DATE: 5 September 2011

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

FCC Radio Test Report

for

Mobile Access Networks

Equipment under test:

VE LTE 700MHz Mix Band MIMO Comprising :
1. VE Control Unit
2. VE Access Pod

1. VCU-MB-LTE700-12E
2. VAP-MB-LTE700E

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
A. Moses, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for

FCC ID: OJFVELTE700MB

This report concerns: Original Grant: X
Class II change:
Class I change:

Equipment type: Licensed Non-Broadcast Station Transmitter

Limits used:
47CFR Part 27 Subpart C

Measurement procedure used is ANSI C63.4-2003.
Substitution Method used as in ANSI/TIA-603-D: 2010

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

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1. General Information

1.1 Administrative Information

Manufacturer:	Mobile Access Networks
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Equipment Model No.:	**1. VCU-MB-LTE700-12E** **2. VAP-MB-LTE700E**
Equipment Serial No.:	1. 00112600037 2. 00112600002
Date of Receipt of E.U.T:	24.07.11
Start of Test:	24.07.11
End of Test:	09.08.11
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 27 Subpart C

1.2 List of Accreditations

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

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

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

1.3 Product Description

The MobileAccessVE Multi-Band LTE 700 MHz MIMO solution provides enhanced, cost effective, in-building LTE MIMO Upper C or Lower A, B, C Block coverage for all enterprise environments. This solution is quickly and easily deployed using the existing cable infrastructure to provide instant coverage without affecting existing LAN services or performance.

MobileAccessVE Mixed-Band LTE 700 MHz solution interfaces with the Service Provider's RF capacity sources, combines the MIMO wireless services with the Ethernet services and routes the combined services over the existing Ethernet infrastructure to strategically distributed Access Pods. The Access Pods are connected to standard RJ45 Ethernet jacks. They provide signal coverage and Ethernet connectivity for IP devices.

MobileAccessVE Mixed-Band LTE 700MHz solution is simply implemented via two types of units:

VE Control Unit (VCU) – Interfaces with the Service Provider's RF capacity sources and VE Access Pods (VAPs). It combines the two wireless LTE MIMO channels with the Ethernet services and distributes them to the VAPs over CAT-5e/6 cables. Coverage can be expanded with Slave VCUs. The Master Unit can be configured to either support the Lower A,B,C and/or Upper C spectrum from the RF source.

VE Access Pods (VAPs) – Two types of MIMO LTE VAPs, supporting Upper C or Lower A,B,C blocks (Model Dependent). Distributes LTE MIMO service and provides Ethernet/IP connectivity and PoE pass-through to connected IP appliances, such as Wi-Fi APs and IP phones.

1.4 Test Methodology

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

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing 03 September 2009).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) 0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

2. System Test Configuration

2.1 Justification

The test setup was configured to closely resemble the standard installation.
The EUT consists of the VCU and the VAP.
The LTE source signal is represented in the setup by appropriate signal generator.
An "Exercise" SW on the computer was used to enable / disable transmission of the VAP, while the EUT output was connected to the spectrum analyzer.
Both MIMO channels transmit during the testing.

2.2 EUT Exercise Software

The Element Management System EngGUI ver. 3.2 build 02 used for commands delivery.
These commands are used to enable / disable of VAP transmission.
APod Embedded SW version 3.2build 03
VCU Embedded SW version 3.2 build 05

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

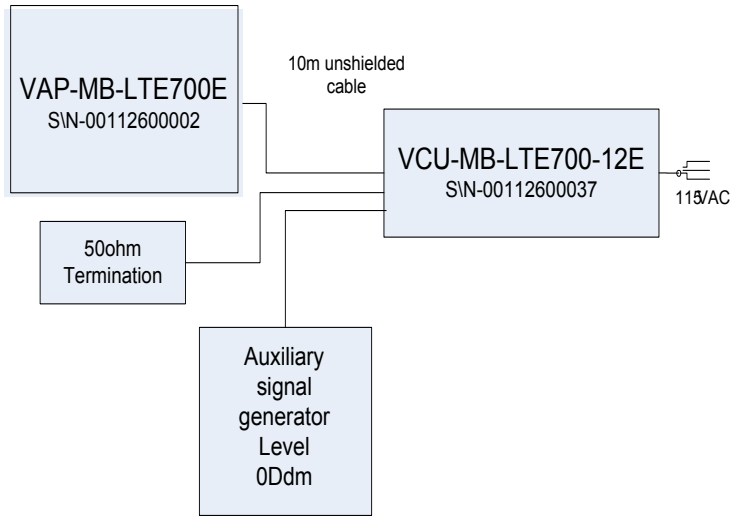


Figure 1. Test Set-up

3. Conducted and Radiated Measurement Test Set-ups Photo

Figure 2. Conducted Emission From AC Mains Test

Figure 3. Conducted Emission From Antenna Ports Test

Figure 4. Radiated Emission Test

Figure 5. Radiated Emission Test

Figure 6. Frequency Error Test

4. Conducted Emission From AC Power Lines

4.1 Test Specification

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

4.2 Test Procedure

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

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

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

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

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

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

4.3 Measured Data

JUDGEMENT: Passed by 9.87 dB

The margin between the emission levels and the specification limit is, in the worst case, 9.87 dB for the phase line at 24.00 MHz and 9.87 dB at 24.00 MHz for the neutral line.

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

The details of the highest emissions are given in *Figure 7* to *Figure 10*.

TEST PERSONNEL:

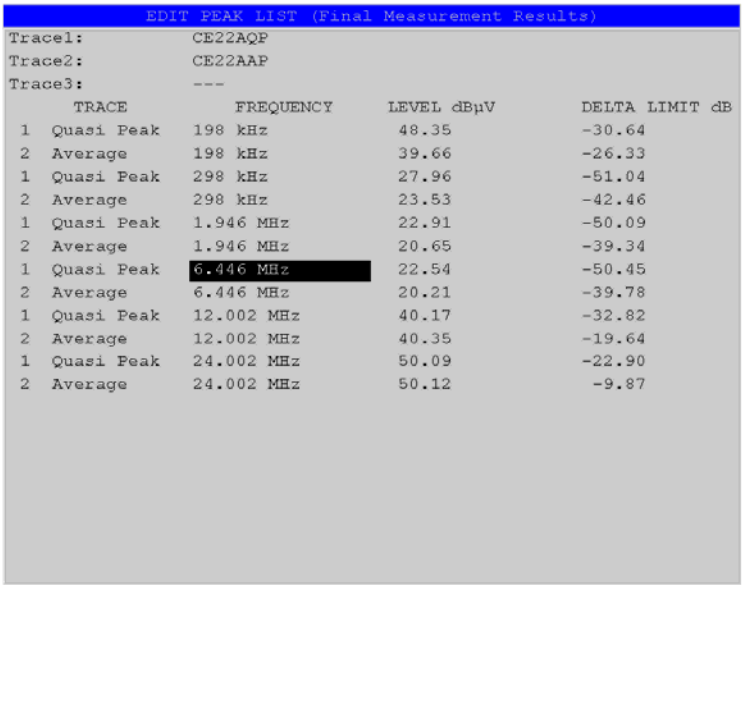
Tester Signature: _____ Date: 06.09.11

Typed/Printed Name: A. Moses

Conducted Emission

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

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



EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22AQP
Trace2: CE22AAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	198 kHz	48.35	-30.64
2	Average	198 kHz	39.66	-26.33
1	Quasi Peak	298 kHz	27.96	-51.04
2	Average	298 kHz	23.53	-42.46
1	Quasi Peak	1.946 MHz	22.91	-50.09
2	Average	1.946 MHz	20.65	-39.34
1	Quasi Peak	6.446 MHz	22.54	-50.45
2	Average	6.446 MHz	20.21	-39.78
1	Quasi Peak	12.002 MHz	40.17	-32.82
2	Average	12.002 MHz	40.35	-19.64
1	Quasi Peak	24.002 MHz	50.09	-22.90
2	Average	24.002 MHz	50.12	-9.87

Date: 2.AUG.2011 09:17:59

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

Note: DELTA LIMIT refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

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

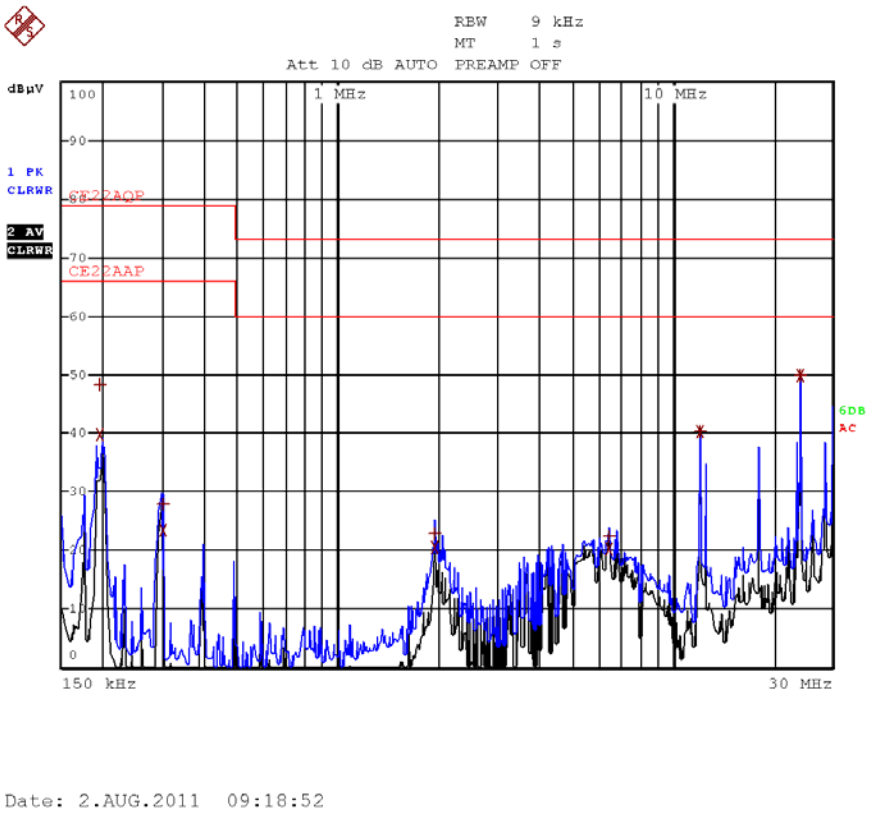


Figure 8. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

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

Figure 9. Detectors: Peak, Quasi-peak, AVERAGE

Note: DELTA LIMIT refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

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

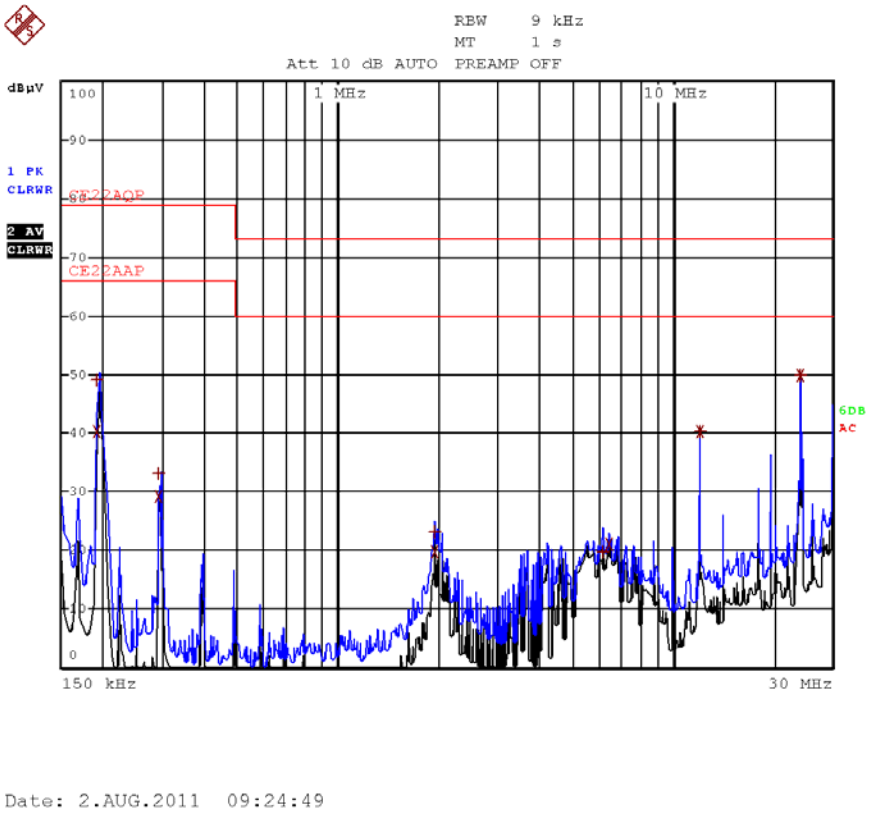


Figure 10 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2011	1 Year
EMI Receiver	Rohde&Schwarz	ESCI7	100724	October 20, 2010	1Year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

5. Maximum Peak Output Power

5.1 Test Specification

FCC Part 27, Subpart C (27.50(h) (2))

5.2 Test procedure

Peak Power Output must not exceed 1000 W. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (21 dB). The E.U.T. RF output was 64QAM 16QAQM and QPSK at 10 MHz bandwidth in the 728-756 MHz bands. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 100 kHz RBW.

Signal generator output power was 0dBm.

