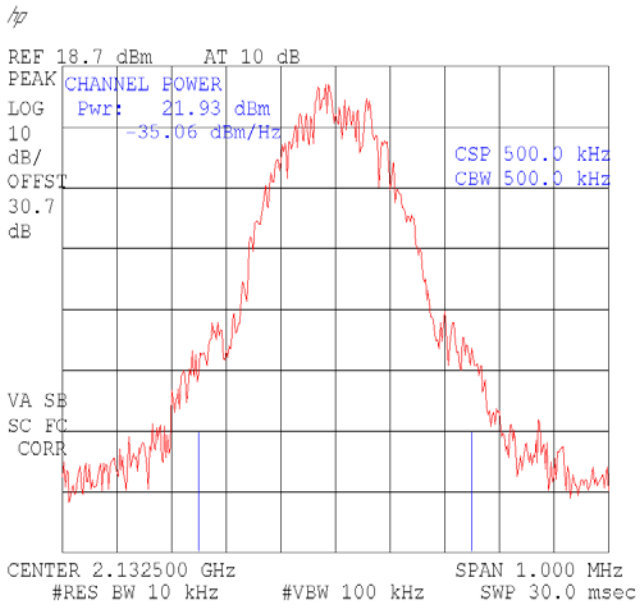


**Figure 59.— GSM (2132.5 MHz)**

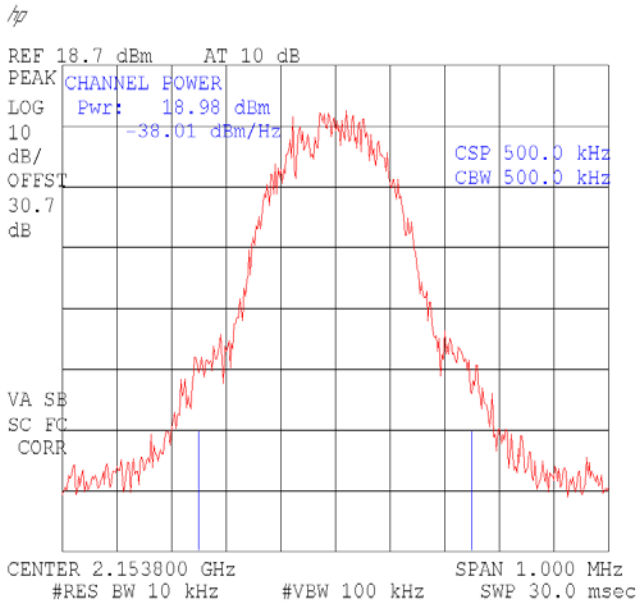


**Figure 60.— GSM (2153.8 MHz)**

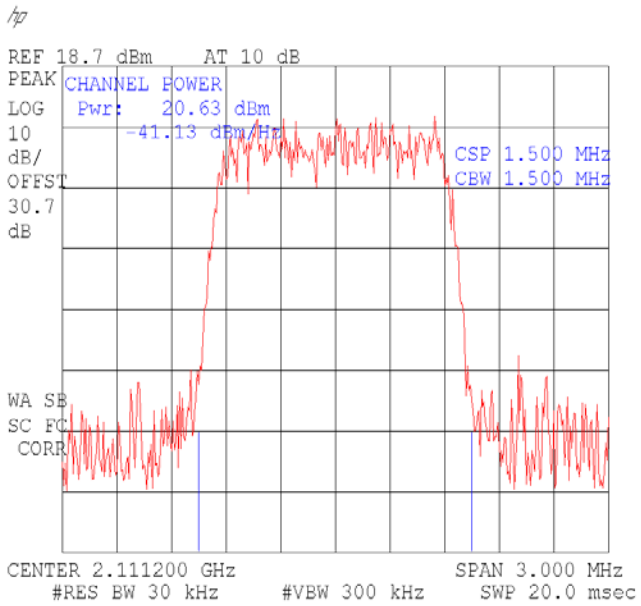


**Figure 61.— CDMA (2111.2 MHz)**

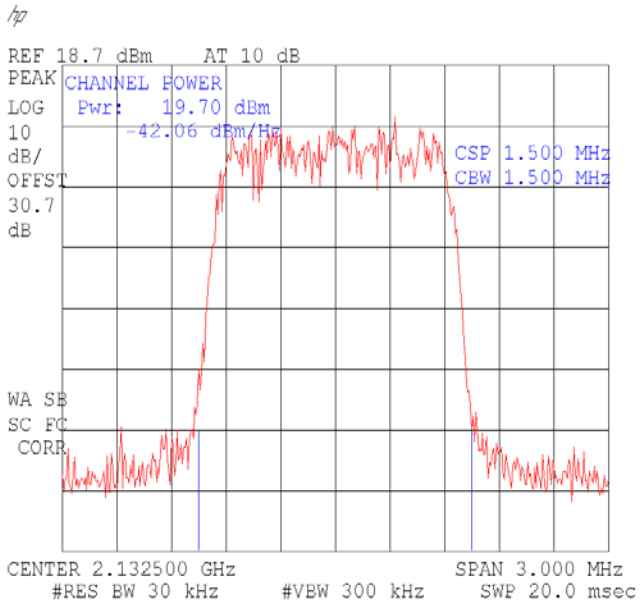


**Figure 62.— CDMA (2132.5 MHz)**

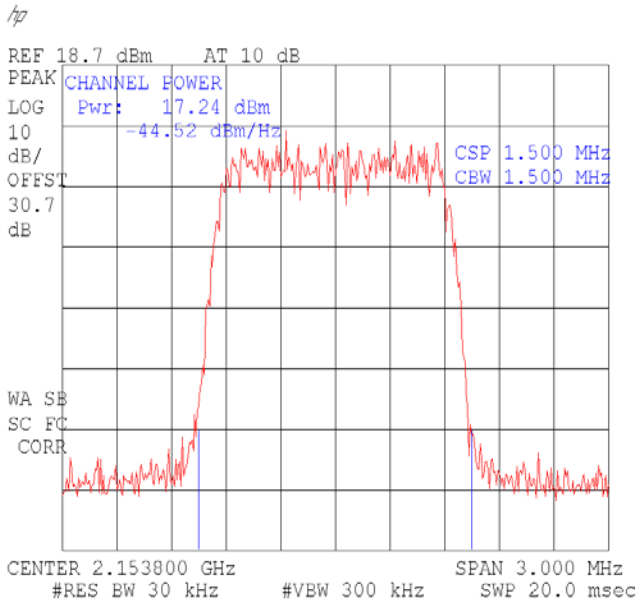


**Figure 63.— CDMA (2153.8 MHz)**

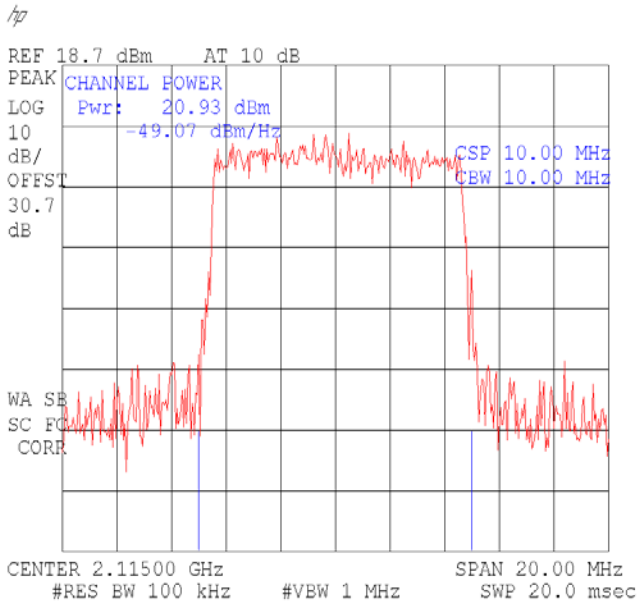


**Figure 64.— LTE 64QAM(2115.0 MHz)**

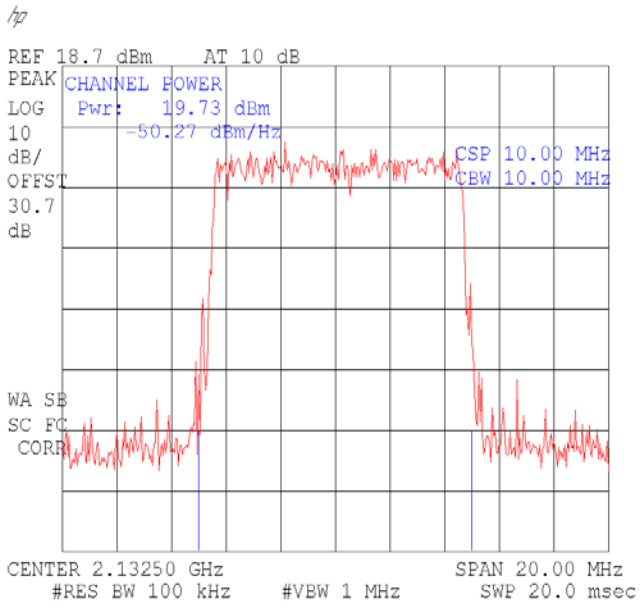


**Figure 65.— LTE 64QAM (2132.5 MHz)**

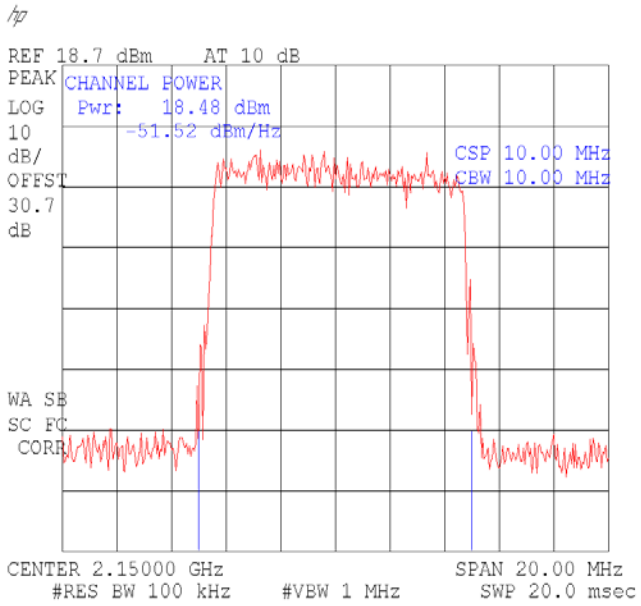


**Figure 66.— LTE 64QAM (2150.0 MHz)**

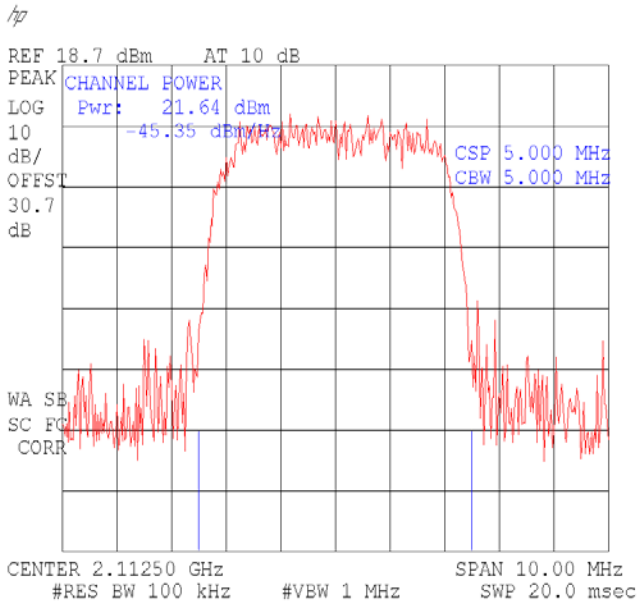


**Figure 67.— W-CDMA (2112.5 MHz)**

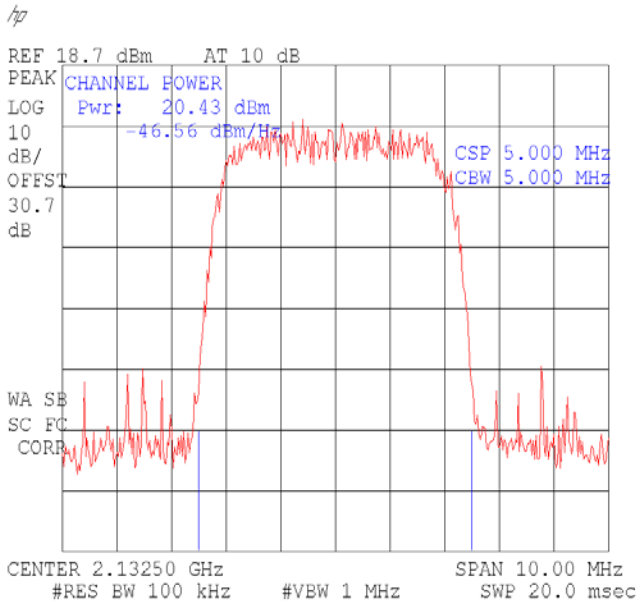


**Figure 68.— W-CDMA (2132.5 MHz)**

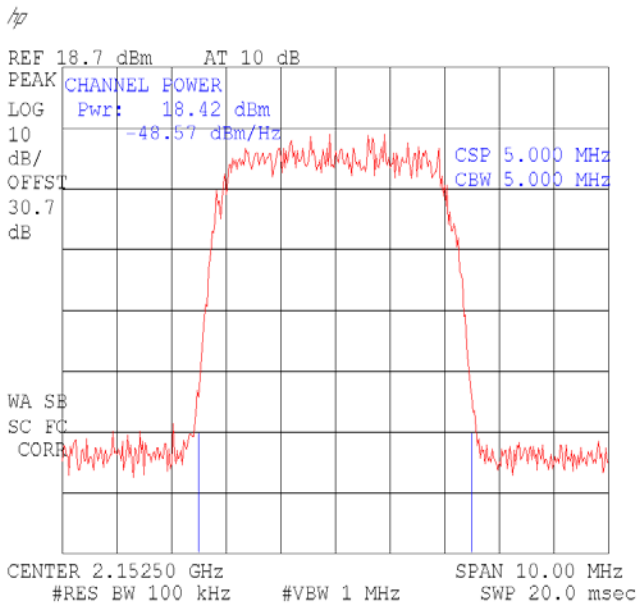


**Figure 69.— W-CDMA (2152.5 MHz)**

## 9.4 Test Equipment Used.

RF Power Output AWS

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 70 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 | 2111.2 | 1.34 |
| | Output | 2111.2 | 1.34 |
| | Input | 2132.5 | 1.34 |
| | Output | 2132.5 | 1.33 |
| | Input | 2153.8 | 1.34 |
| | Output | 2153.8 | 1.34 |
| LTE 64QAM | Input | 2115.0 | 9.70 |
| | Output | 2115.0 | 9.60 |
| | Input | 2132.5 | 9.75 |
| | Output | 2132.5 | 9.65 |
| | Input | 2150.0 | 9.60 |
| | Output | 2150.0 | 9.65 |
| GSM | Input | 2111.2 | 0.285 |
| | Output | 2111.2 | 0.275 |
| | Input | 2132.5 | 0.282 |
| | Output | 2132.5 | 0.277 |
| | Input | 2153.8 | 0.270 |
| | Output | 2153.8 | 0.282 |
| WCDMA | Input | 2112.5 | 4.58 |
| | Output | 2112.5 | 4.60 |
| | Input | 2132.5 | 4.60 |
| | Output | 2132.5 | 4.55 |
| | Input | 2152.5 | 4.55 |
| | Output | 2152.5 | 4.58 |

**Figure 71 Occupied Bandwidth AWS**

See additional information in Figure 72 to Figure 95.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.13

