

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No. : E14NR-086
AGR No. : A149A-236
Applicant : Airpoint Co., Ltd.
Address : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon,
305-500, South Korea
Manufacturer : Airpoint Co., Ltd.
Address : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon,
305-500, South Korea
Type of Equipment : ICS Repeater System
FCC ID. : WYFAWE43LC20CG
Model Name : IRES-1900US20-20 CG-Prototype
Serial number : N/A
Total page of Report : 122 pages (including this page)
Date of Incoming : October 16, 2014
Date of issue : November 14, 2014

SUMMARY

The equipment complies with the regulation; **FCC Part 24 Subpart E, B2I Part 20 Industrial Booster**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by:

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ONETECH Corp.

Approved by:

Gea-Won, Lee / Managing Director
ONETECH Corp.

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EMC-003 (Rev.2)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E14NR-086	November 14, 2014	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : Airpoint Co., Ltd.
ADDRESS : MIGUN TECHNO WORLD 2-CHA, 533-1, Yongsan-dong, Yuseong-gu, Daejeon,
 305-500, South Korea
CONTACT PERSON : Jung-nam, Lim / Research Manager
TELEPHONE NO : +82-42-484-5460
FCC ID : WYFAWE43LC20CG
MODEL NAME : IRES-1900US20-20 CG-Prototype
SERIAL NUMBER : N/A
DATE : November 14, 2014

EQUIPMENT CLASS	B2I- Part 20 Industrial Booster
EQUIPMENT DESCRIPTION	ICS Repeater System
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	TIA 603-C, the booster KDB and the power measurement KDB.
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC Part 24 Subpart E
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 m, Semi Anechoic Chamber

- The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
2.1046(a), 24.232	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1047	Modulation Characteristics	PASS (See Note 1)
2.1049, 24.238	Occupied Bandwidth, Bandwidth Limitation	Met the Limit / PASS
2.1049	Band Edge	Met the Limit / PASS
2.1051, 24.238(a)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 24.238(a)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055, 24.235	Frequency Stability with Temperature variation	Met the requirement / PASS
2.1055, 24.235	Frequency stability with primary voltage variation	Met the requirement / PASS
1.1307(b)	RF Exposure	See Note 2

Note 1: The Equipment under Test (EUT) is a repeater which reproduces the modulated input signal, so the EUT meets the requirement

Note 2: End users and/or installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original Grant

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in EIA/TIA-603-C: 2004 was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862 Korea.

- Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-4617/ G-666/ T-1842 IC (Industry Canada) – Registration No. Site# 3736-3

- Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation No. 85

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The Airpoint Co., Ltd., Models IRES-1900US20-20 CG-Prototype (referred to as the EUT in this report) are ICS Repeater System . The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE		ICS Repeater System
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)		38.4 MHz
EMISSION DESIGNATOR		F9W(CDMA 2000, 1xEVDO), G7D(LTE:QPSK), D7W(LTE:16QAM, 64QAM)
OPERATING FREQUENCY	Downlink	1 975 MHz ~ 1 995 MHz
	Uplink	1 895 MHz ~ 1 915 MHz
CHANNEL SEPARATION		CDMA 2000 (1.25 MHz), 1xEVDO (1.25 MHz), LTE (5 MHz, 10 MHz, 15 MHz)
RF OUTPUT POWER		43 dBm (Downlink), 30 dBm (Uplink)
ELECTRICAL RATING		DC -48 V
OPERATING TEMPERATURE		-10 °C ~ 50 °C

3.2 Alternative type(s)/model(s); also covered by this test report.

- None

3.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
IRES-1900US20-20 CG-Prototype	Airpoint Co., Ltd.	WYFAWE43LC20CG	ICS Repeater System (EUT)	Signal Generator
SMJ100A	R/S	N/A	Signal Generator	EUT
SMBV100A	R/S	N/A	VECTOR SIGNAL GENERATOR	EUT
SMB100A	R/S	N/A	SIGNAL GENERATOR	EUT
FSV30	R/S	N/A	Spectrum Analyzer	EUT
R510	LG	N/A	Notebook	EUT
6032A	HP	N/A	DC Power Supply	EUT

3.4 Mode of operation during the test

The EUT was received signal from signal generator and then each modulation was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission. The applicant does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports on the EUT for radiated spurious emission testing.