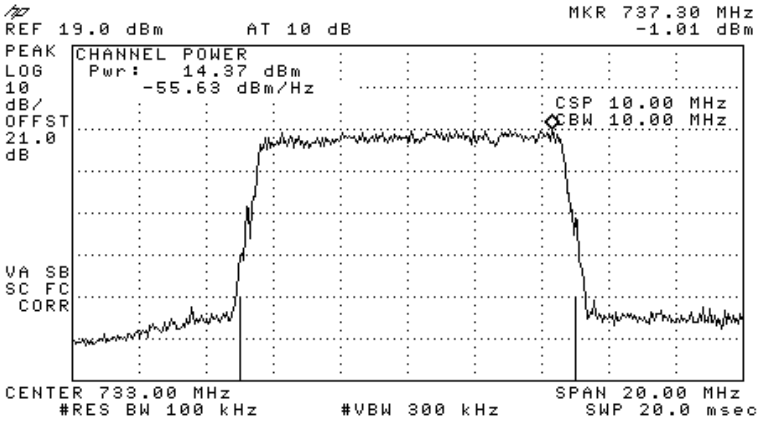


Figure 11.— 733.00 MHz QPSK

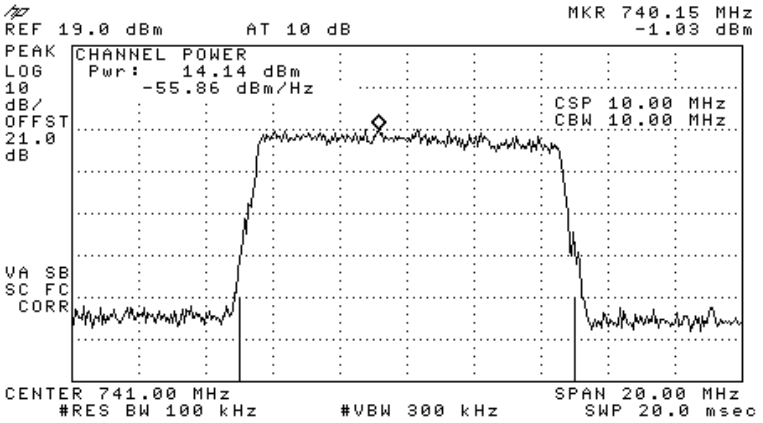


Figure 12.— 741.00 MHz QPSK

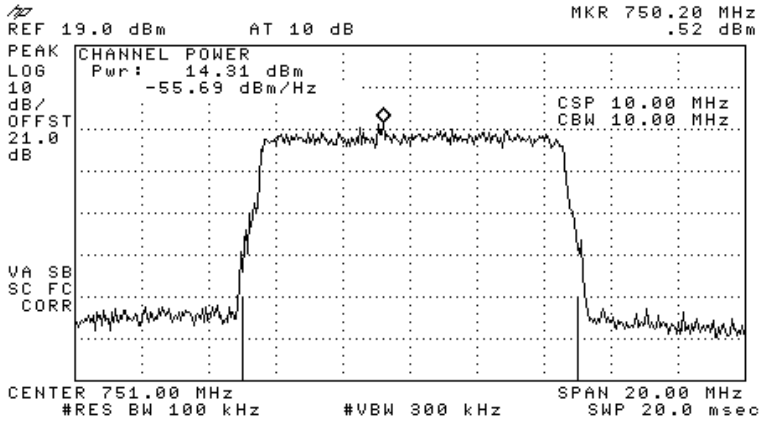


Figure 13.— 751.00 MHz QPSK

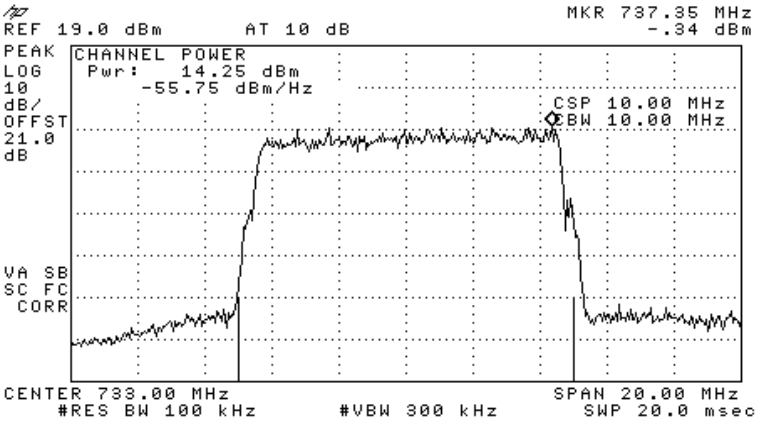


Figure 14.— 733.00 MHz 16QAM

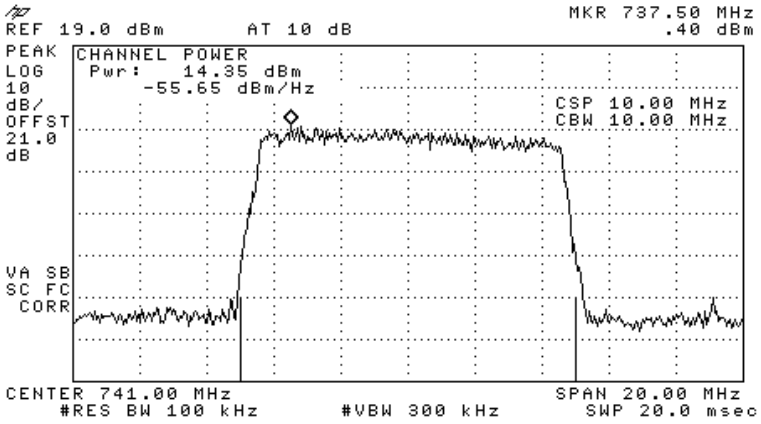


Figure 15.— 741.00 MHz 16QAM

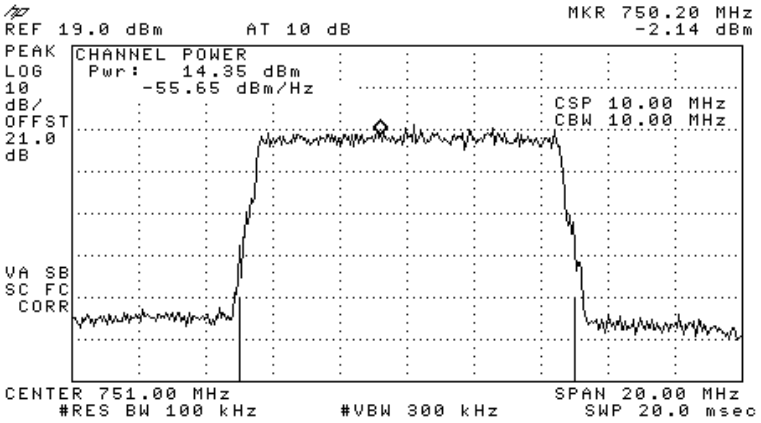


Figure 16.— 751.00 MHz 16QAM

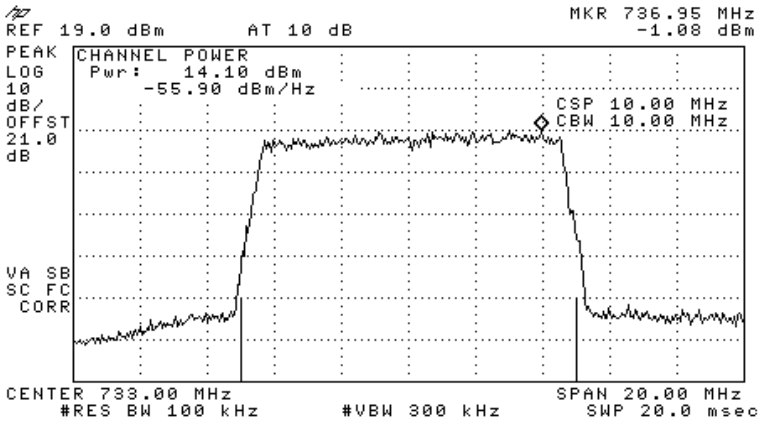


Figure 17.— 733.00 MHz 64QAM

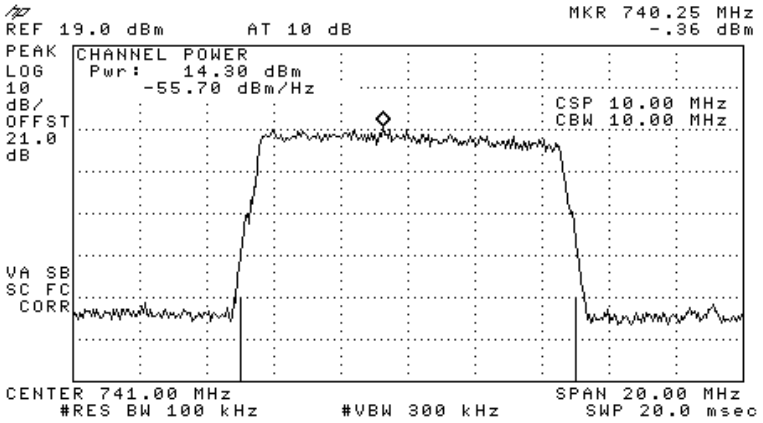


Figure 18.— 741.00 MHz 64QAM

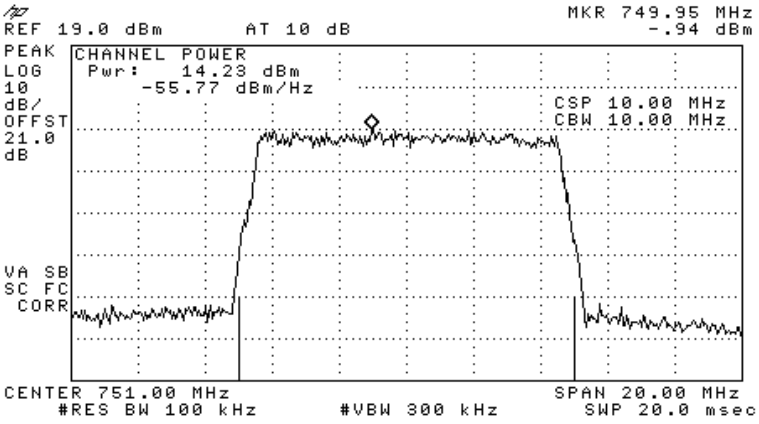


Figure 19.— 751.00 MHz 64QAM

5.3 Results table

E.U.T. Description: VE LTE 700MHz Mix Band MIMO Comprising :
1. VE Control Unit
2. VE Access Pod

Model No.: 1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number: 1. 00112600037 2. 00112600002
Specification: FCC Part 27, Subpart C, Section 27.50 (h) (2)

Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dB)	Reading (EIRP) (dBm)	Reading (EIRP) (mW)	MIMO Total (EIRP) (W)	Specification (W)
QPSK	733.00	14.37	-1.1	13.27	21.23	0.0425	1000
16QAM	733.00	14.25	-1.1	13.15	20.65	0.0413	1000
64QAM	733.00	14.10	-1.1	13.00	19.95	0.0399	1000
QPSK	741.00	14.14	-1.1	13.04	20.14	0.0403	1000
16QAM	741.00	14.35	-1.1	13.25	21.14	0.0423	1000
64QAM	741.00	14.30	-1.1	13.20	20.89	0.0418	1000
QPSK	751.00	14.31	-1.1	13.21	20.94	0.0419	1000
16QAM	751.00	14.35	-1.1	13.25	21.14	0.0423	1000
64QAM	751.00	14.23	-1.1	13.13	20.56	0.0411	1000

Note: The peak output power is the combined maximum conducted output power.

Figure 20 Maximum Peak Power Output With Internal Antenna

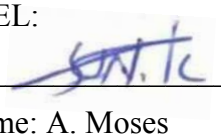
Modulation	Operation Frequency (MHz)	Reading (dBm)	Antenna Gain (dB)	Reading (EIRP) (dBm)	Reading (EIRP) (mW)	MIMO Total (EIRP) (W)	Specification (W)
QPSK	733.00	14.37	10	24.37	273.53	0.5471	1000
16QAM	733.00	14.25	10	24.25	266.07	0.5321	1000
64QAM	733.00	14.10	10	24.10	257.04	0.5141	1000
QPSK	741.00	14.14	10	24.14	259.42	0.5188	1000
16QAM	741.00	14.35	10	24.35	272.27	0.5445	1000
64QAM	741.00	14.30	10	24.30	269.15	0.5383	1000
QPSK	751.00	14.31	10	24.31	269.77	0.5395	1000
16QAM	751.00	14.35	10	24.35	272.27	0.5445	1000
64QAM	751.00	14.23	10	24.23	264.85	0.5297	1000

Note: The peak output power is the combined maximum conducted output power.

Figure 21 Maximum Peak Power Output With External Antenna

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature:  Date: 06.09.11

Typed/Printed Name: A. Moses

5.4 Test Equipment Used.

Maximum Peak Output Power

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 Year
Signal Generator	Agilent	E4438C	MY42082764	July 18, 2011	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	January 4, 2011	1 year
Cable	TestLINE	18	11556	January 4, 2011	1 year
Cable	MiniCircuit	CBL-4FT-SMNM	30095	January 4, 2011	1 year

Figure 22 Test Equipment Used

6. Emission Bandwidth

6.1 Test Specification

FCC Part 2, Section 1049; FCC Part 27 Section 27.53(m)(6)

6.2 Test Procedure

The E.U.T. was set to the applicable test frequency with 64QAM, 16QAM, QPSK 10 MHZ modulation in the 728-751MHz 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 (21.0dB).
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.