Typed/Printed Name: A. Sharabi

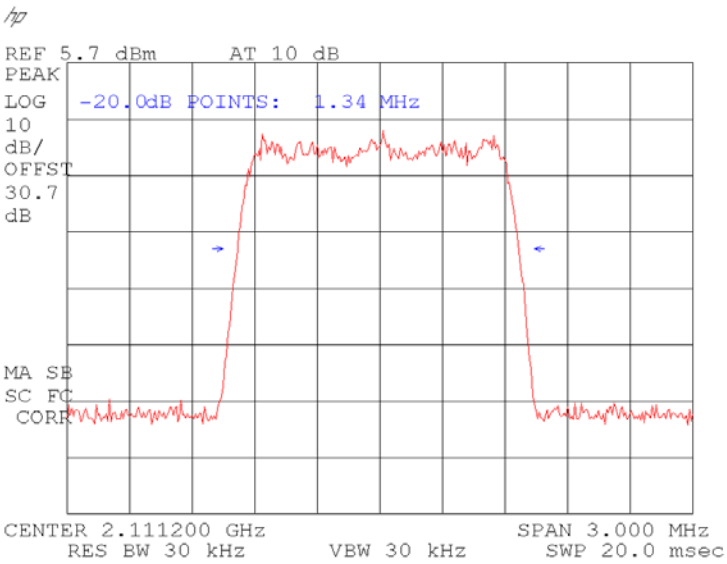


**Figure 72.— CDMA (2111.2 MHz) IN**

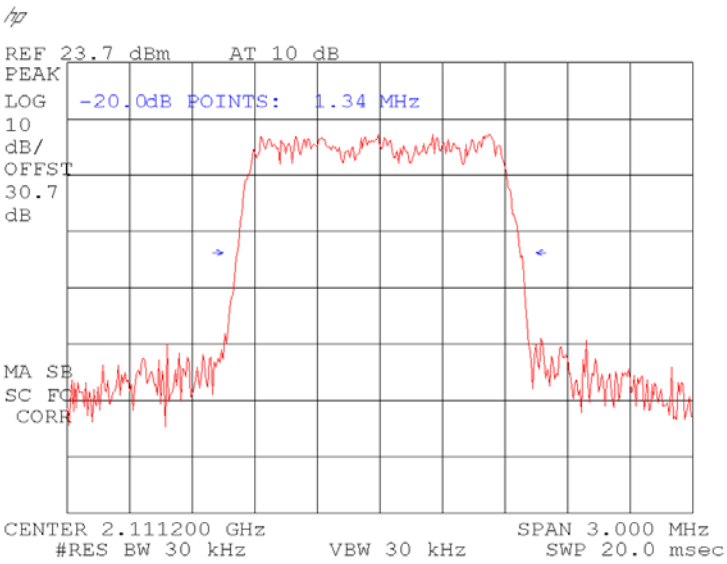


**Figure 73.— CDMA (2111.2 MHz) OUT**

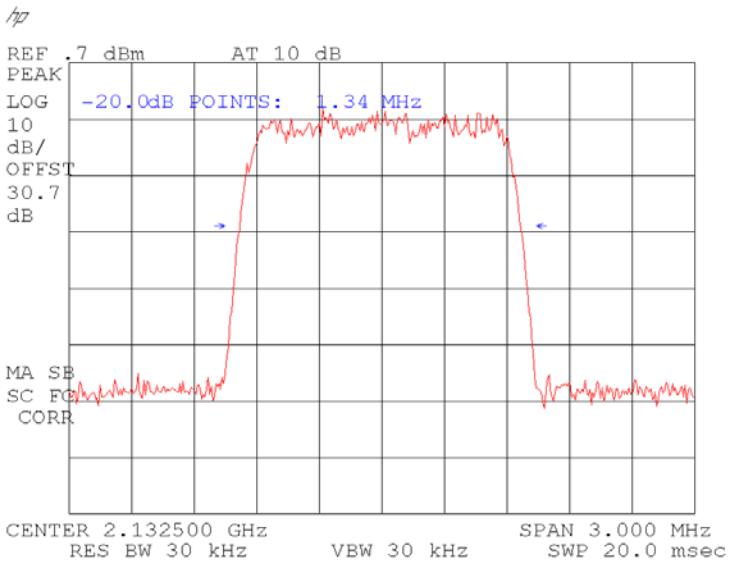


**Figure 74.— CDMA (2132.5 MHz) IN**

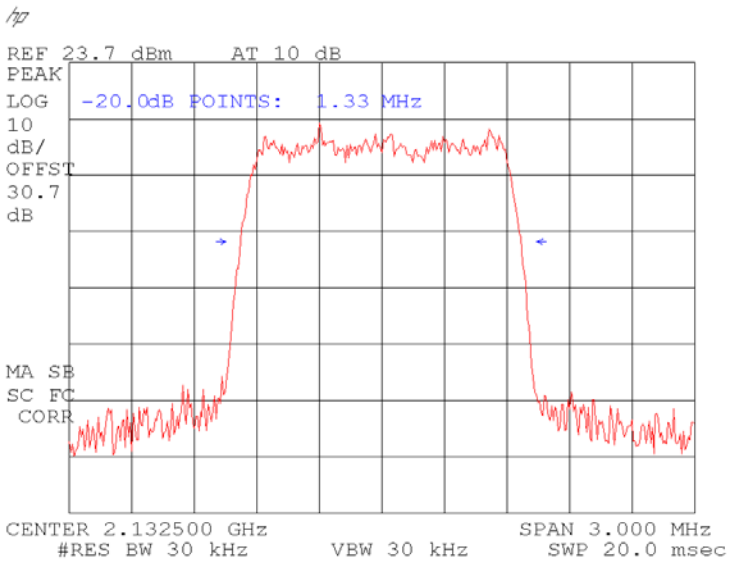


**Figure 75.— CDMA (2132.5 MHz) OUT**

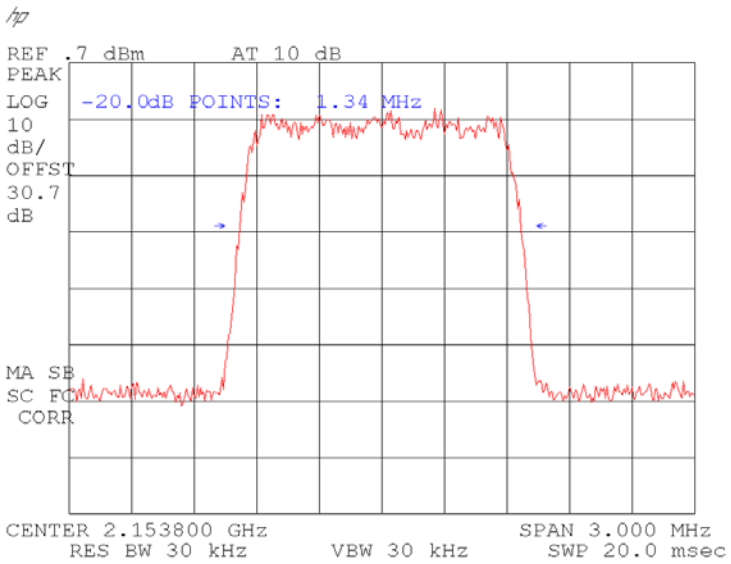


**Figure 76.— CDMA (2153.8 MHz) IN**

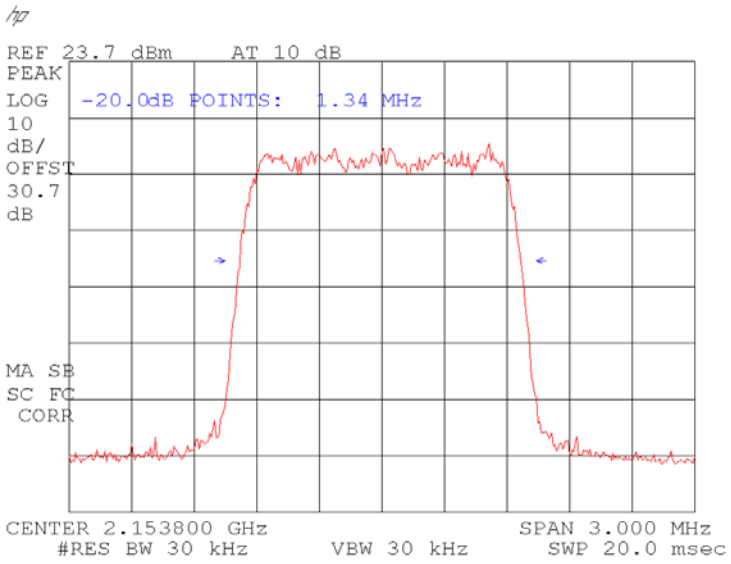


**Figure 77.— CDMA (2153.8 MHz) OUT**

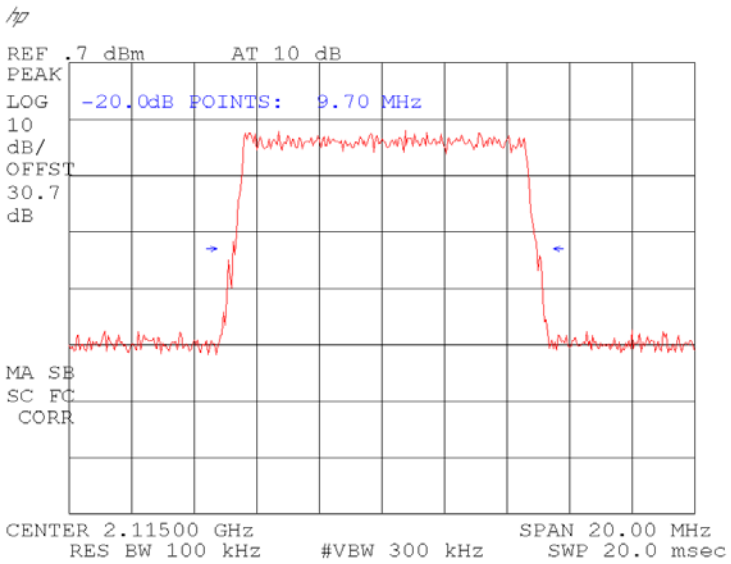


**Figure 78.— LTE 64QAM(2115.0 MHz) IN**

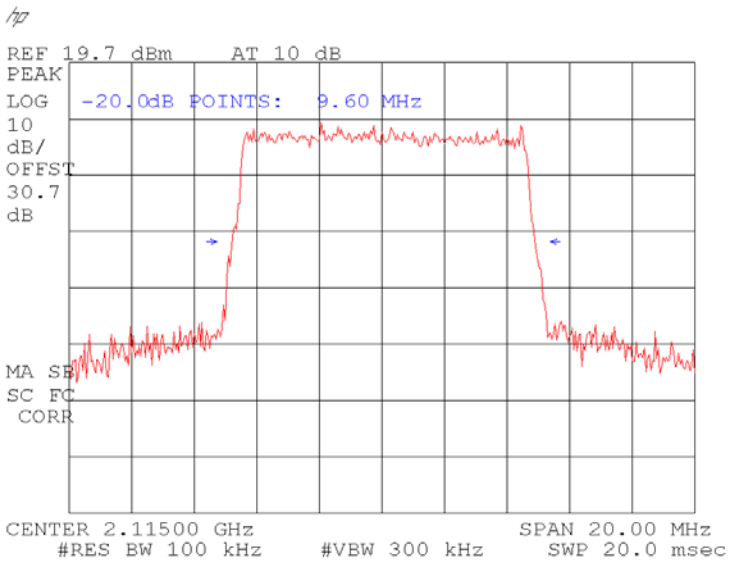


**Figure 79.— LTE 64QAM (2115.0 MHz) OUT**

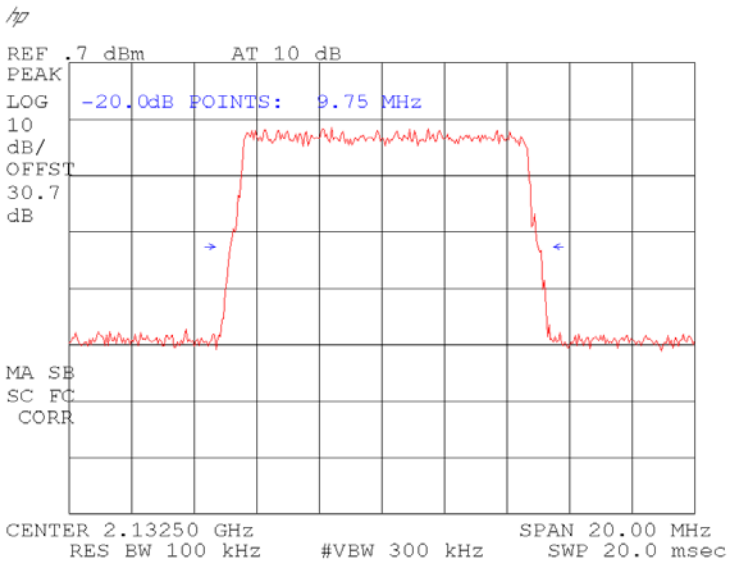


**Figure 80.— LTE 64QAM (2132.5 MHz) IN**

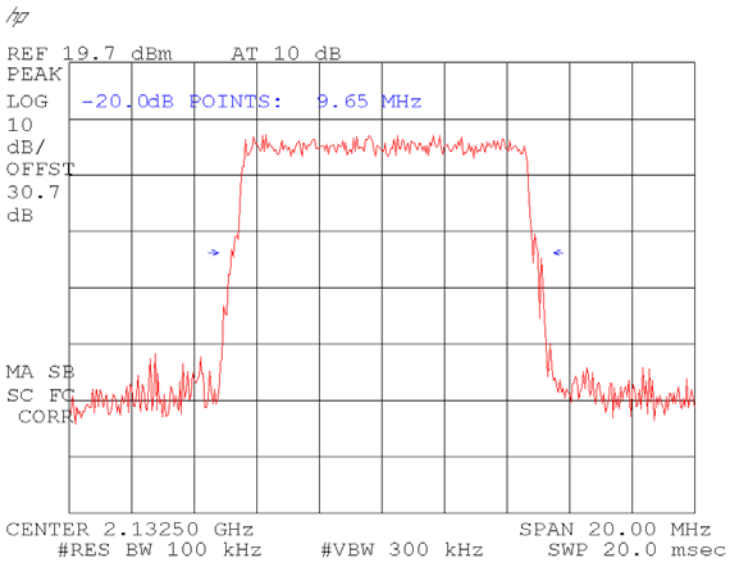