For the above testing, following frequencies per channel were selected for each modulation.

1. Mode: Downlink

Modulation	Channel	Frequency	Modulation	Channel	Frequency	Modulation	Channel	Frequency	
1xEVDO	Low	1 976.25	LTE 5 M	QPSK	1 992.50	LTE 15 M	QPSK	1 982.50	
	Middle	1 982.50		16 QAM			16 QAM		
	High	1 988.75		64 QAM			64 QAM		
CDMA 2000	Low	1 976.25	LTE 10 M	QPSK	1 980.00	N/A			
	Middle	1 982.50		16 QAM		N/A			
	High	1 988.75		64 QAM		N/A			

2. Mode: Uplink

Modulation	Channel	Frequency	Modulation	Channel	Frequency	Modulation	Channel	Frequency	
1xEVDO	Low	1 896.25	LTE 5 M	QPSK	1 912.50	LTE 15 M	QPSK	1 902.50	
	Middle	1 902.50		16 QAM			16 QAM		
	High	1 908.75		64 QAM			64 QAM		
CDMA 2000	Low	1 896.25	LTE 10 M	QPSK	1 900.00	N/A			
	Middle	1 902.50		16 QAM		N/A			
	High	1 908.75		64 QAM		N/A			

4. EUT MODIFICATIONS

- None

5. RF POWER OUTPUT at ANTENNA TERMINAL

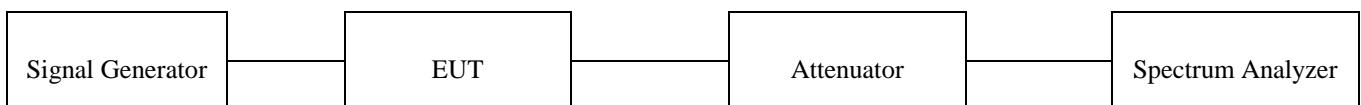
5.1 Operating environment

Temperature : 25 °C
Relative humidity : 50 % R.H.

5.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

RF output power was measured by channel power measurement function of the spectrum analyzer with RMS detector mode.



5.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - SMJ100A	Rohde & Schwarz	Signal Generator	101038	Oct. 08, 2014 (1Y)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