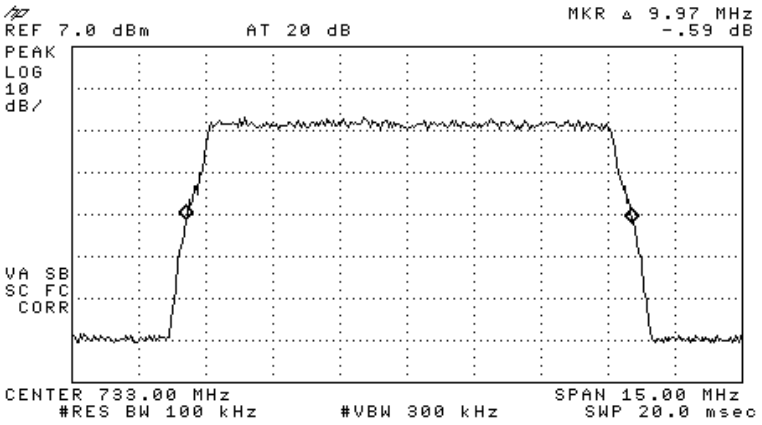


Figure 23.— 733.00 MHz QPSK IN

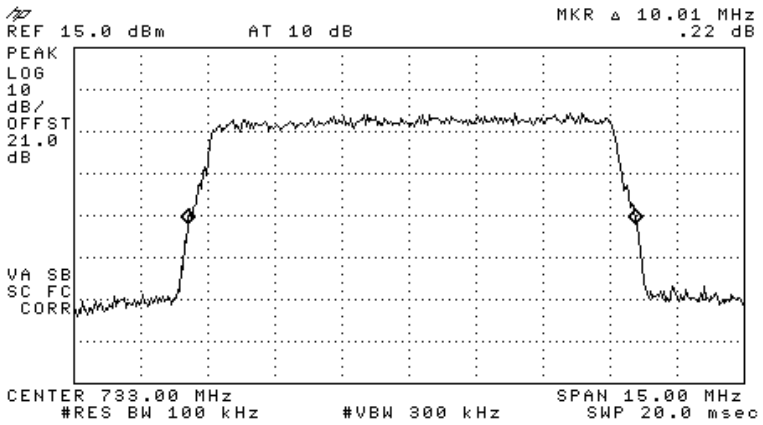


Figure 24.— 733.00 MHz QPSK OUT

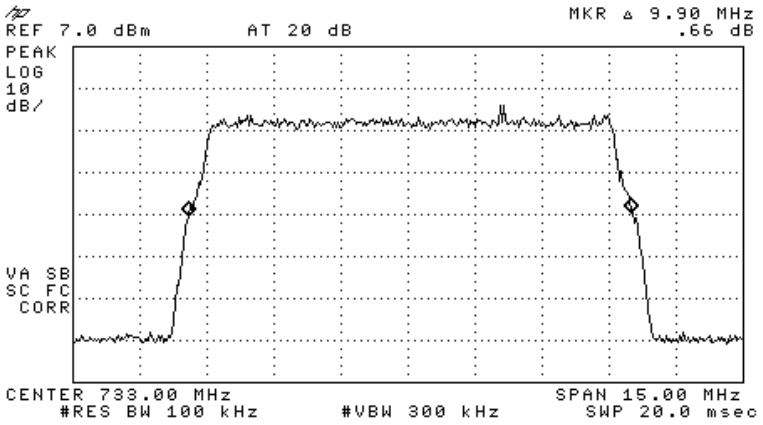


Figure 25.— 733.00 MHz 16QAM IN

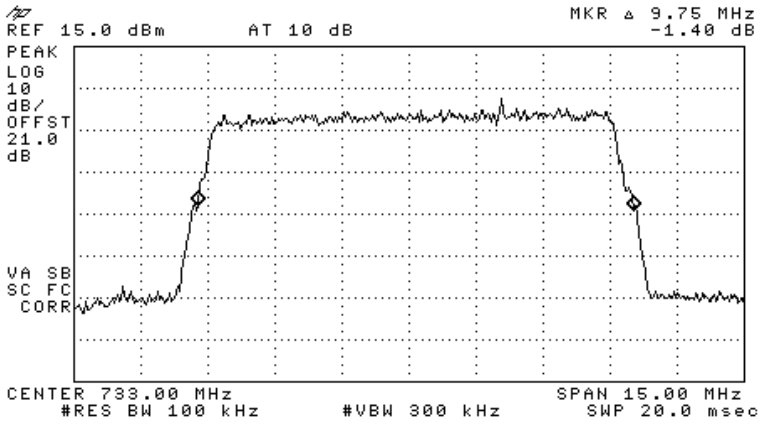


Figure 26.— 733.00 MHz 16QAM OUT

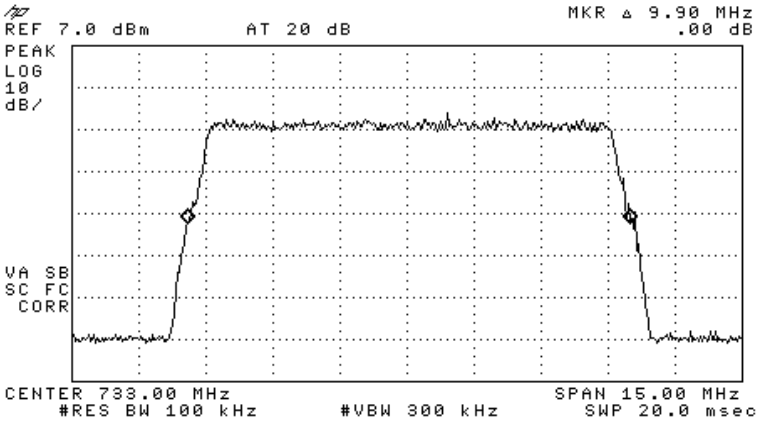


Figure 27.— 733.00 MHz 64QAM IN

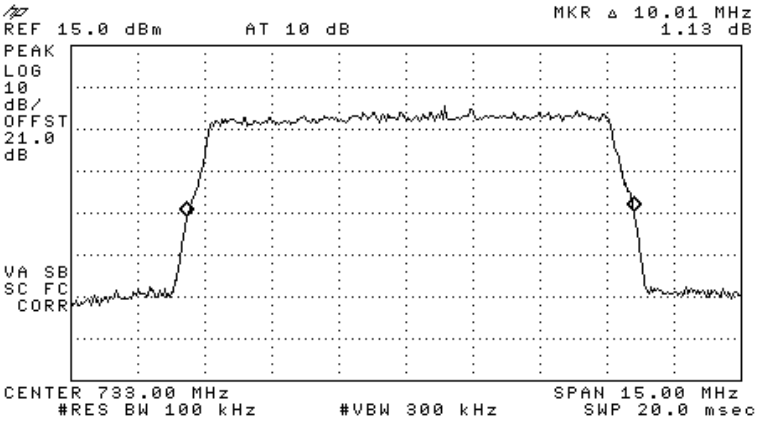


Figure 28.— 733.00 MHz 64QAM OUT

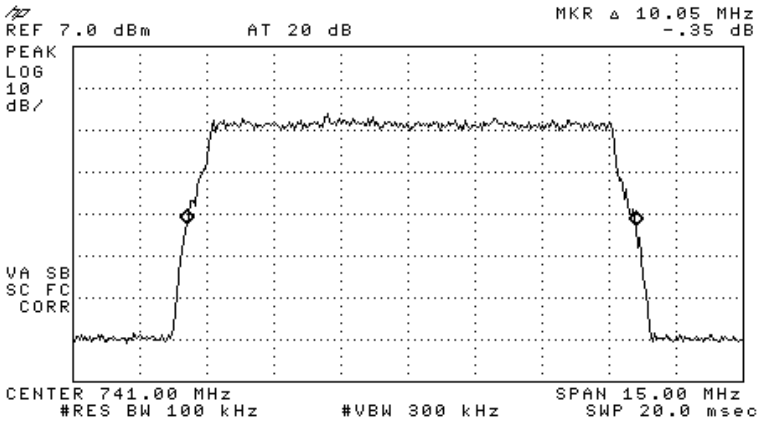


Figure 29.— 741.00 MHz QPSK IN

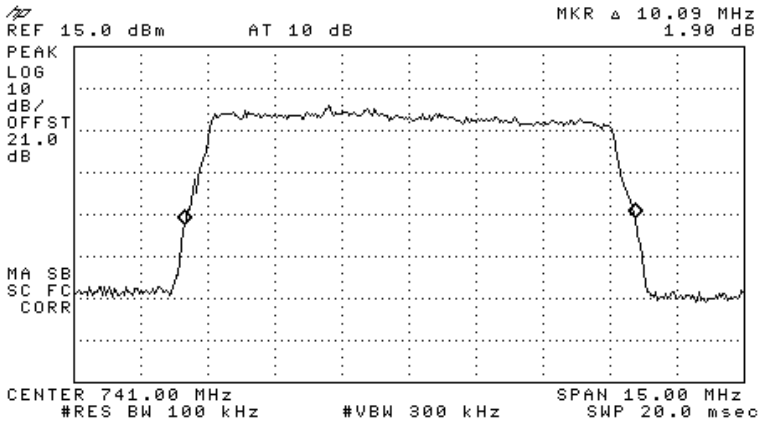


Figure 30.— 741.00 MHz QPSK OUT

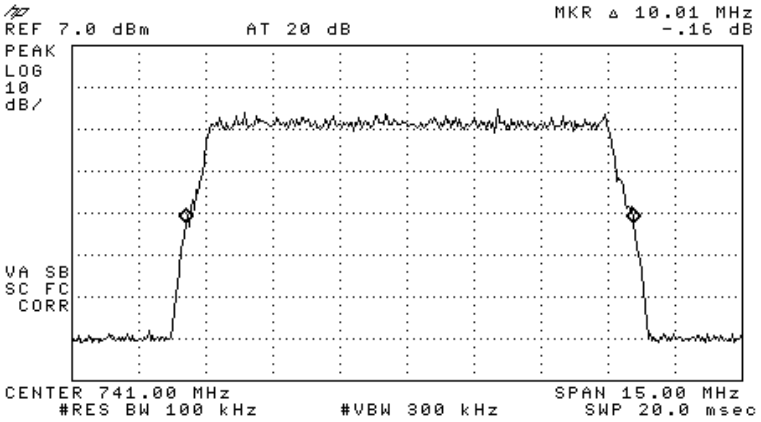


Figure 31.— 741.00 MHz 16QAM IN

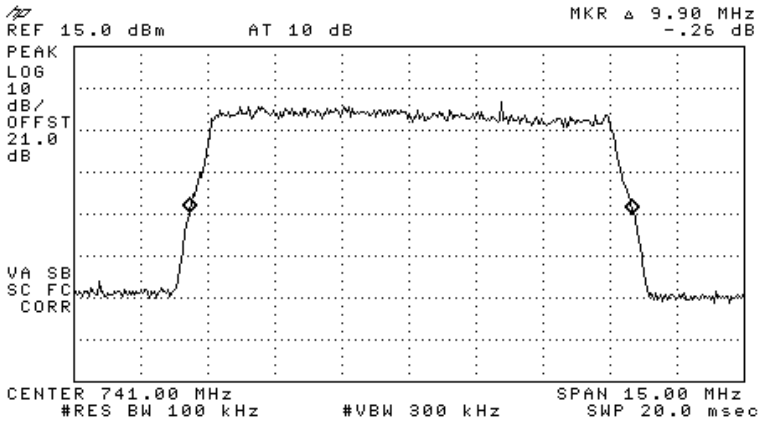


Figure 32.— 741.00 MHz 16QAM OUT

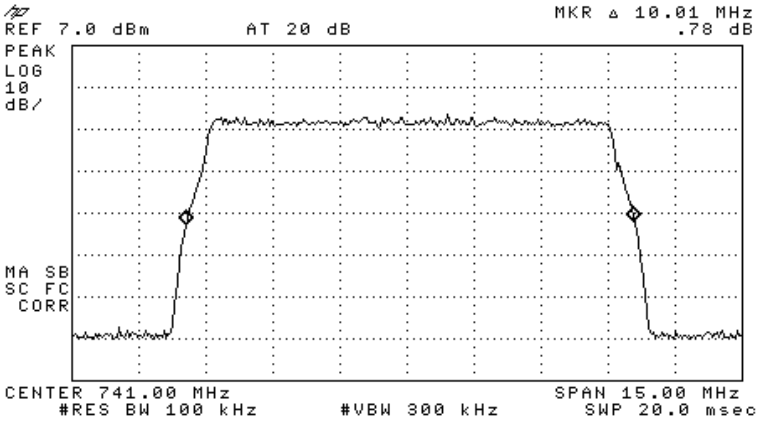
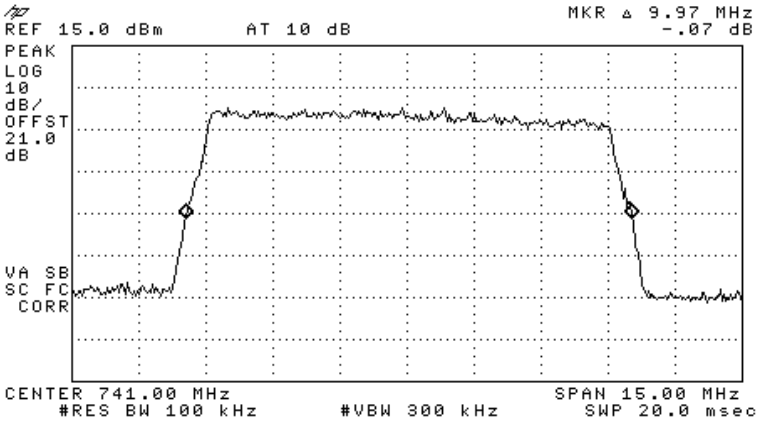