**Figure 81.— LTE 64QAM (2132.5 MHz) OUT**

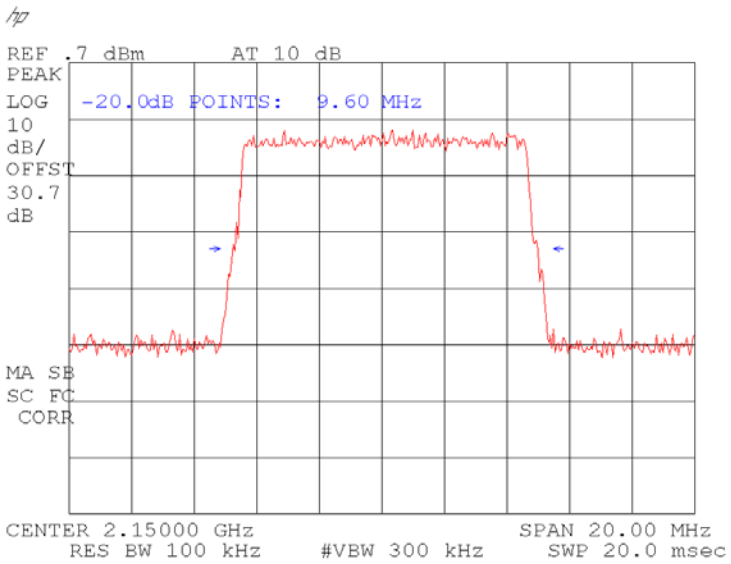


**Figure 82.— LTE 64QAM (2150.0 MHz) IN**

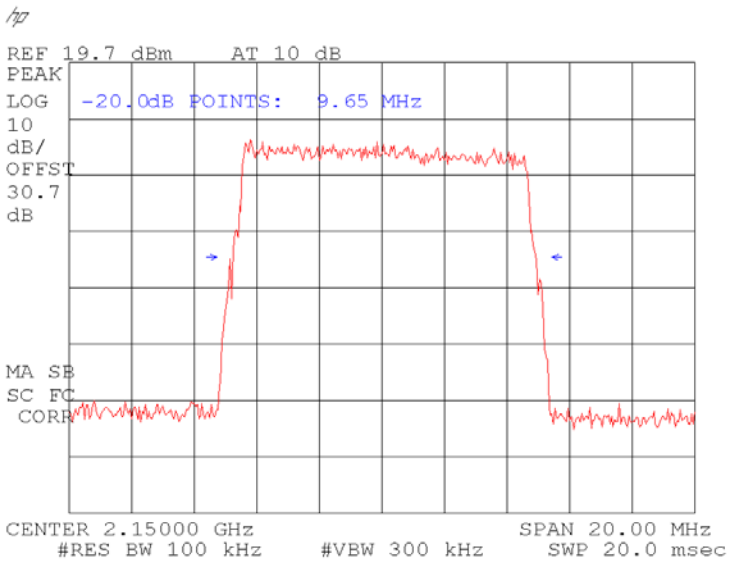


**Figure 83.— LTE 64QAM (2150.0 MHz) OUT**

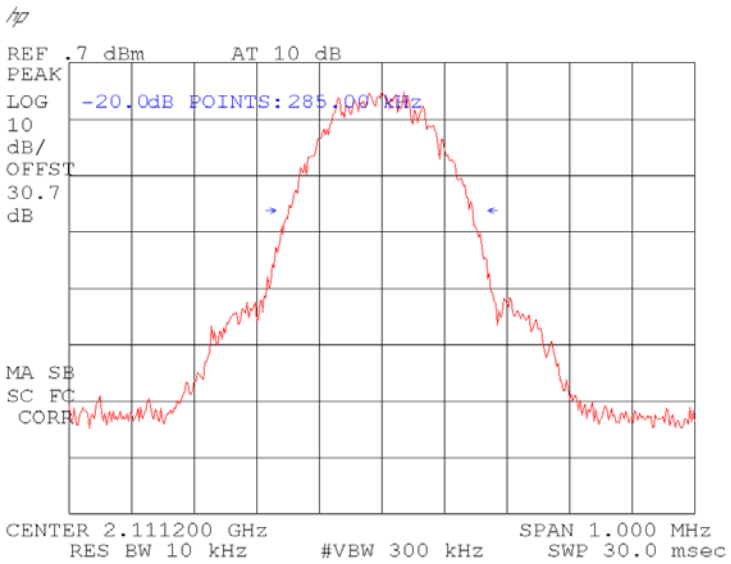


**Figure 84.— GSM (2111.2 MHz) IN**

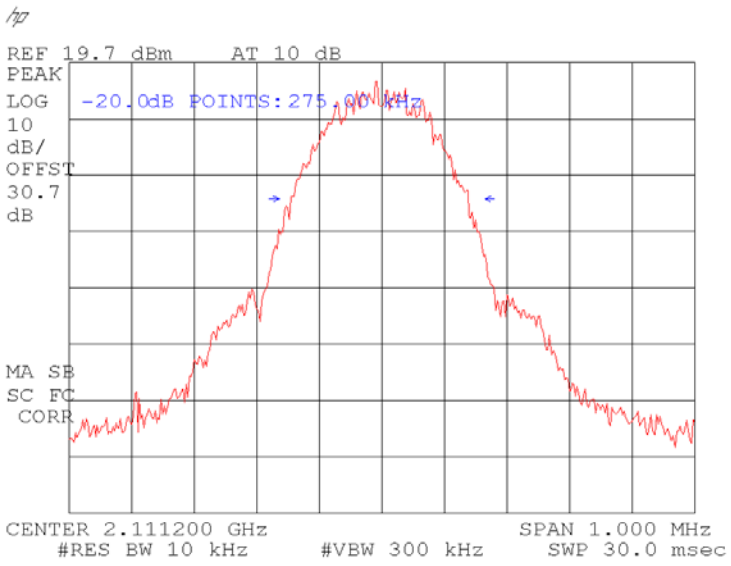


**Figure 85.— GSM (2111.2 MHz) OUT**

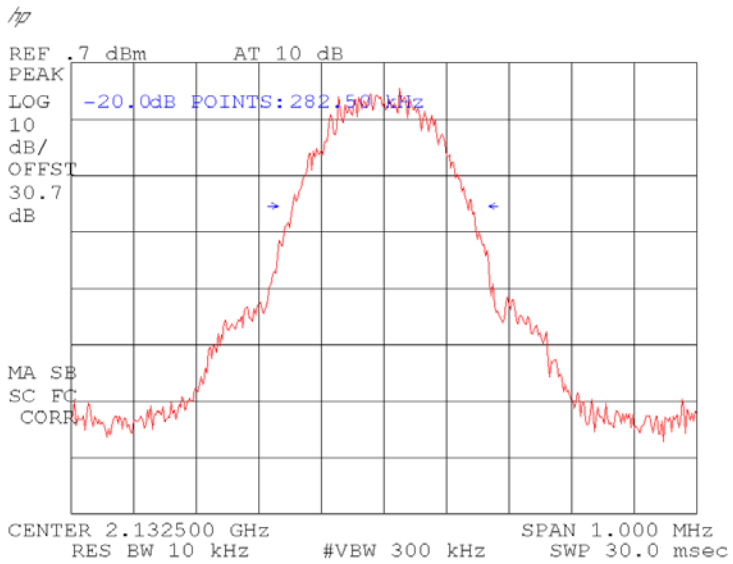


**Figure 86.— GSM (2132.5 MHz) IN**

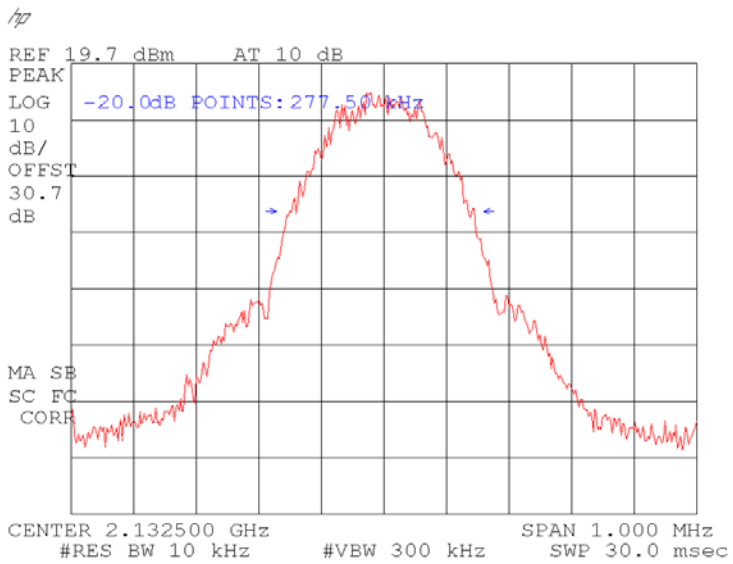


**Figure 87.— GSM (2132.5 MHz) OUT**

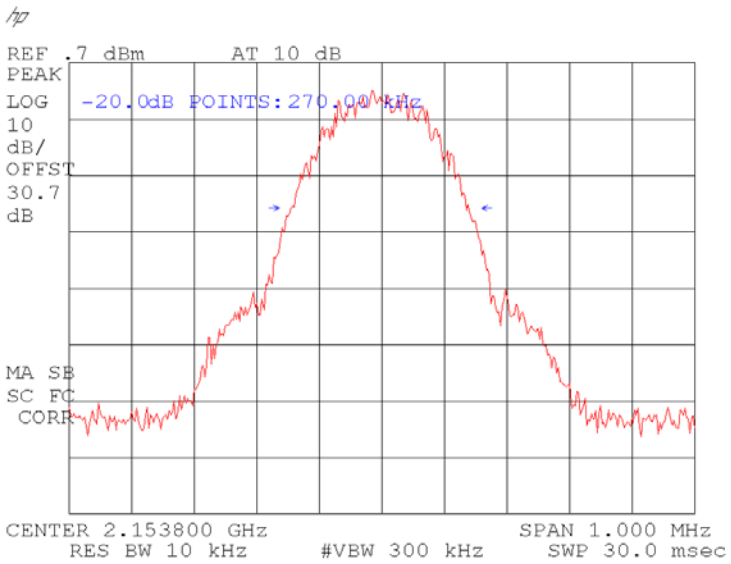


**Figure 88.— GSM (2153.8 MHz) IN**

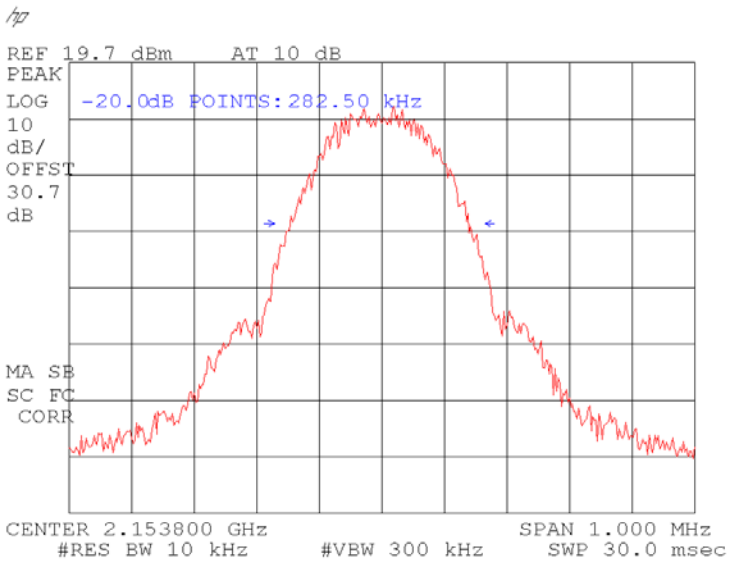


**Figure 89.— GSM (2153.8 MHz) OUT**

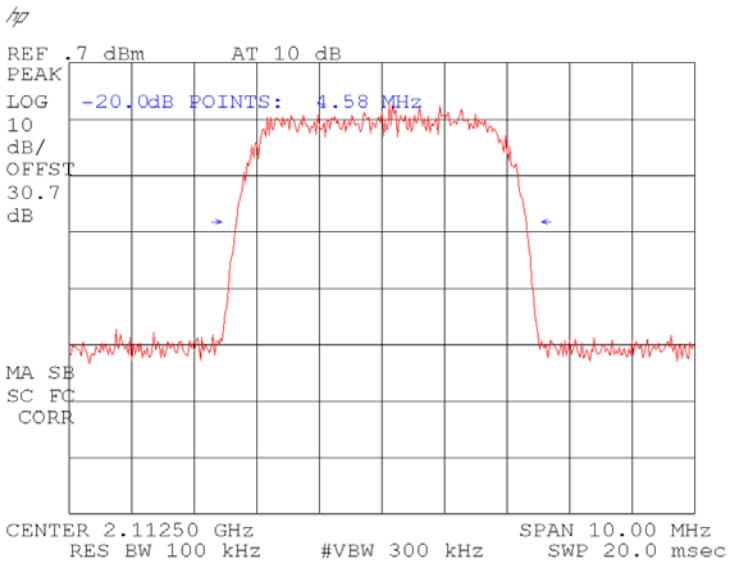