Figure 33.— 741.00 MHz 64QAM IN



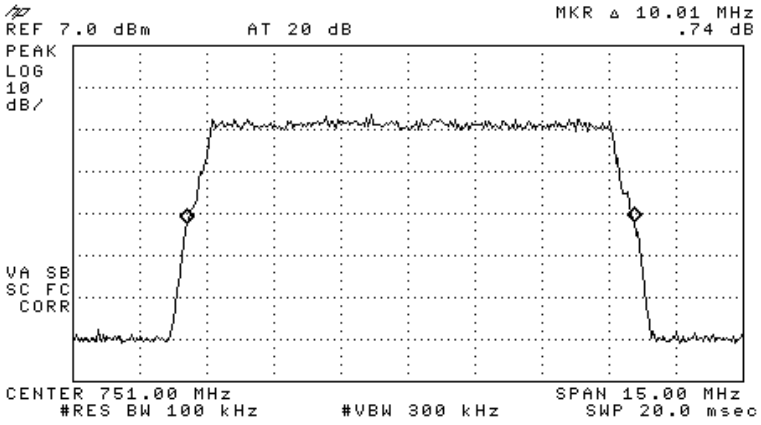


Figure 34.— 741.00 MHz 64QAM OUT

Figure 35.— 751.00 MHz QPSK IN

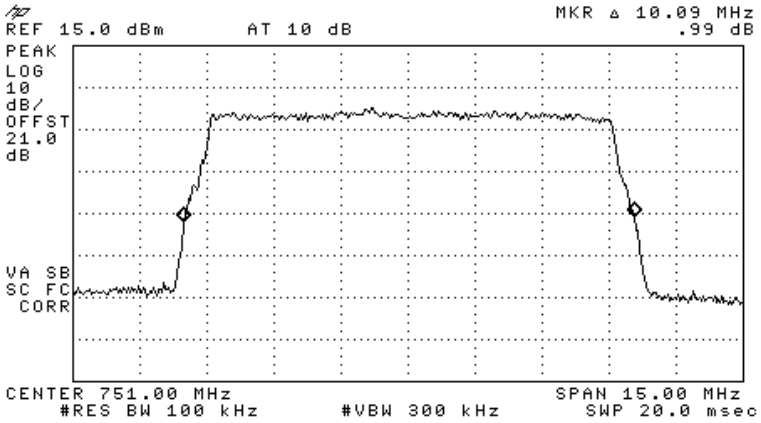


Figure 36.— 751.00 MHz QPSK OUT

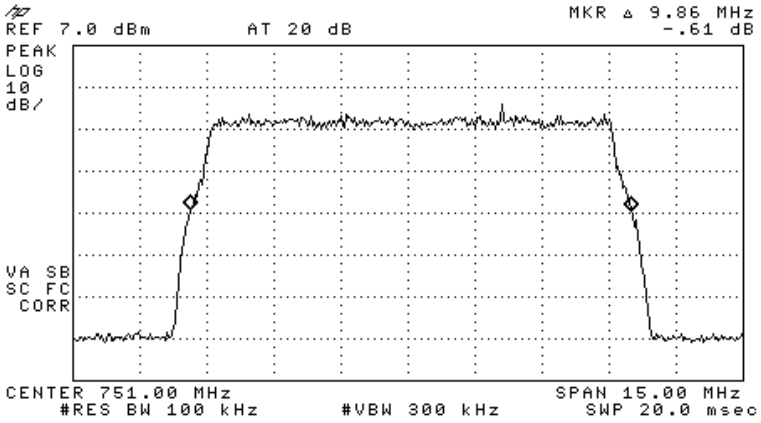
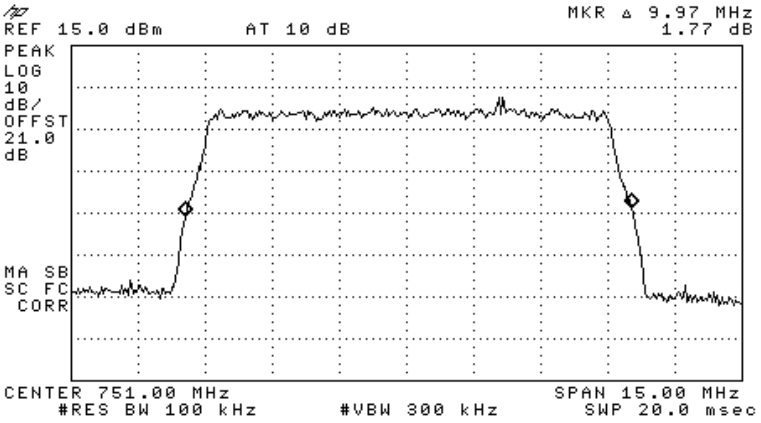


Figure 37.— 751.00 MHz 16QAM IN



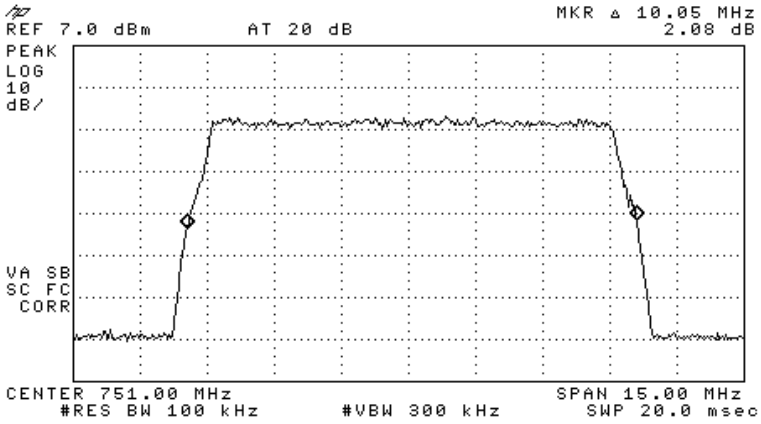


Figure 38.— 751.00 MHz 16QAM OUT

Figure 39.— 751.00 MHz 64QAM IN

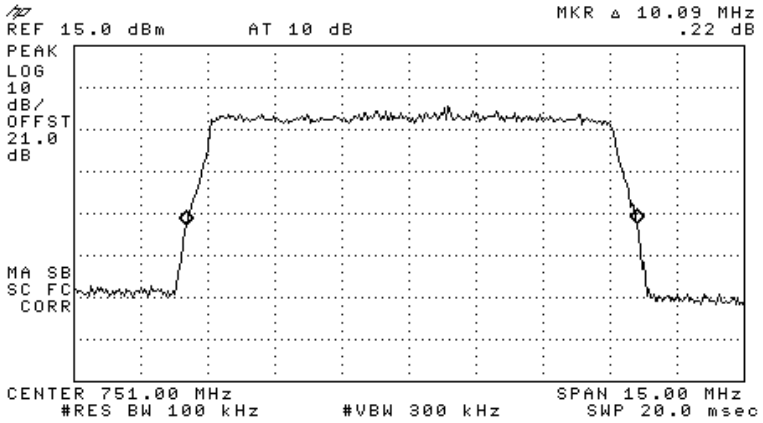


Figure 40.— 751.00 MHz 64QAM OUT

6.3 Results Table

E.U.T. Description: VE LTE 700MHz Mix Band MIMO Comprising :
1. VE Control Unit
2. VE Access Pod

Model No.: 1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number: 1. 00112600037 2. 00112600002
Specification: FCC Part 2, Section 1049; FCC Part 27 Section 27.53(m)(6)

Operating Frequency (MHz)	Modulation		Reading (26dBc) (MHz)
733.00	QPSK	Input	9.97
		Output	10.01
	16QAM	Input	9.90
		Output	9.75
	64QAM	Input	9.90
		Output	10.01
741.00	QPSK	Input	10.05
		Output	10.09
	16QAM	Input	10.01
		Output	9.90
	64QAM	Input	10.01
		Output	9.97
751.00	QPSK	Input	10.01
		Output	10.09
	16QAM	Input	9.86
		Output	9.97
	64QAM	Input	10.05
		Output	10.09

Figure 41 Emission Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: Date: 06.09.11

Typed/Printed Name: A. Moses

6.4 Test Equipment Used.

Occupied Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 Year
Signal Generator	Agilent	E4438C	MY42082764	July 18, 2011	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	January 4, 2011	1 year
Cable	TestLINE	18	11556	January 4, 2011	1 year
Cable	MiniCircuit	CBL-4FT-SMNM	30095	January 4, 2011	1 year

Figure 42 Test Equipment Used

7. Conducted Spurious Emissions

7.1 Test Specification

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

7.2 Test procedure

The power of any emission outside of the authorized operating frequency ranges 728 MHz-746 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 (21dB).
The signal generator was configured for 0dBm output power and 10MHz LTE signal, modulated with 64QAM, 16QAM and QPSK

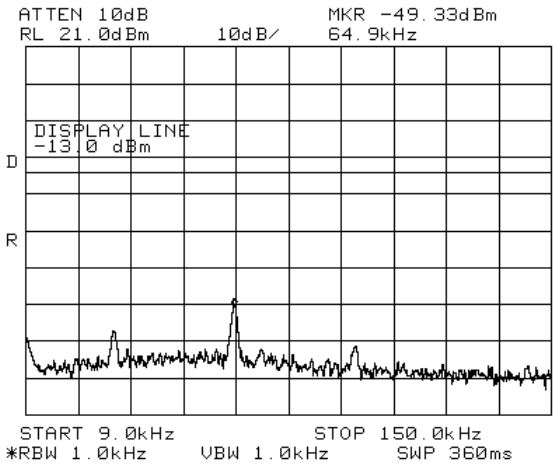


Figure 43.— 733.00 MHz QPSK

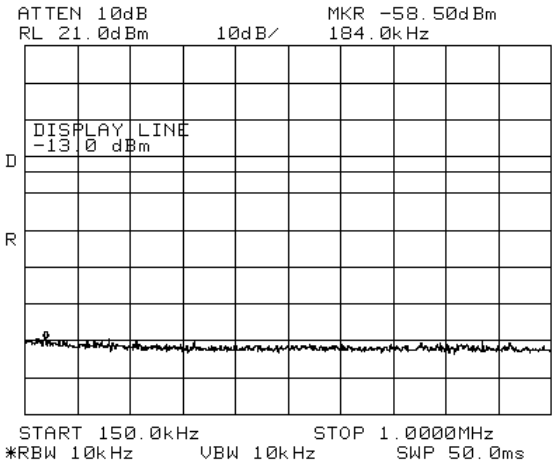


Figure 44.— 733.00 MHz QPSK

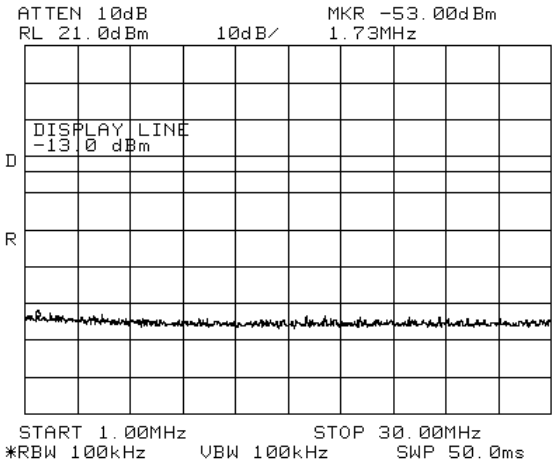


Figure 45.— 733.00 MHz QPSK

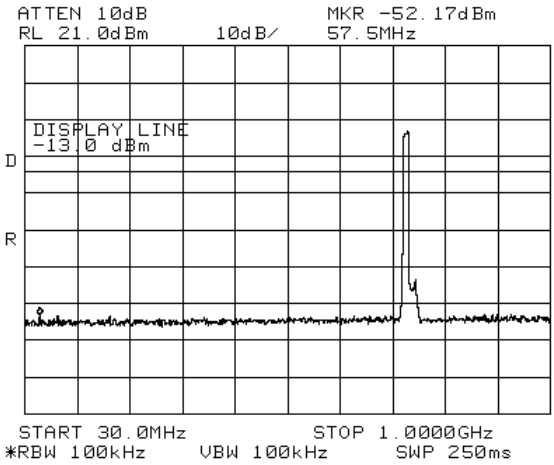


Figure 46.— 733.00 MHz QPSK

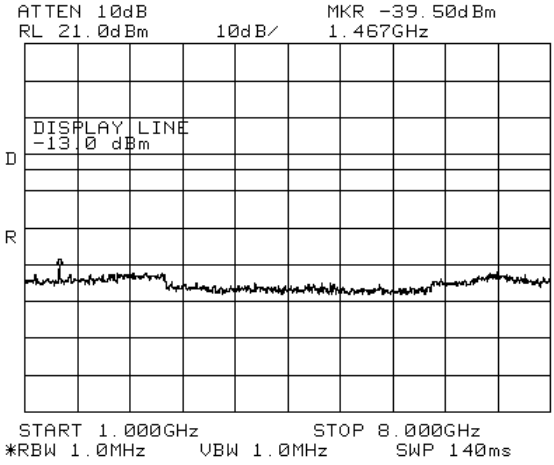


Figure 47.— 733.00 MHz QPSK

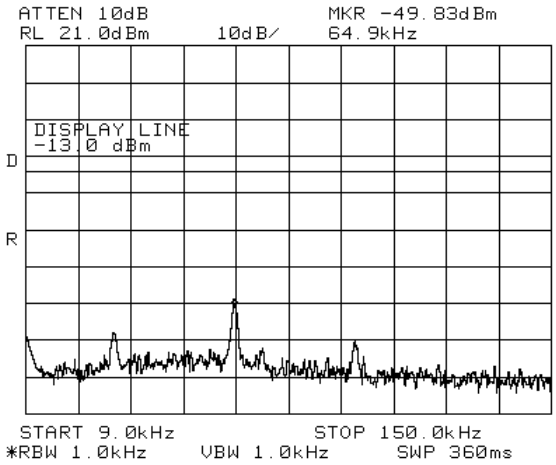


Figure 48.— 733.00 MHz 16QAM

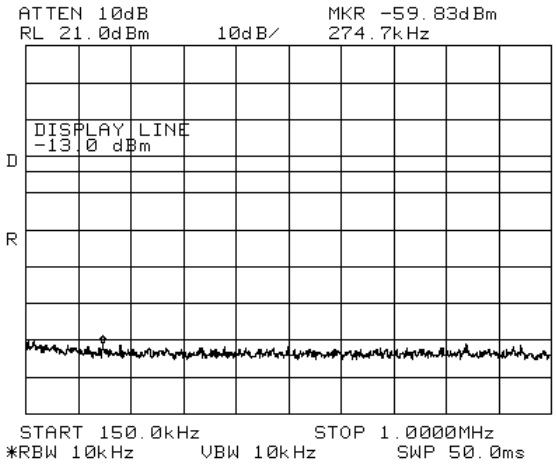


Figure 49.— 733.00 MHz 16QAM

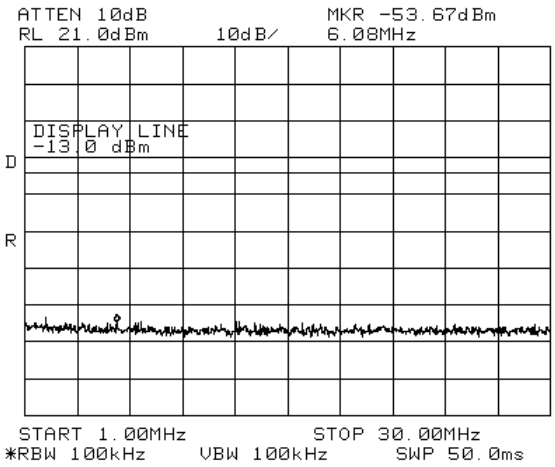


Figure 50.— 733.00 MHz 16QAM

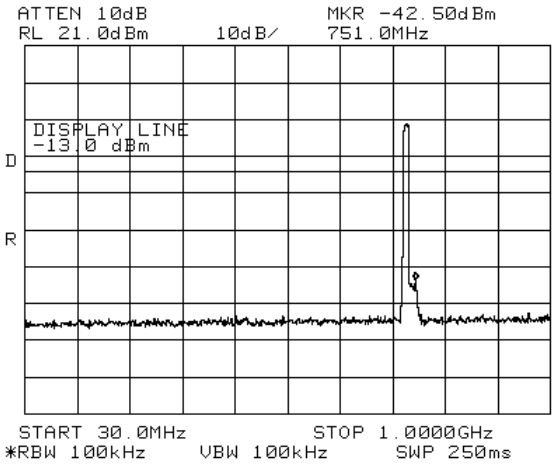


Figure 51.— 733.00 MHz 16QAM

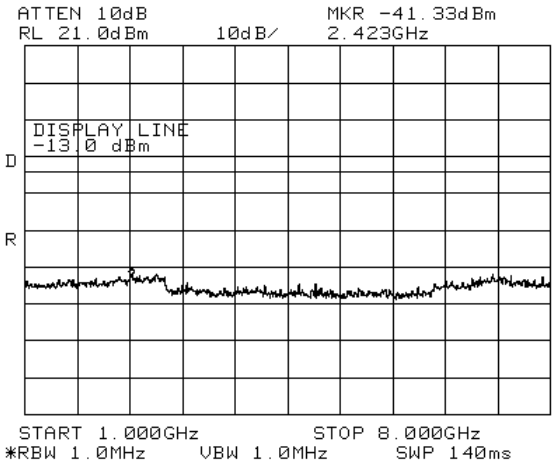


Figure 52.— 733.00 MHz 16QAM

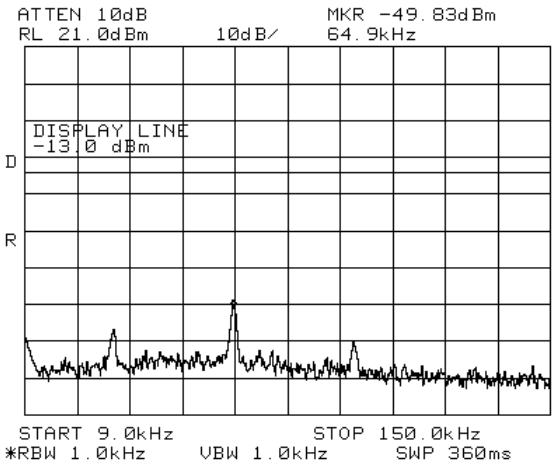


Figure 53.— 733.00 MHz 64QAM

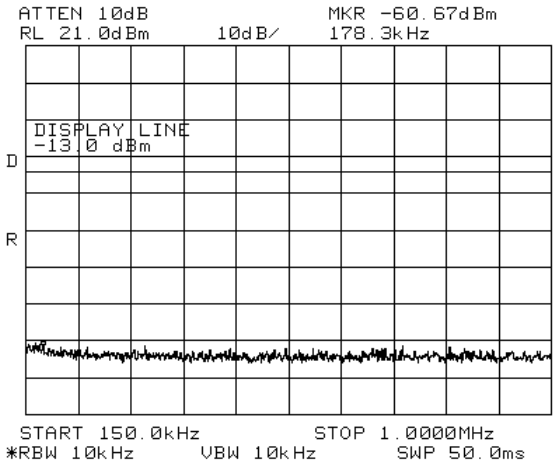


Figure 54.— 733.00 MHz 64QAM

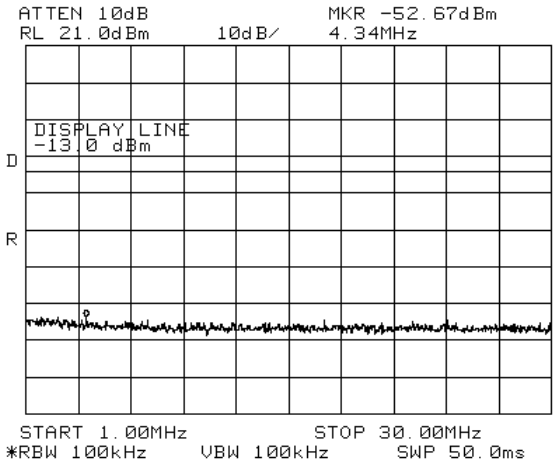


Figure 55.— 733.00 MHz 64QAM

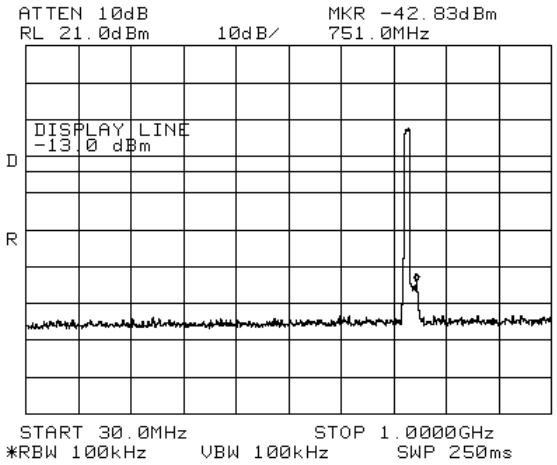


Figure 56.— 733.00 MHz 64QAM

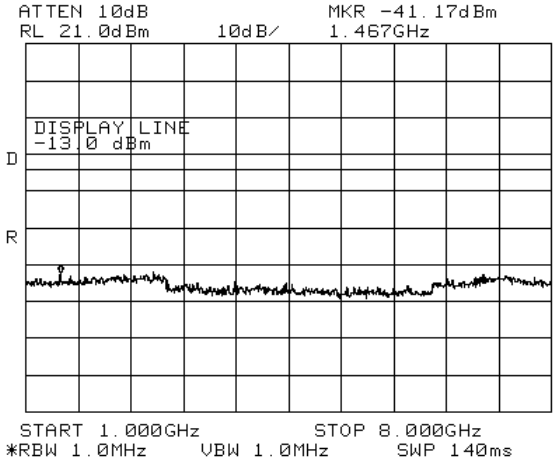


Figure 57.— 733.00 MHz 64QAM

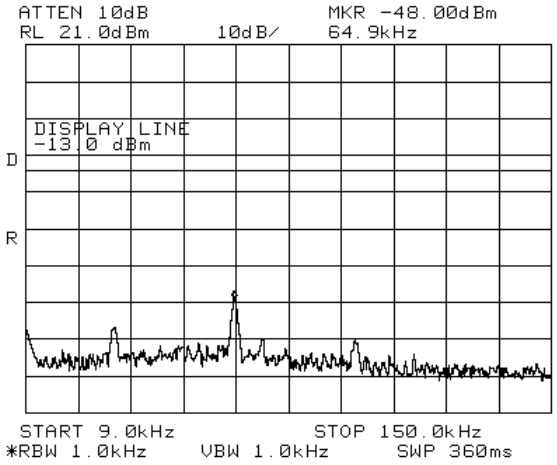


Figure 58.— 741.00 MHz QPSK

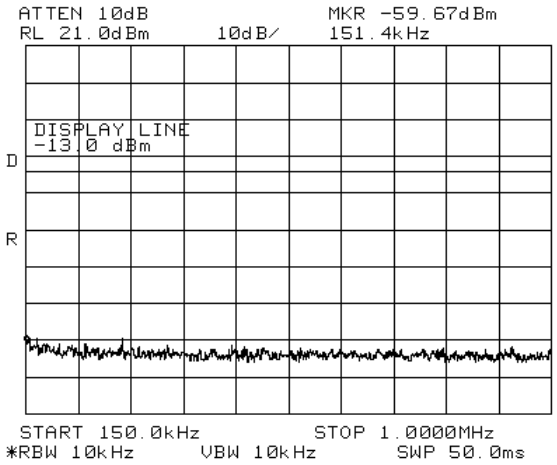


Figure 59.— 741.00 MHz QPSK

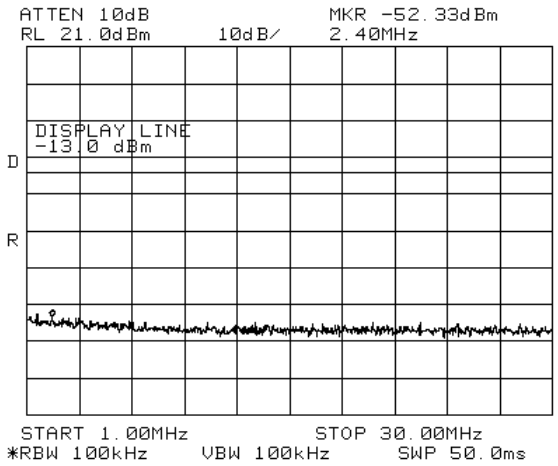


Figure 60.— 741.00 MHz QPSK

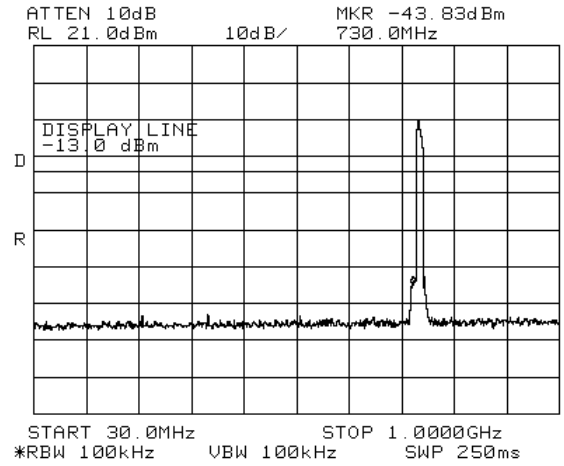


Figure 61.— 741.00 MHz QPSK

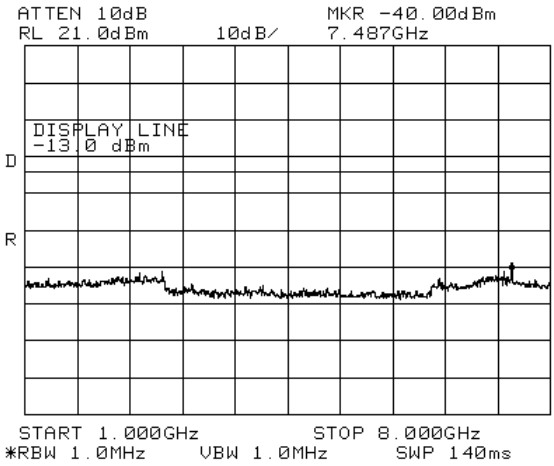


Figure 62.— 741.00 MHz QPSK

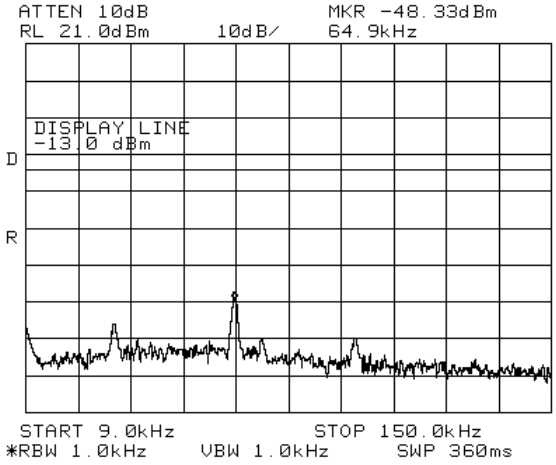


Figure 63.— 741.00 MHz 16QAM

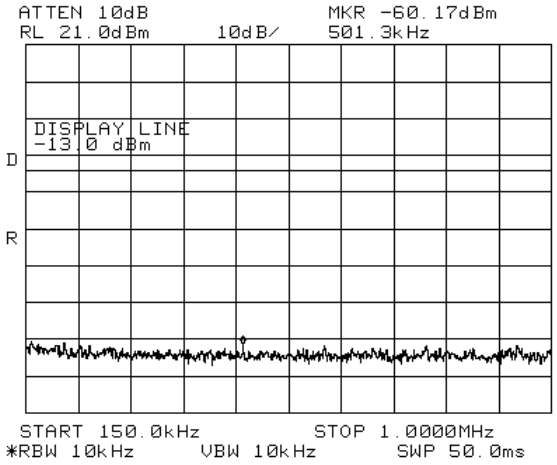


Figure 64.— 741.00 MHz 16QAM