**Figure 90.— W-CDMA (2112.5 MHz) IN**

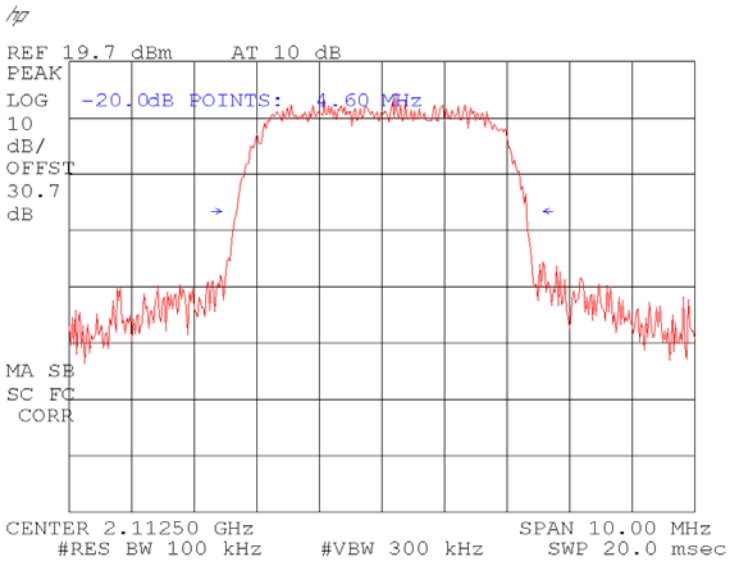


**Figure 91.— W-CDMA (2112.5 MHz) OUT**

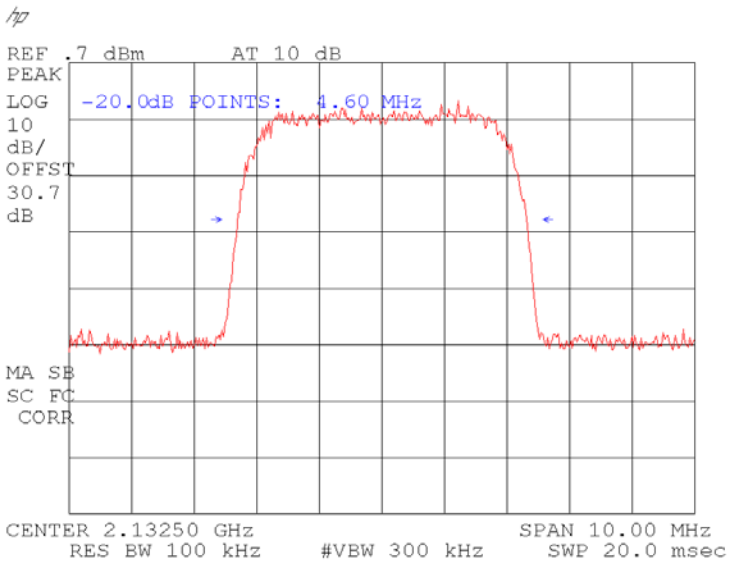


**Figure 92.— W-CDMA (2132.5 MHz) IN**

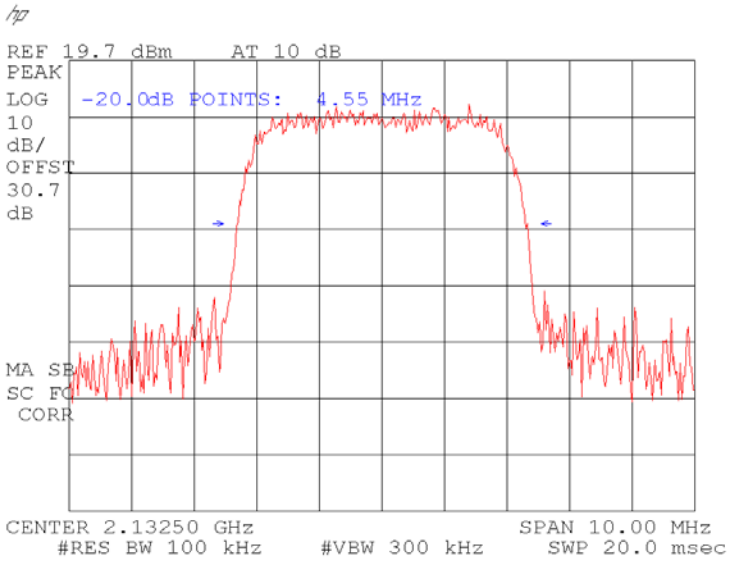


**Figure 93.— W-CDMA (2132.5 MHz) OUT**

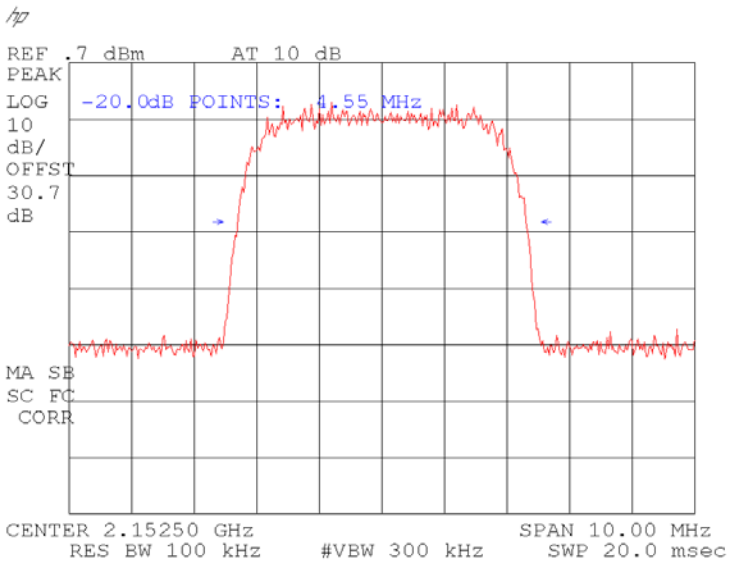


**Figure 94.— W-CDMA (2152.5 MHz) IN**

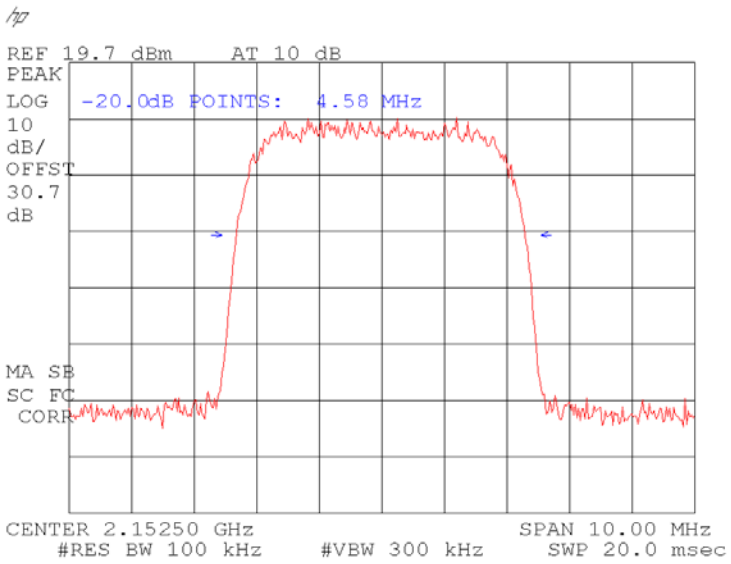


**Figure 95.— W-CDMA (2152.5 MHz) OUT**

## 10.4 Test Equipment Used.

Occupied Bandwidth

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 96 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 = 31.0 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*

See additional information in Figure 97 to Figure 108.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.013