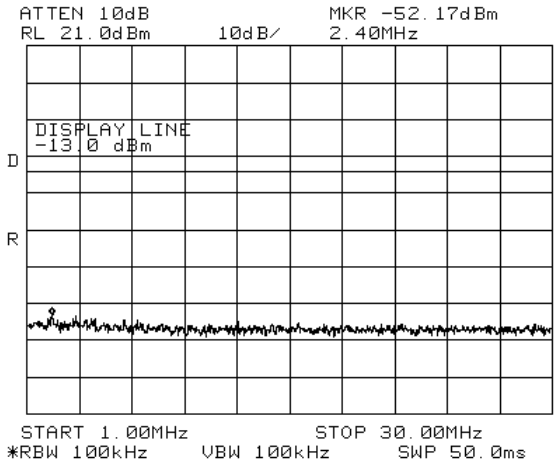


Figure 65.— 741.00 MHz 16QAM

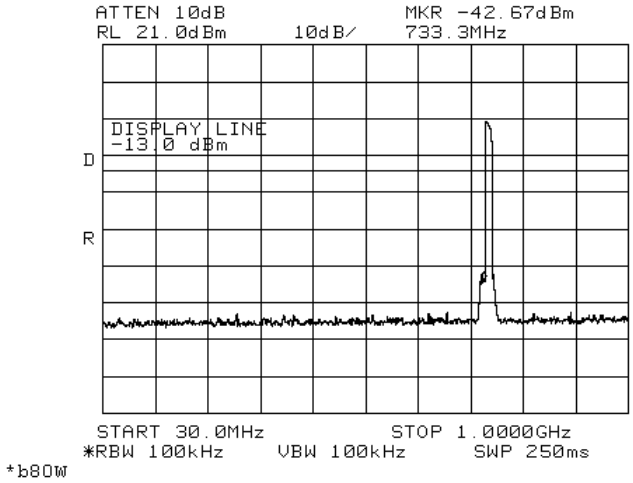


Figure 66.— 741.00 MHZ 16QAM

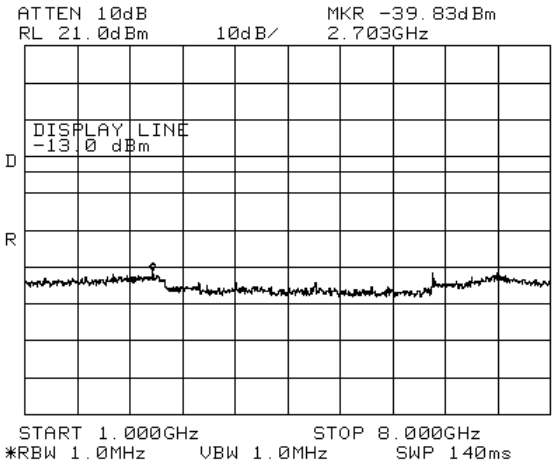


Figure 67.— 741.00 MHZ 16QAM

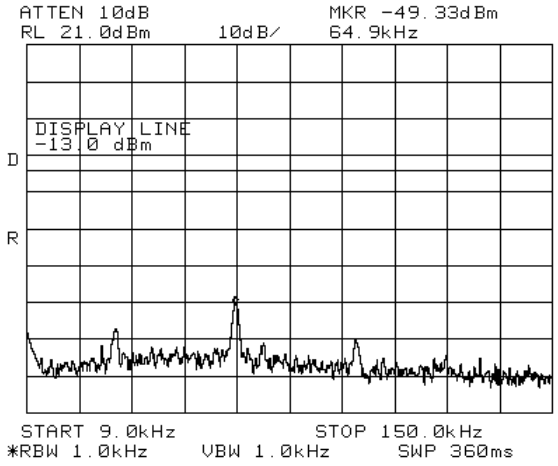


Figure 68.— 741.00 MHZ 64QAM

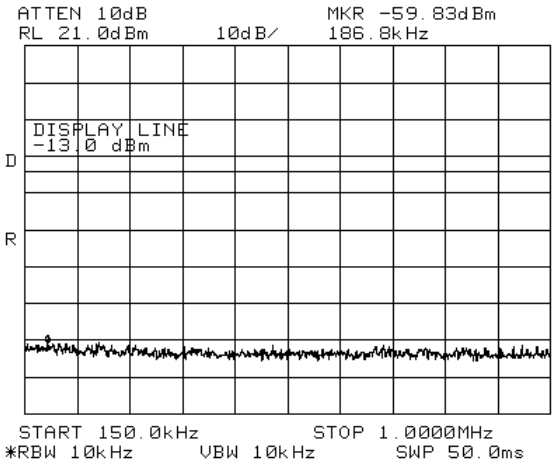


Figure 69.— 741.00 MHZ 64QAM

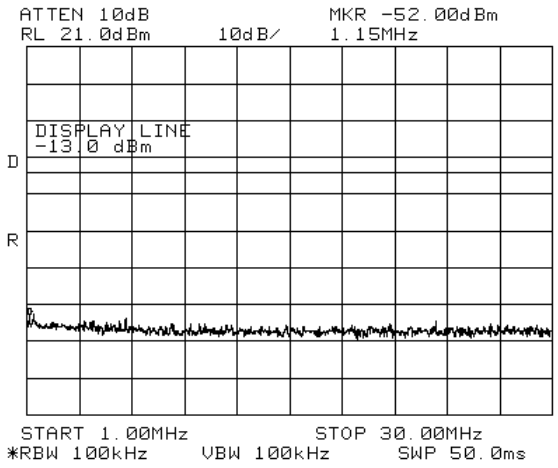


Figure 70.— 741.00 MHZ 64QAM

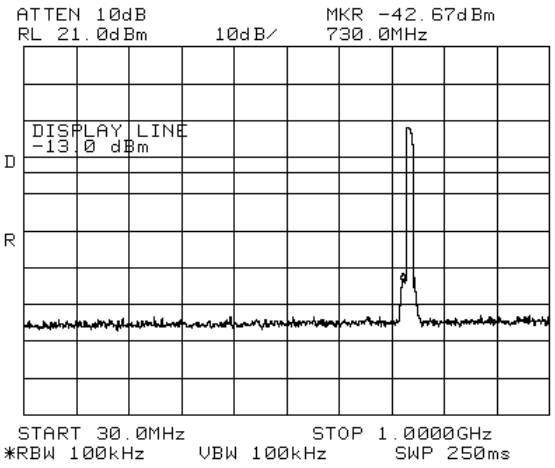


Figure 71.— 741.00 MHZ 64QAM

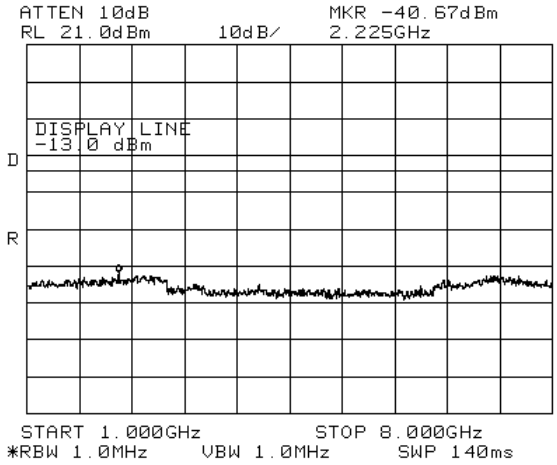


Figure 72.— 741.00 MHZ 64QAM

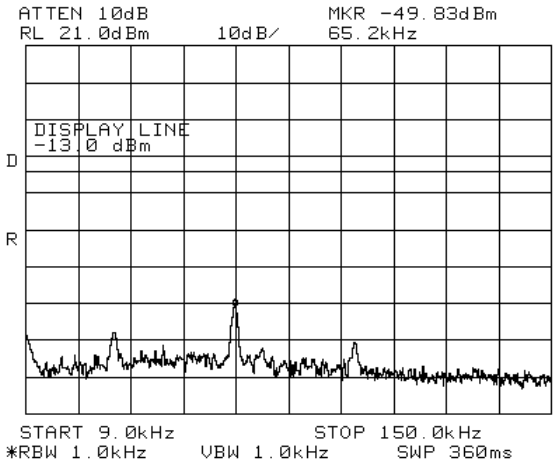


Figure 73.— 751.00 MHZ QPSK

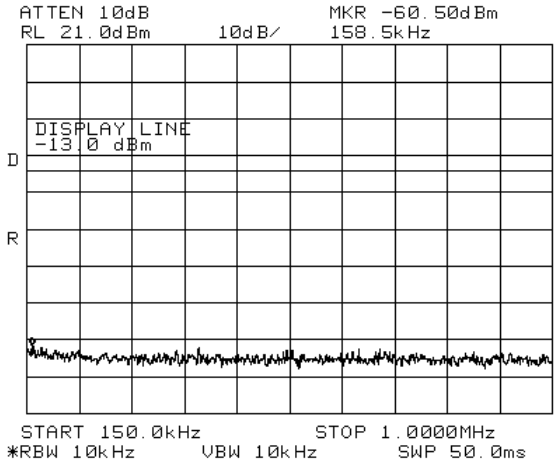


Figure 74.— 751.00 MHZ QPSK

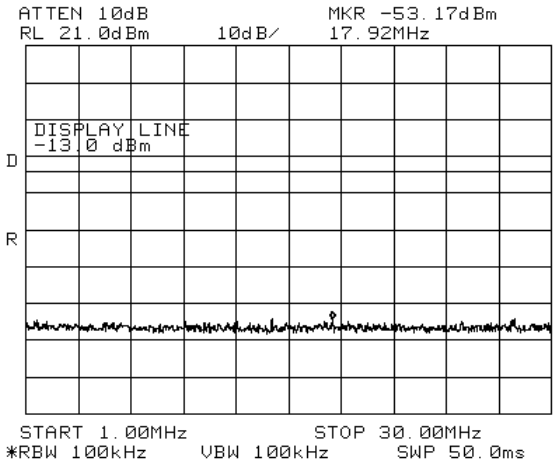


Figure 75.— 751.00 MHZ QPSK

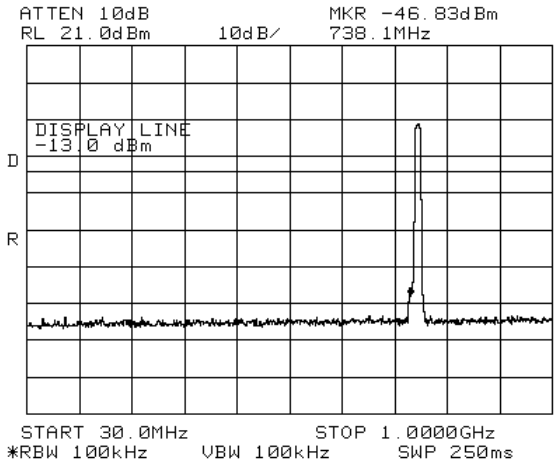


Figure 76.— 751.00 MHZ QPSK

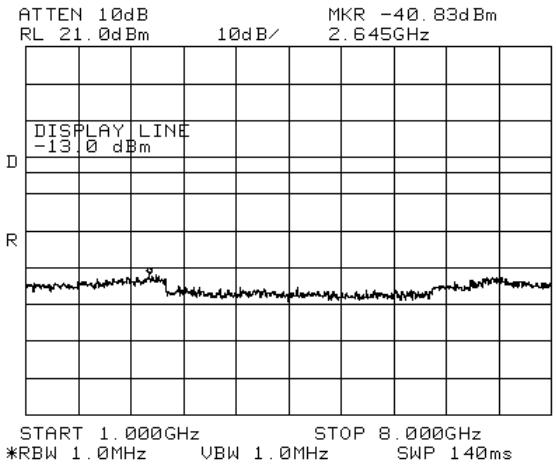


Figure 77.— 751.00 MHZ QPSK

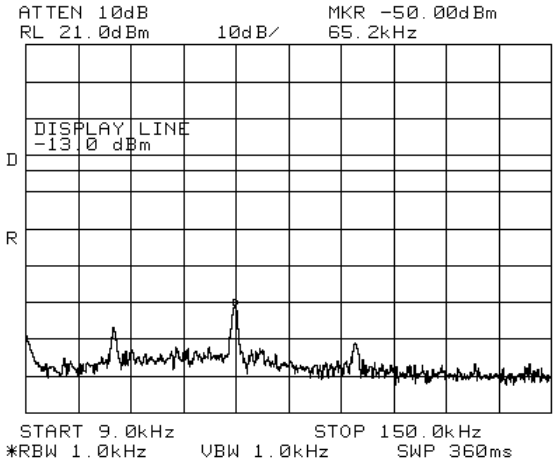


Figure 78.— 751.00 MHZ 16QAM

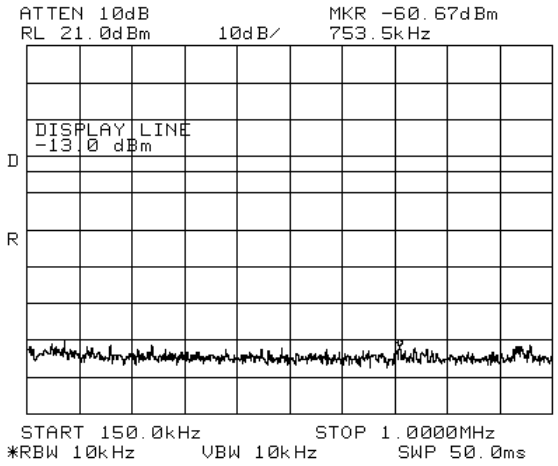


Figure 79.— 751.00 MHZ 16QAM

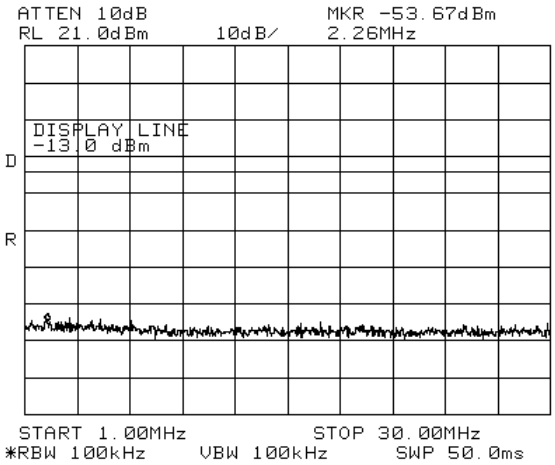


Figure 80.— 751.00 MHZ 16QAM

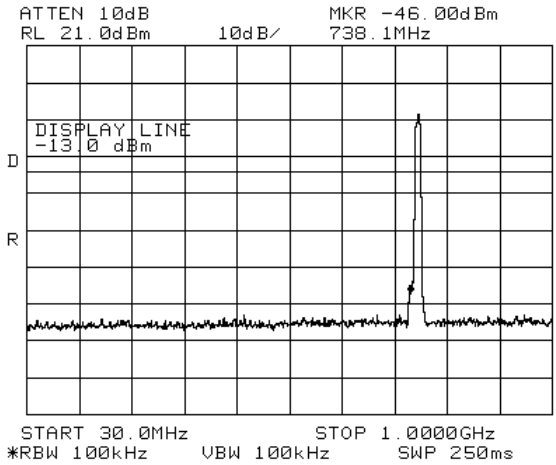


Figure 81.— 751.00 MHZ 16QAM

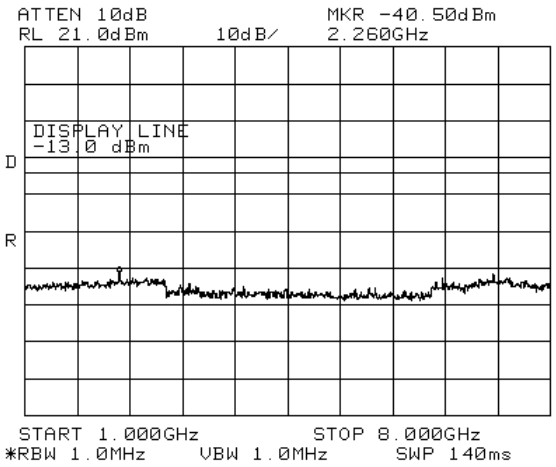


Figure 82.— 751.00 MHZ 16QAM

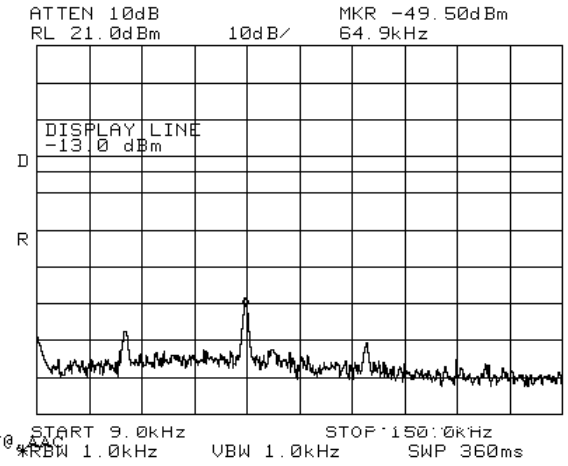


Figure 83.— 751.00 MHZ 64QAM

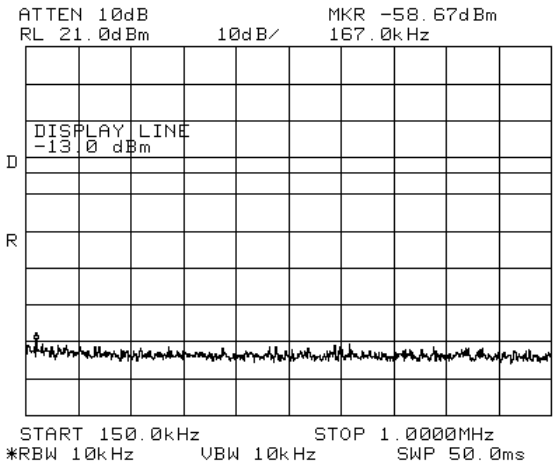


Figure 84.— 751.00 MHZ 64QAM

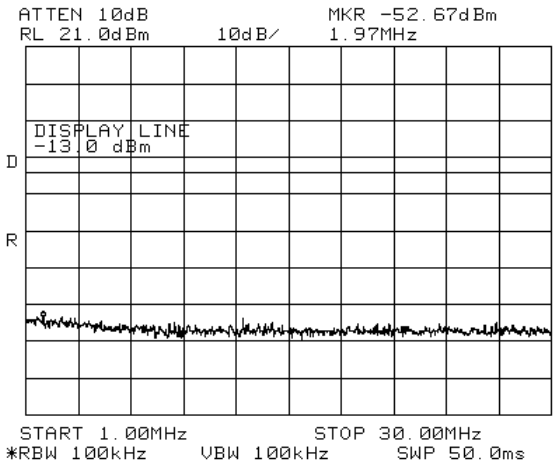


Figure 85.— 751.00 MHZ 64QAM

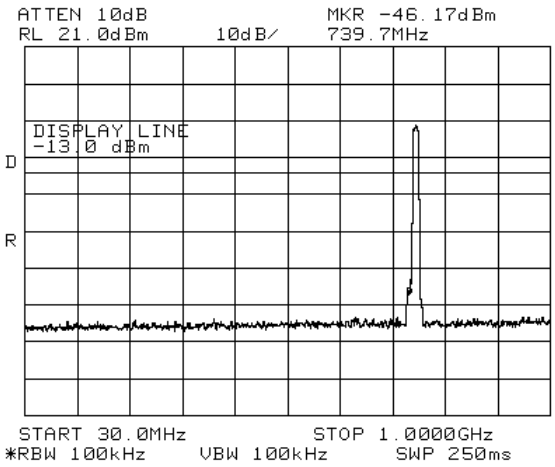