Typed/Printed Name: A. Sharabi

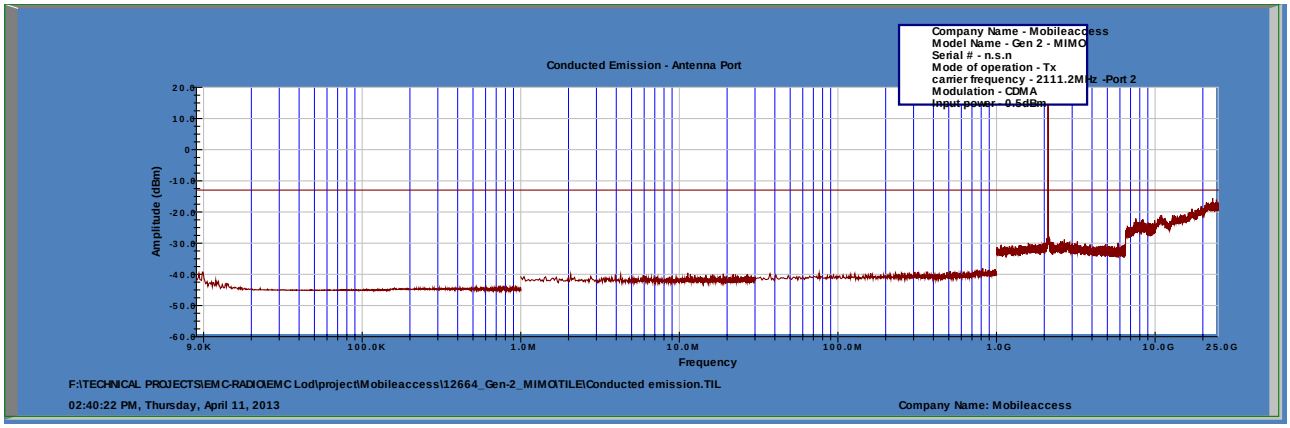


**Figure 97 Spurious Emissions at Antenna Terminals CDMA, 2111.2MHz**

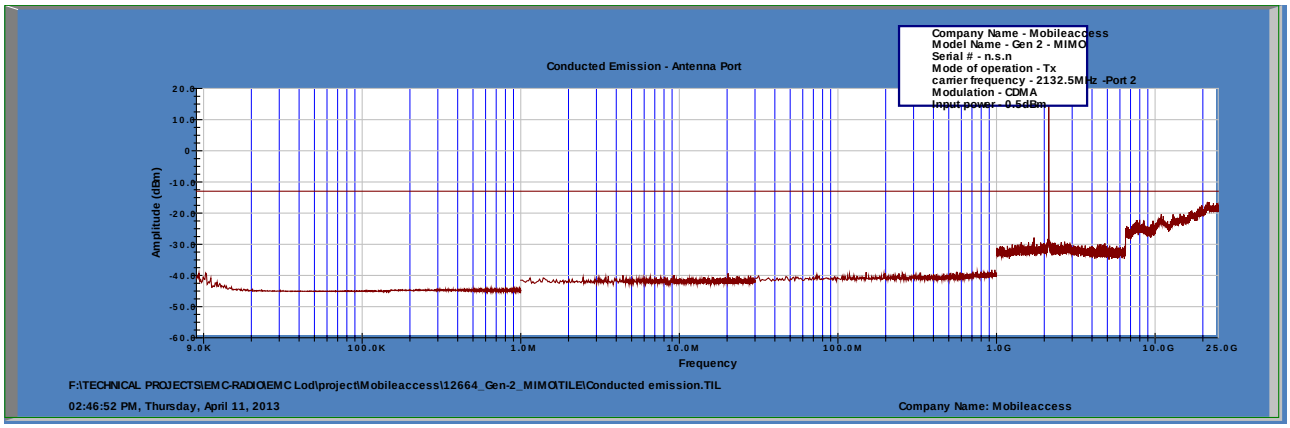


**Figure 98 Spurious Emissions at Antenna Terminals CDMA, 2132.5MHz**

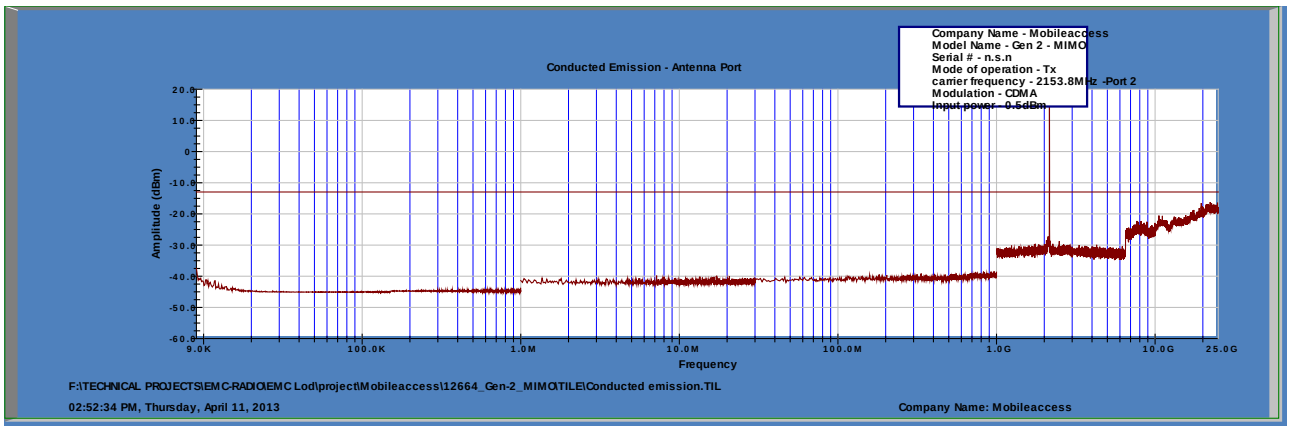


**Figure 99 Spurious Emissions at Antenna Terminals CDMA, 2153.8MHz**

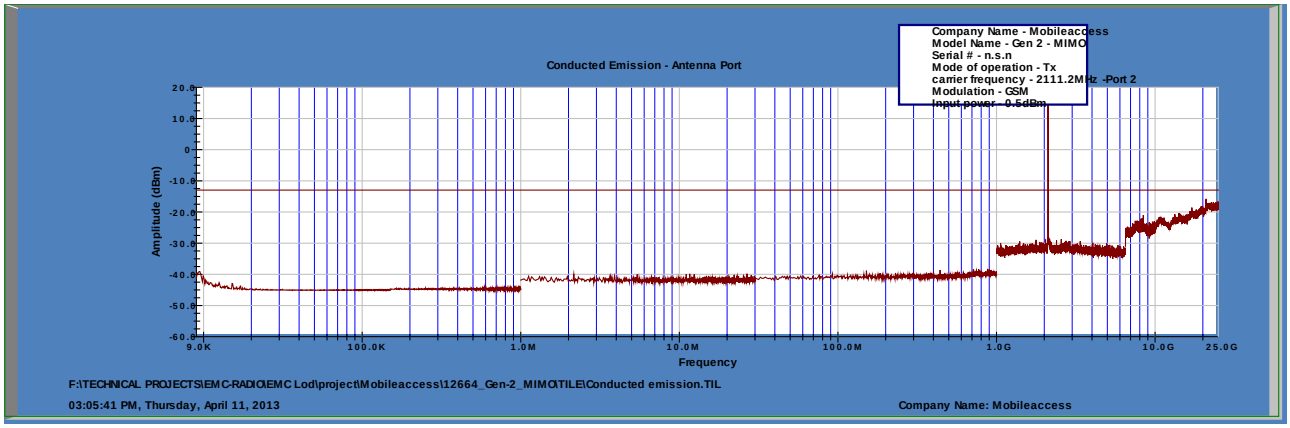


**Figure 100 Spurious Emissions at Antenna Terminals GSM, 2111.2MHz**

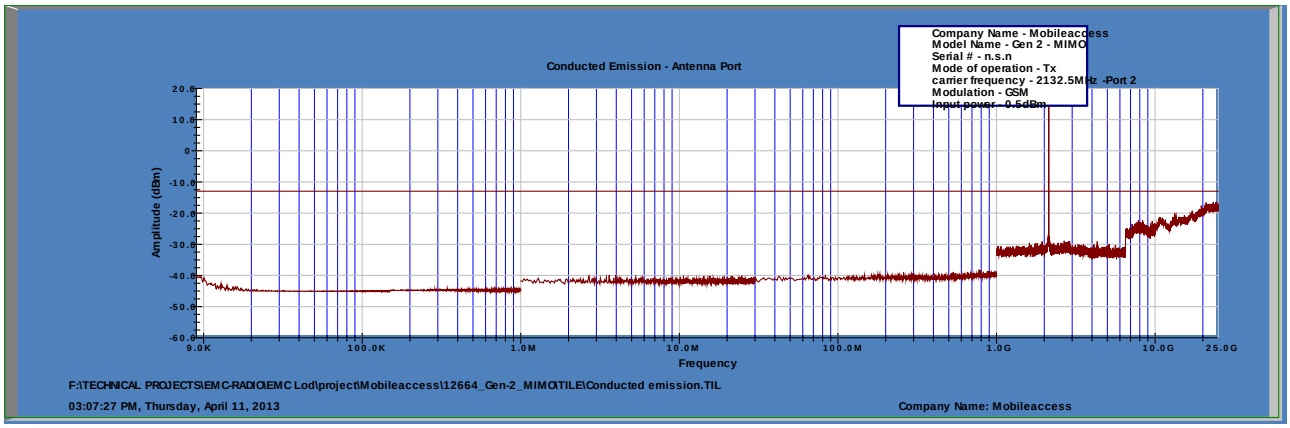


**Figure 101 Spurious Emissions at Antenna Terminals GSM, 2132.5MHz**

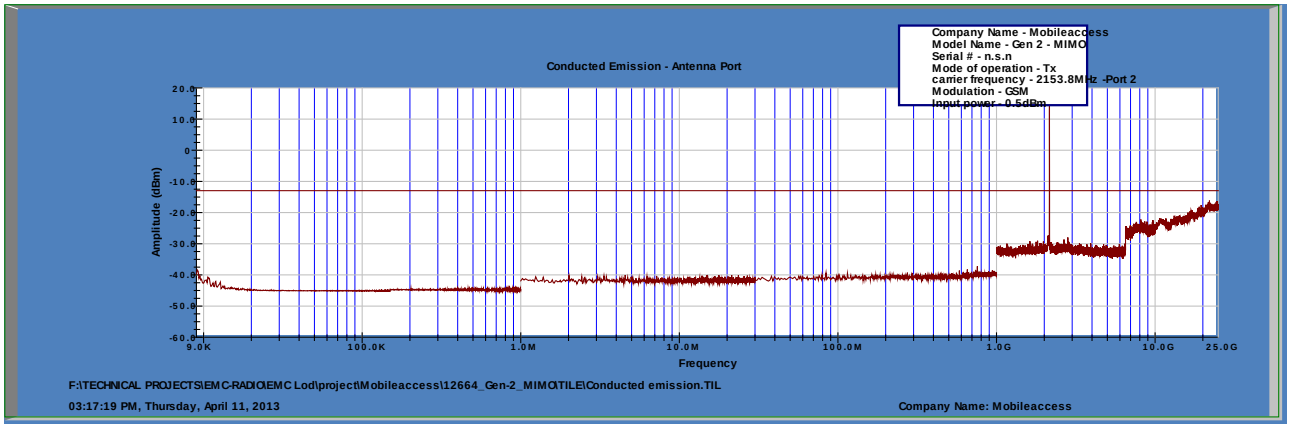


**Figure 102 Spurious Emissions at Antenna Terminals GSM, 2153.8MHz**

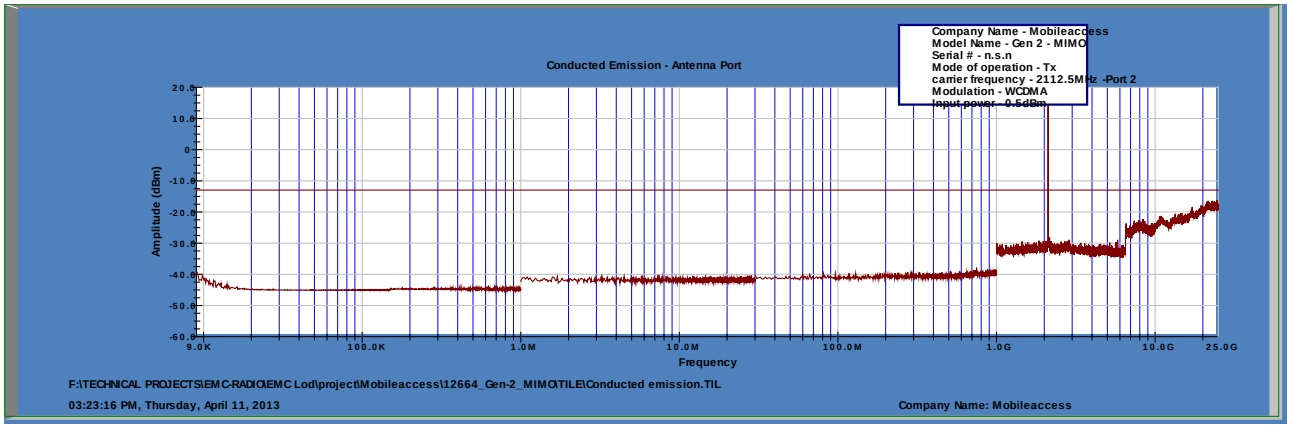


**Figure 103 Spurious Emissions at Antenna Terminals WCDMA, 2112.5MHz**

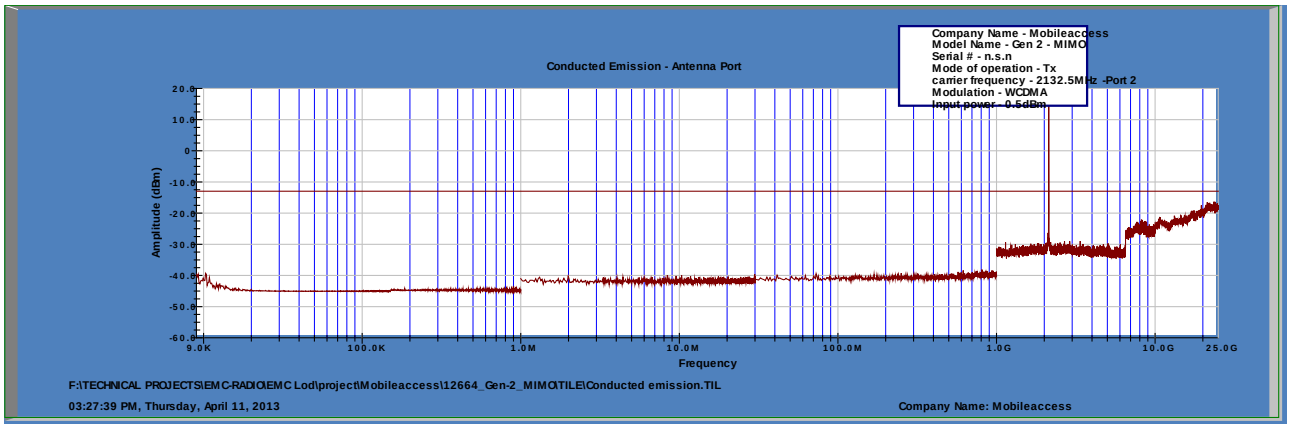


**Figure 104 Spurious Emissions at Antenna Terminals WCDMA, 2132.5MHz**

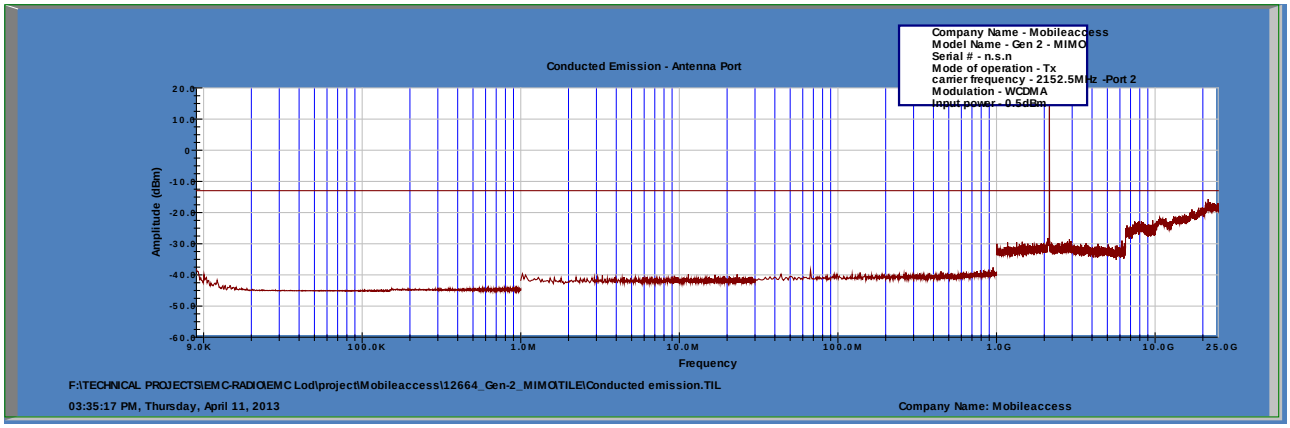


**Figure 105 Spurious Emissions at Antenna Terminals WCDMA, 2152.5MHz**

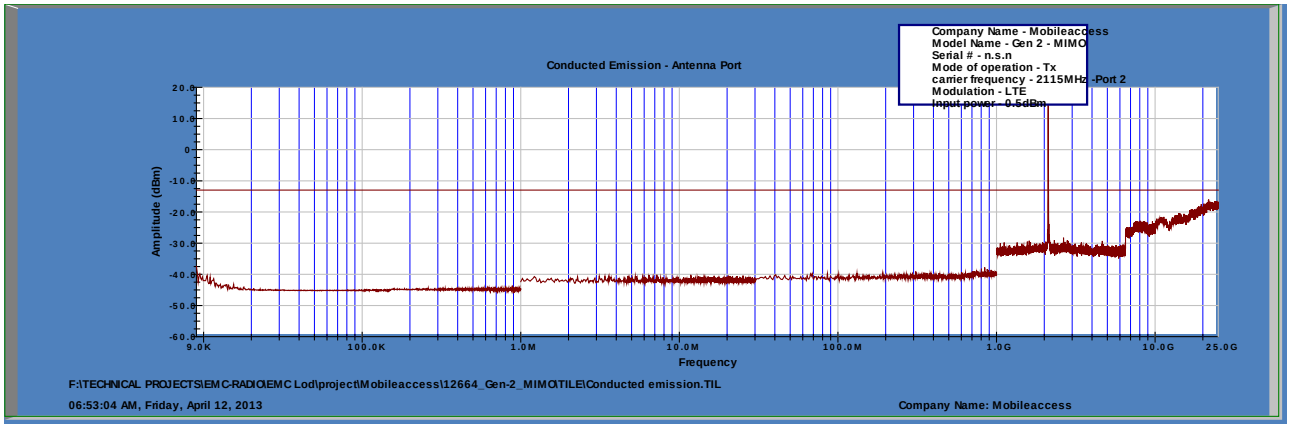


**Figure 106 Spurious Emissions at Antenna Terminals LTE, 2115.0MHz**

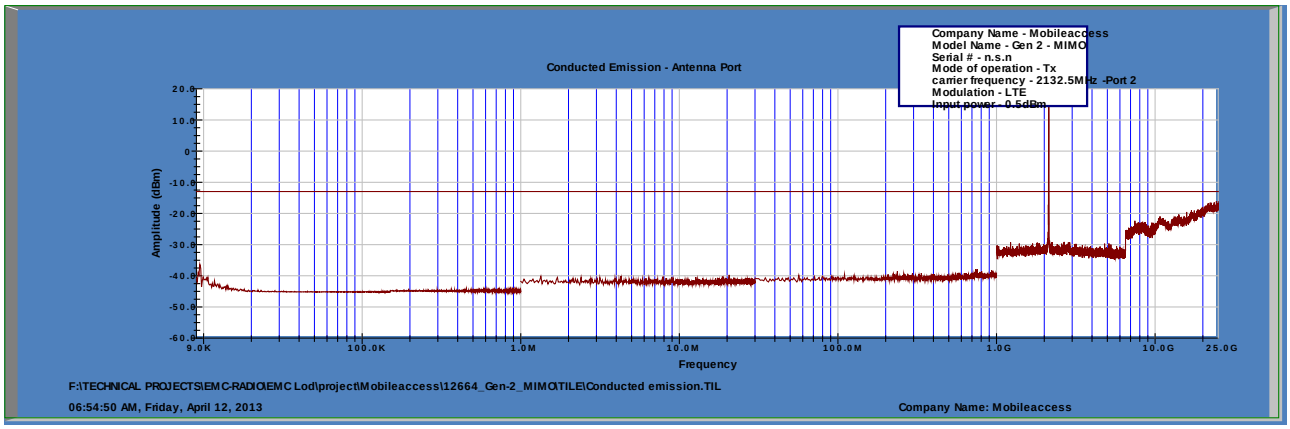


**Figure 107 Spurious Emissions at Antenna Terminals LTE, 2132.5MHz**

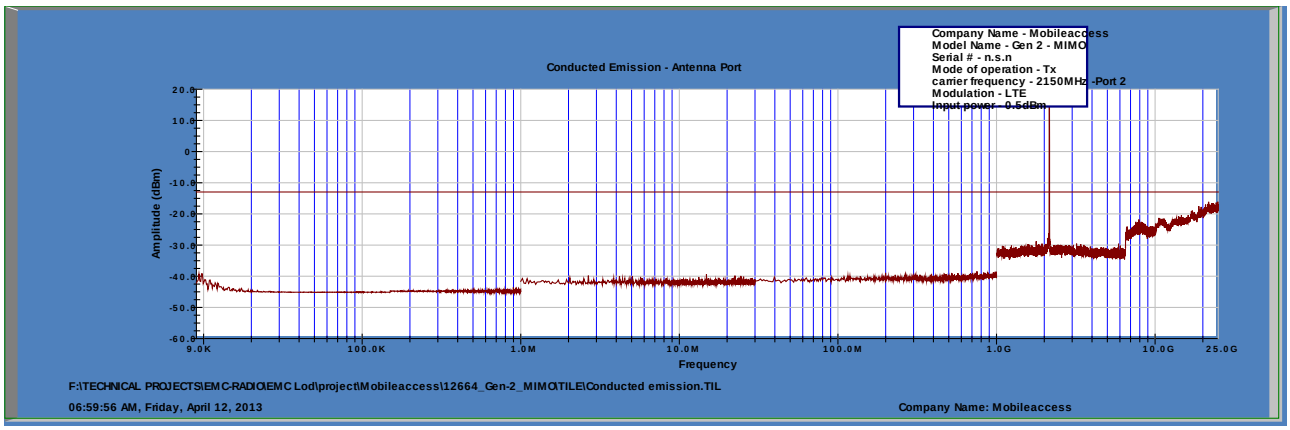


**Figure 108 Spurious Emissions at Antenna Terminals LTE, 2150.0MHz**

### *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 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 109 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 = 30.7 dB).

## 12.3 Test Results

| Modulation | Operation Frequency (MHz) | Band Edge Frequency (MHz) | Reading (dBm) | Specification (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| CDMA | 2111.2 | 2110.00 | -18.74 | -13.0 | -5.74 |
| CDMA | 2153.8 | 2155.00 | -39.67 | -13.0 | -26.67 |
| LTE 64QAM | 2115.0 | 2110.00 | -19.35 | -13.0 | -6.35 |
| LTE 64QAM | 2150.0 | 2155.00 | -21.91 | -13.0 | -8.91 |
| GSM | 2111.2 | 2110.00 | -40.77 | -13.0 | -27.77 |
| GSM | 2153.8 | 2155.00 | -44.85 | -13.0 | -31.85 |
| W-CDMA | 2112.5 | 2110.00 | -18.77 | -13.0 | -5.77 |
| W-CDMA | 2152.5 | 2155.00 | -34.59 | -13.0 | -21.59 |

**Figure 110 Band Edge Spectrum Results AWS**

See additional information in Figure 111 to Figure 118.

JUDGEMENT: Passed by 4.62 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 07.05.013