Figure 86.— 751.00 MHZ 64QAM

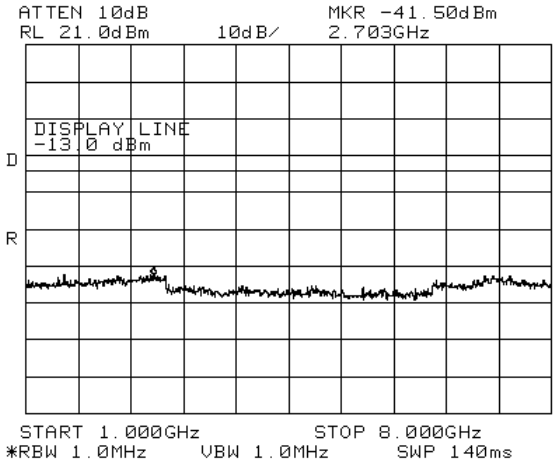


Figure 87.— 751.00 MHZ 64QAM

7.3 Results table

E.U.T. Description: VE LTE 700MHz Mix Band MIMO Comprising :
1. VE Control Unit
2. VE Access Pod

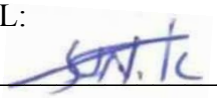
Model No.: 1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number: 1. 00112600037 2. 00112600002
Specification: FCC Part 27, Subpart C, Section 27.53 (m)

Modulation	Operation Frequency	Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	733.0	1467.00	-39.50	-13.0	-26.50
16QAM		2423.00	-41.33	-13.0	-28.33
64QAM		1467.00	-41.17	-13.0	-28.17
QPSK	741.0	7487.00	-40.00	-13.0	-27.00
16QAM		2703.00	-39.83	-13.0	-26.83
64QAM		2225.00	-40.67	-13.0	-26.67
QPSK	751	2645.00	-40.83	-13.0	-27.83
16QAM		2260.00	-40.50	-13.0	-27.50
64QAM		2703.00	-41.50	-13.0	-28.50

Figure 88 Conducted Spurious Emission Results

JUDGEMENT: Passed by 26.5 dB

TEST PERSONNEL:

Tester Signature:  Date: 06.09.11

Typed/Printed Name: A. Moses

7.4 Test Equipment Used.

Spurious Emissions at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2011	1 year
Signal Generator	Agilent	E4438C	MY42082764	July 18, 2011	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	January 4, 2011	1 year
Cable	TestLINE	18	11556	January 4, 2011	1 year
Cable	MiniCircuit	CBL-4FT-SMNM	30095	January 4, 2011	1 year

Figure 89 Test Equipment Used

8. Band Edge Measurements

8.1 Test Specification

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

8.2 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 (21.0 dB).
The spectrum analyzer was set to 100 kHz R.B.W.