Typed/Printed Name: A. Sharabi

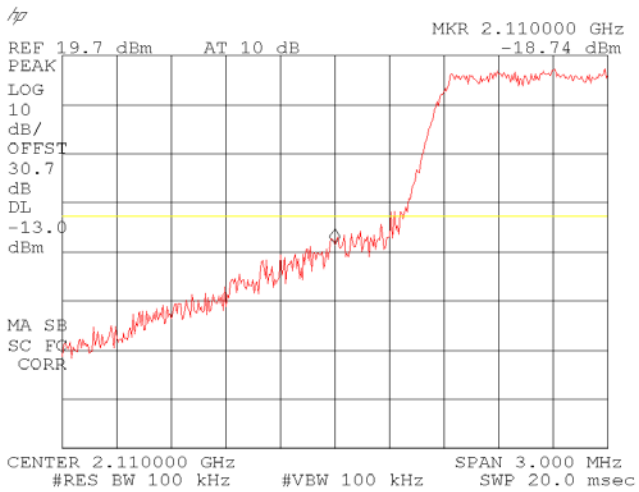


**Figure 111.— CDMA 2111.20 MHz**

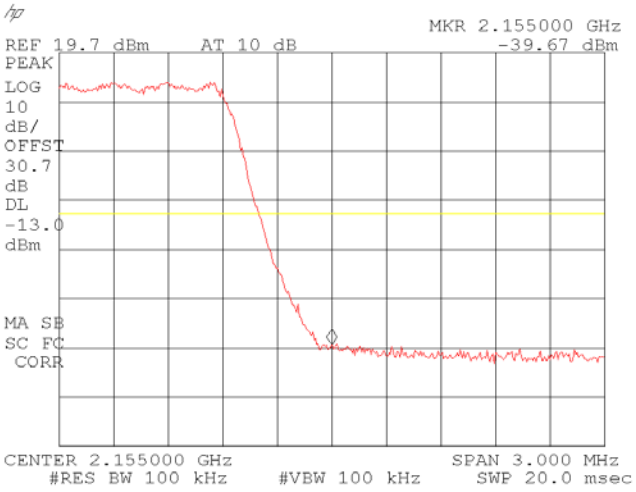


**Figure 112.— CDMA 2153.80 MHz**

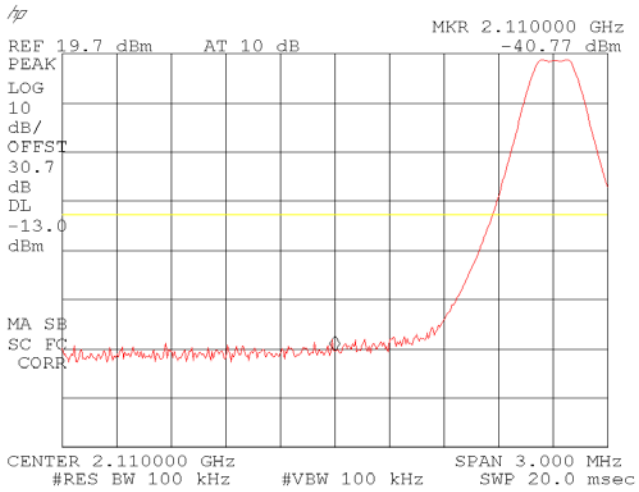


**Figure 113.— GSM 2111.20 MHz**

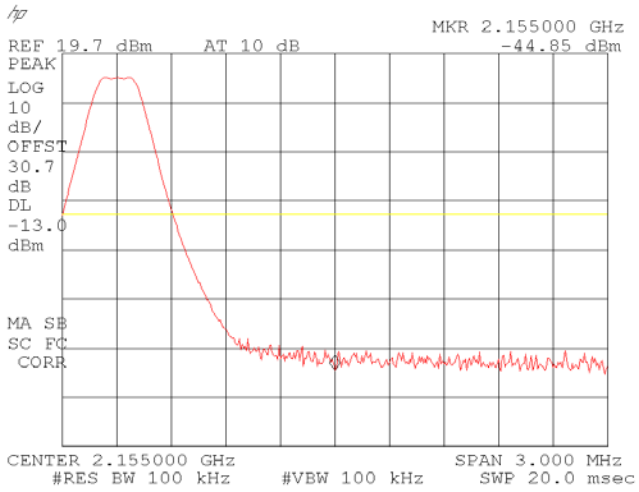


**Figure 114.— GSM 2153.80 MHz**

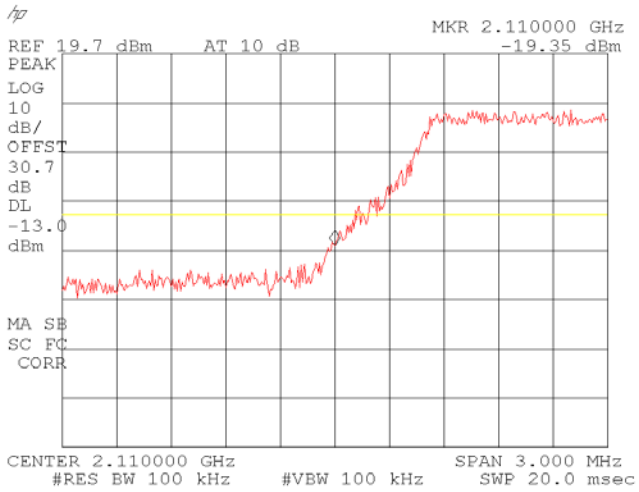


**Figure 115.— LTE 64QAM 2115.00 MHz**

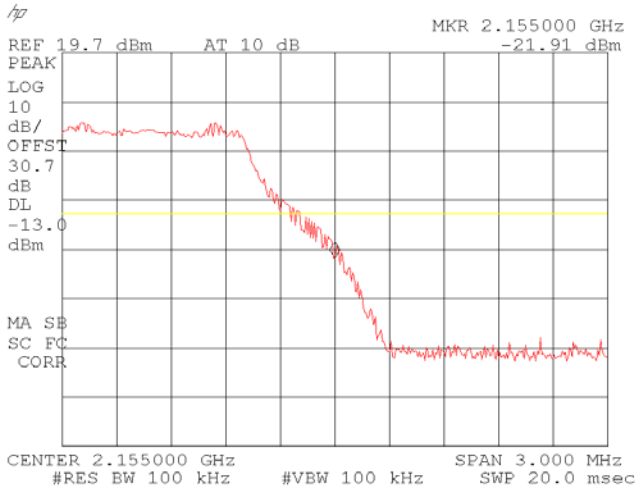


**Figure 116.— LTE 64QAM 2150.00 MHz**

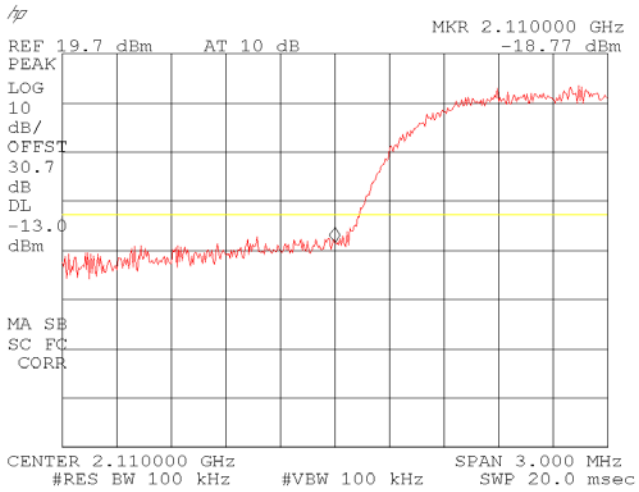


**Figure 117.— W-CDMA 2112.50 MHz**

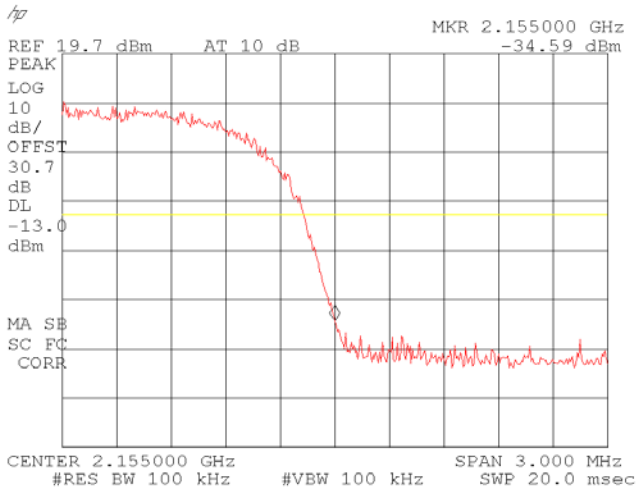


**Figure 118.— W-CDMA 2152.50 MHz**

## 12.4 Test Equipment Used.

Band Edge Spectrum AWS

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 119 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

| 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 | 51.9 | -51.49 | 4.45 | 9.12 | -46.82 | -13.0 | -33.82 |
| 2111.20 | 4222.4 | H | 52.9 | -50.25 | 4.45 | 9.12 | -45.58 | -13.0 | -32.58 |
| 2135.00 | 4270.0 | V | 52.4 | -51.67 | 4.45 | 9.38 | -46.74 | -13.0 | -33.74 |
| 2135.00 | 4270.0 | H | 51.7 | -51.91 | 4.45 | 9.38 | -46.98 | -13.0 | -33.98 |
| 2153.80 | 4307.6 | V | 52.2 | -51.87 | 4.45 | 9.38 | -46.94 | -13.0 | -33.94 |
| 2153.80 | 4307.6 | H | 51.9 | -51.71 | 4.45 | 9.38 | -46.78 | -13.0 | -33.78 |

**Figure 120 Spurious Radiated Emission AWS**

JUDGEMENT: Passed by 32.58 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: 07.05.13

Typed/Printed Name: A. Sharabi

### *13.4 Test Instrumentation Used, Radiated Measurements AWS*

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|---|---|---|---|---|---|
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Signal Generator | Agilent | N5182A | MY50141213 | July 9, 2012 | 1 year |
| Signal Generator | Agilent | 83731B | US37100653 | October 23, 2012 | 1 year |
| Signal Generator | Agilent | 8647A | 3625U00686 | March 5, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 121 Test Equipment Used**

# 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 = 31.0 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.

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

LTE 747 MHz QPSK 0 dBm

AWS: 2135 MHz W-CDMA 0 dBm

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

## *14.2 Test Results*

See additional information in Figure 122.

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 07.05.13

Typed/Printed Name: A. Sharabi

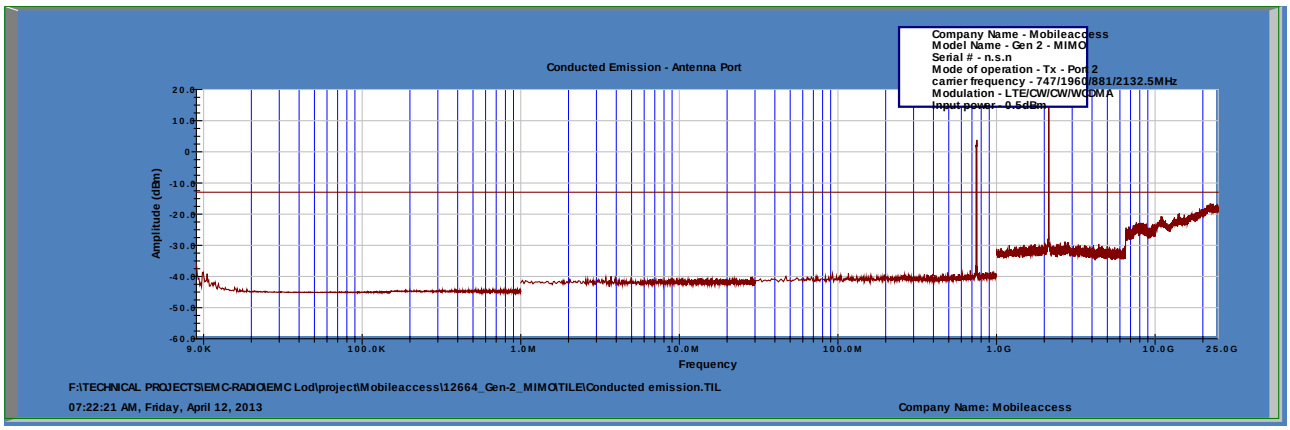


**Figure 122 Intermodulation**

## *14.3 Test Equipment Used.*

Intermodulation Conducted

| Instrument | Manufacturer | Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Calibration | Period |
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 123 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: 07.05.13
Typed/Printed Name: A. Sharabi

| 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 | 52.7 | -47.99 | 7.4 | 8.26 | -47.13 | -13.0 | -34.13 |