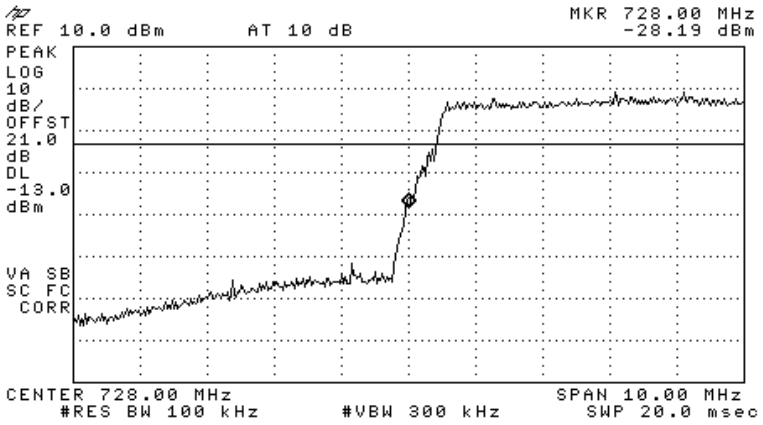


Figure 90.— 733.00 MHz QPSK

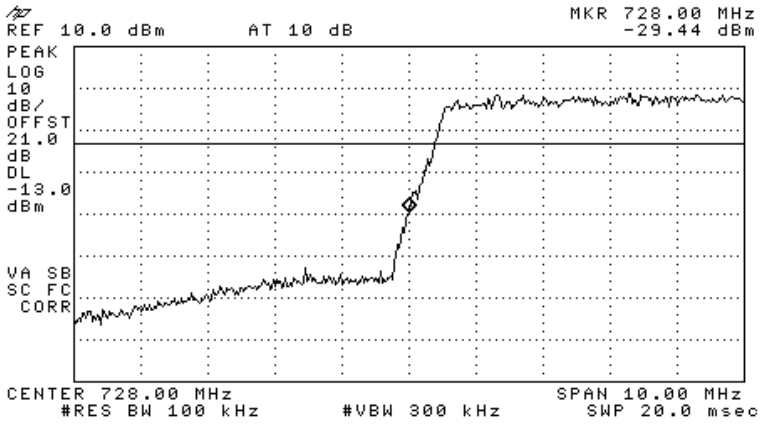


Figure 91.— 733.00 MHz 16QAM

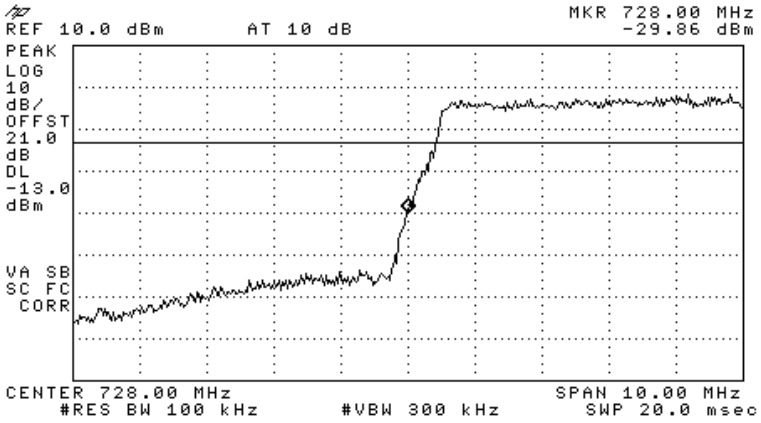


Figure 92.— 733.00 MHz 64QAM

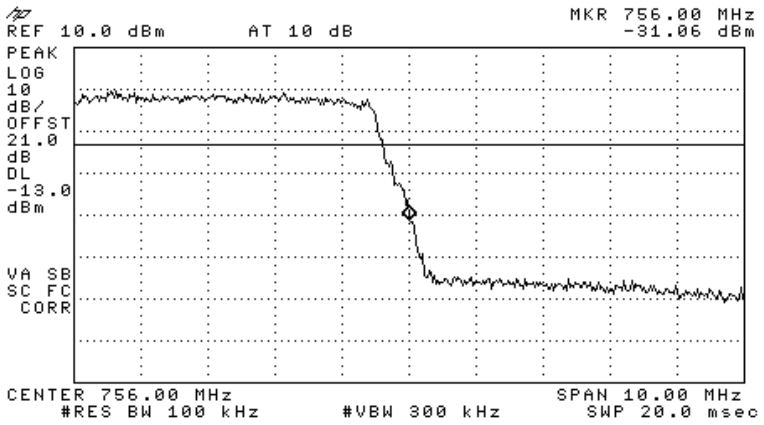


Figure 93.— 751.00 MHz QPSK

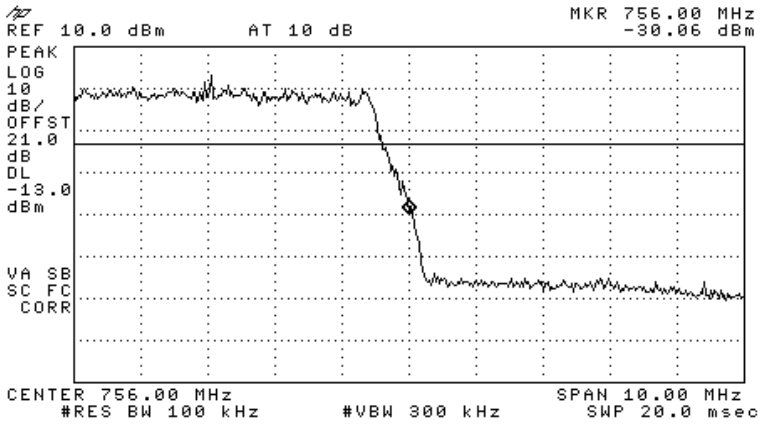


Figure 94.— 751.00 MHz 16QAM

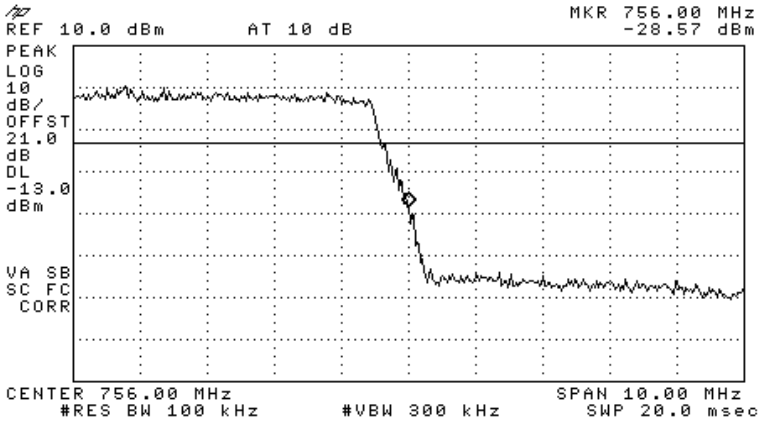


Figure 95.— 751.00 MHz 64QAM

8.3 Results table

E.U.T. Description: VE LTE 700MHz Mix Band MIMO Comprising :
1. VE Control Unit
2. VE Access Pod

Model No.: 1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number: 1. 00112600037 2. 00112600002
Specification: FCC Part 27, Subpart C, Section 27.53 (m)

Bandwidth	Operation Frequency (MHz)	Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
QPSK	733.0	728.00	-28.19	-13.0	-15.19
	751.0	756.00	-31.06	-13.0	-18.06
16QAM	733.0	728.00	-29.44	-13.0	-16.44
	751.0	756.00	-30.06	-13.0	-17.03
64QAM	733.0	728.00	-29.86	-13.0	-16.86
	751.0	756.00	-28.57	-13.0	-15.57

Figure 96 Band Edge Measurements Results

JUDGEMENT: Passed by 15.19 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 06.09.11

Typed/Printed Name: A. Moses

8.4 Test Equipment Used.

Band Edge Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 Year
Signal Generator	Agilent	E4438C	MY42082764	July 18, 2011	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G 2W20	January 4, 2011	1 year
Cable	TestLINE	18	11556	January 4, 2011	1 year
Cable	MiniCircuit	CBL-4FT-SMNM	30095	January 4, 2011	1 year

Figure 97 Test Equipment Used

9. Spurious Radiated Emission

9.1 Test Specification

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

9.2 Test Procedure

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.
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 + 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.

The controller was connected to 2 signal generators on the same RF channel Both in CW modulated and the Both Signal generators were 0dBm output power.
The E.U.T. was tested in downlink mode.

Internal wall mount position Antenna

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	1466.00	V	56.3	-44.99	5.15	7.6	-42.54	-13.0	-29.54
733.00	1466.00	H	56.6	-44.83	5.15	7.6	-42.38	-13.0	-29.38
741.00	1482.00	V	53.6	-47.69	5.15	7.6	-45.24	-13.0	-32.24
741.00	1482.00	H	52.2	-49.23	5.15	7.6	-46.78	-13.0	-33.78
751.00	1502.00	V	53.8	-47.49	5.15	7.6	-45.04	-13.0	-32.04
751.00	1502.00	H	53.6	-47.83	5.15	7.6	-45.38	-13.0	-32.38

Internal Ceiling position antenna

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	1466.00	V	55.8	-45.49	5.15	7.6	-43.04	-13.0	-30.04
733.00	1466.00	H	55.2	-45.49	5.15	7.6	-43.04	-13.0	-30.04
741.00	1482.00	V	51.8	-49.49	5.15	7.6	-47.04	-13.0	-34.04
741.00	1482.00	H	51.6	-49.83	5.15	7.6	-47.38	-13.0	-34.38
751.00	1502.00	V	55.0	-46.29	5.15	7.6	-43.84	-13.0	-30.81
751.00	1502.00	H	52.5	-48.93	5.15	7.6	-46.48	-13.0	-33.48

IF Band

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	353.50	V	69.7	-24.02	2.5	0.75	-25.77	-13.0	-12.77
733.00	353.50	H	70.2	-28.4	2.5	0.75	-30.15	-13.0	-17.15
741.00	345.50	V	70.8	-26.37	2.1	1.35	-27.12	-13.0	-14.12
741.00	345.50	H	74.3	-25.43	2.1	1.35	-26.18	-13.0	-13.18
751.00	349.50	V	66.9	-30.27	2.1	1.35	-31.02	-13.0	-18.02
751.00	349.50	H	69.7	-30.03	2.1	1.35	-30.78	-13.0	-17.78

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

TEST PERSONNEL:

Tester Signature: _____ Date: 06.09.11

Typed/Printed Name: A. Moses

9.3 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 24, 2010	1 year
RF Section	HP	85420E	3427A00103	November 24, 2010	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 27, 2011	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A
Spectrum Analyzer	HP	8592L	3826A01204	February 21, 2011	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 5, 2010	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 4, 2011	1 year
Signal Generator	HP	8647A	625U00686	March 9, 2010	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 year

10. Frequency Stability

10.1 Test Specification

Part 27 Section 27.54

10.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 2. The E.U.T. was operated with a CW signal in the downlink path.

The E.U.T. was placed inside a temperature chamber. The E.U.T. was operated from 115 VAC at normal temperature and the chamber temperature was set to +20°C.

The spectrum analyzer was set to 50.0 kHz span and 1.0 kHz resolution B.W.

The carrier frequency was measured and recorded (reference frequency reading).

The carrier frequency measurement was repeated for:

(a). +20°C and 97.5 VAC

(b). +20°C and 132.5 VAC

(c). -30°C and 97.5 VAC

(d). -30°C and 115 VAC

(e). -30°C and 132.5 VAC

(f). +50°C and 97.5 VAC

(g). +50°C and 115 VAC

(h). +50°C and 132.5 VAC

The carrier frequency was measured and recorded after at least 20 minutes of exposing the E.U.T. to the temperature.

The E.U.T. was operated at 733.00, 741.00 MHz and 751MHz.

Frequency Stability

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

Specification: Part 27 Section 27.54

Operation Frequency (MHz)				Δ f(max) (kHz)	Spec. (ppm)
	Temp	Volt	Readings		
733.00	+20°C	97.5	733.0001 MHz	-	±1
	+20°C	115	733.0001 MHz	-	±1
	+20°C	132.5	733.0001 MHz	-	±1
	-30°C	97.5	733.0001 MHz	0	±1
	-30°C	115	733.0001 MHz	0	±1
	-30°C	132.5	733.0001 MHz	0	±1
	+50°C	97.5	733.0001 MHz	0	±1
	+50°C	115	733.0001 MHz	0	±1
	+50°C	132.5	733.0001 MHz	0	±1

Figure 98. Frequency Stability

Notes:

1. Δ f = Reference frequency – frequency reading.
2. Reference reading measured at 115 VAC, + 20°C.
3. Specification: spec: ± 1 ppm = ± 1.9 kHz

Frequency Stability

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

Specification: Part 27 Section 27.54

Operation Frequency (MHz)				Δ f(max) (kHz)	Spec. (ppm)
	Temp	Volt	Readings		
741.0	+20°C	97.5	741.0000 MHz	0	±1
	+20°C	115	741.0000 MHz	0	±1
	+20°C	132.5	741.0001 MHz	0.1	±1
	-30°C	97.5	741.0000 MHz	0	±1
	-30°C	115	741.0000 MHz	0	±1
	-30°C	132.5	741.0000 MHz	0	±1
	+50°C	97.5	741.0000 MHz	0	±1
	+50°C	115	741.0000 MHz	0	±1
	+50°C	132.5	741.0000 MHz	0	±1

Figure 99. Frequency Stability

Notes:

1. Δ f = Reference frequency – frequency reading.
2. Reference reading measured at 115 VAC, + 20°C.
3. Specification: spec: ± 1 ppm = ± 1.9 kHz

Frequency Stability

E.U.T Description	VE LTE 700MHz Mix Band MIMO Comprising : 1. VE Control Unit 2. VE Access Pod
Type	1. VCU-MB-LTE700-12E 2. VAP-MB-LTE700E
Serial Number:	1. 00112600037 2. 00112600002

Specification: Part 27 Section 27.54

Operation Frequency (MHz)				Δ f(max) (kHz)	Spec. (ppm)
	Temp	Volt	Readings		
751.00	+20°C	97.5	751.0000 MHz	0	±1
	+20°C	115	751.0000 MHz	0	±1
	+20°C	132.5	751.0000 MHz	0	±1
	-30°C	97.5	751.0000 MHz	0	±1
	-30°C	115	751.0000 MHz	0	±1
	-30°C	132.5	751.0001 MHz	0.1	±1
	+50°C	97.5	751.000 MHz	0.1	±1
	+50°C	115	751.000 MHz	0	±1
	+50°C	132.5	751.0000 MHz	0	±1

Figure 100. Frequency Stability

Notes:

4. Δ f = Reference frequency – frequency reading.
5. Reference reading measured at 115 VAC, + 20°C.
6. Specification: spec: ± 1 ppm = ± 1.9 kHz

JUDGEMENT: Passed

The E.U.T met the requirements of the FCC, Part 27, Subpart C, Section 27.54 specifications.

TEST PERSONNEL:

Tester Signature:  Date: 06.09.11

Typed/Printed Name: A. Moses

10.3 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Environmental Chamber	THERMOTRON CORP	SM 32C Mini Max	25-1030	December 6, 2010	1 Year
Digital Voltage Meter	Escort	EDM1111A	10313121	December 7, 2010	2 Years
Variable Voltage Transformer	Variac Voltage Co.	-	-	N/A	N/A
Spectrum Analyzer	HP	8594E	3809U03785	March 8, 2010	2 Years

11. APPENDIX A - CORRECTION FACTORS

11.1 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".*

11.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

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

NOTES:

1. The cable type is RG-8.

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

11.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

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

NOTES:

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

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

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

11.4 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

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

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

NOTES:

1. Antenna serial number is 253.

2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.

3. The files mentioned above are located on the disk marked "Antenna Factors".

11.5 Correction factors forDouble-Ridged Waveguide Horn

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

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