| 2*747+881 | 2375 | H | 51.6 | -49.28 | 7.4 | 8.26 | -48.42 | -13.0 | -35.42 |
| 2*747-881 | 613 | V | 39.7 | -56.64 | 3.2 | 0.97 | -58.87 | -13.0 | -45.87 |
| 2*747-881 | 613 | H | 39.8 | -57.91 | 3.2 | 0.97 | -60.14 | -13.0 | -47.14 |
| 2*881-747 | 1015 | V | 51.3 | -50.49 | 4.2 | 5.4 | -49.29 | -13.0 | -36.29 |
| 2*881-747 | 1015 | H | 41.6 | -59.85 | 4.2 | 5.4 | -58.65 | -13.0 | -45.65 |
| 2*881+747 | 2509 | V | 54.6 | -46.16 | 7.7 | 8.4 | -45.46 | -13.0 | -32.46 |
| 2*881+747 | 2509 | H | 54.2 | -47.41 | 7.7 | 8.4 | -46.71 | -13.0 | -33.71 |
| 3*747-2*881 | 579 | V | 38.2 | -58.14 | 3.2 | 0.97 | -58.14 | -13.0 | -45.14 |
| 3*747-2*881 | 579 | H | 38.5 | -59.21 | 3.2 | 0.97 | -61.44 | -13.0 | -48.44 |
| 3*881-2*747 | 1149 | V | 44.2 | -57.29 | 4.45 | 5.84 | -55.90 | -13.0 | -42.90 |
| 3*881-2*747 | 1149 | H | 44.5 | -57.01 | 4.45 | 5.84 | -55.62 | -13.0 | -42.62 |
| 2*1960-2135 | 1785 | V | 48.7 | -51.09 | 5.6 | 7.66 | -49.03 | -13.0 | -36.03 |
| 2*1960-2135 | 1785 | H | 49.2 | -50.85 | 5.6 | 7.66 | -48.79 | -13.0 | -35.79 |
| 2*2135-1960 | 2310 | V | 53.9 | -47.68 | 7.1 | 8.12 | -46.66 | -13.0 | -33.66 |
| 2*2135-1960 | 2310 | H | 52.8 | -49.58 | 7.1 | 8.12 | -48.56 | -13.0 | -35.56 |
| 3*2135-2*1960 | 2485 | V | 54.0 | -46.76 | 7.7 | 8.4 | -46.06 | -13.0 | -33.06 |
| 3*2135-2*1960 | 2485 | H | 54.0 | -47.61 | 7.7 | 8.4 | -46.91 | -13.0 | -33.91 |
| 2*2135-3*1960 | 1610 | V | 50.0 | -51 | 5.3 | 7.62 | -48.68 | -13.0 | -35.68 |
| 2*2135-3*1960 | 1610 | H | 49.3 | -52.14 | 5.3 | 7.62 | -49.82 | -13.0 | -36.82 |

**Figure 124 Intermodulation Radiated Results**

## 15.3 Test Instrumentation Used, Radiated Measurements Intermodulation

| Instrument | Manufacturer | Model | Serial Number | Calibration | Period |
|---|---|---|---|---|---|
| Spectrum Analyzer | HP | 8564E | 3442A00275 | February 13, 2013 | 1 year |
| Signal Generator | Agilent | N5172B ATO 10210 | MY51350182 | May 31, 2012 | 2 years |
| Signal Generator | Agilent | N5182A | MY50141213 | July 9, 2012 | 1 year |
| Signal Generator | Agilent | 83731B | US37100653 | October 23, 2012 | 1 year |
| Signal Generator | Agilent | 8647A | 3625U00686 | March 5, 2012 | 2 years |
| Attenuator | Mini-circuit | UNAT-30+ | N/A | April 3, 2013 | 1 year |
| Cable | Mini-circuit | DCB | N/A | April 3, 2013 | 1 year |
| DC Block | MIDWEST MICROWAVE | DCDB-3624-10-NNN-02 | N/A | N/A | N/A |

**Figure 125 Test Equipment Used**

# 16. APPENDIX A - CORRECTION FACTORS

## *16.1 Correction factors for CABLE*

**from EMI receiver to test antenna at 3 meter range.**

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

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

*NOTES:*

*1. The cable type is RG-214.*

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

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

### *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 |