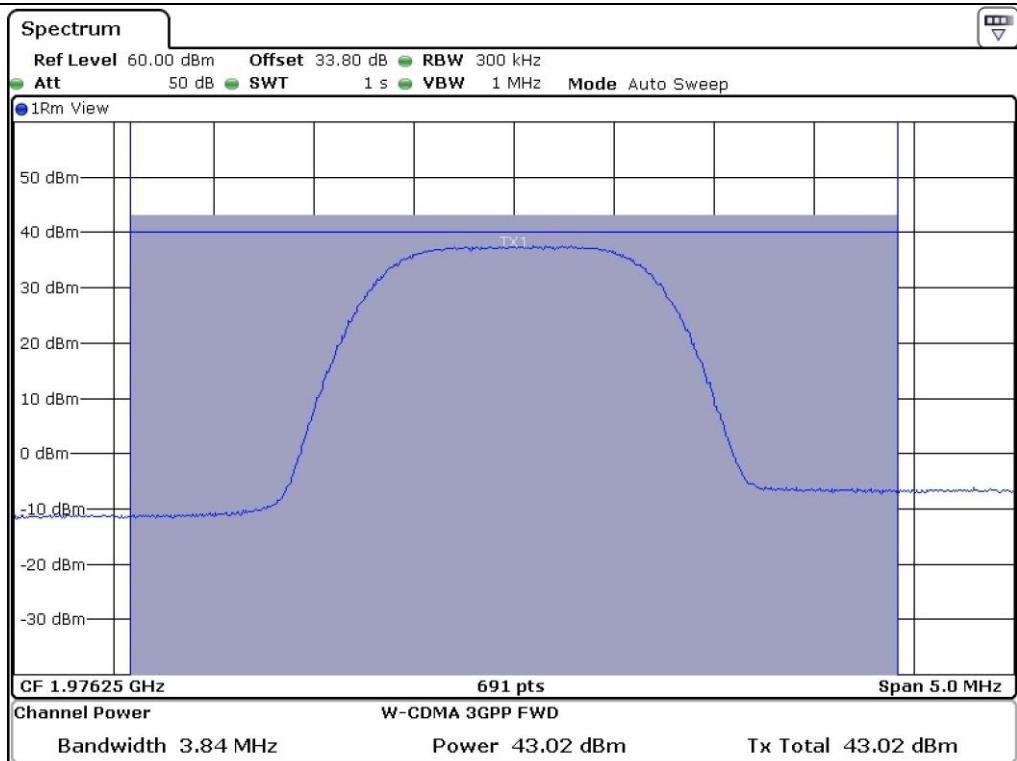
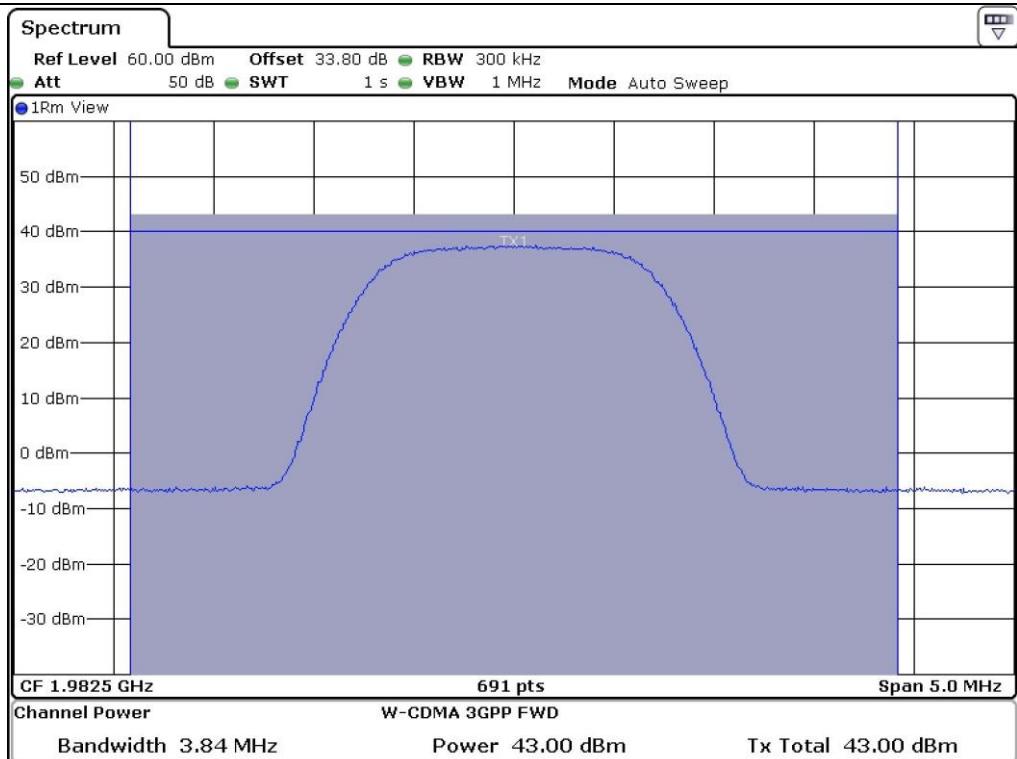
All test equipment used is calibrated on a regular basis.

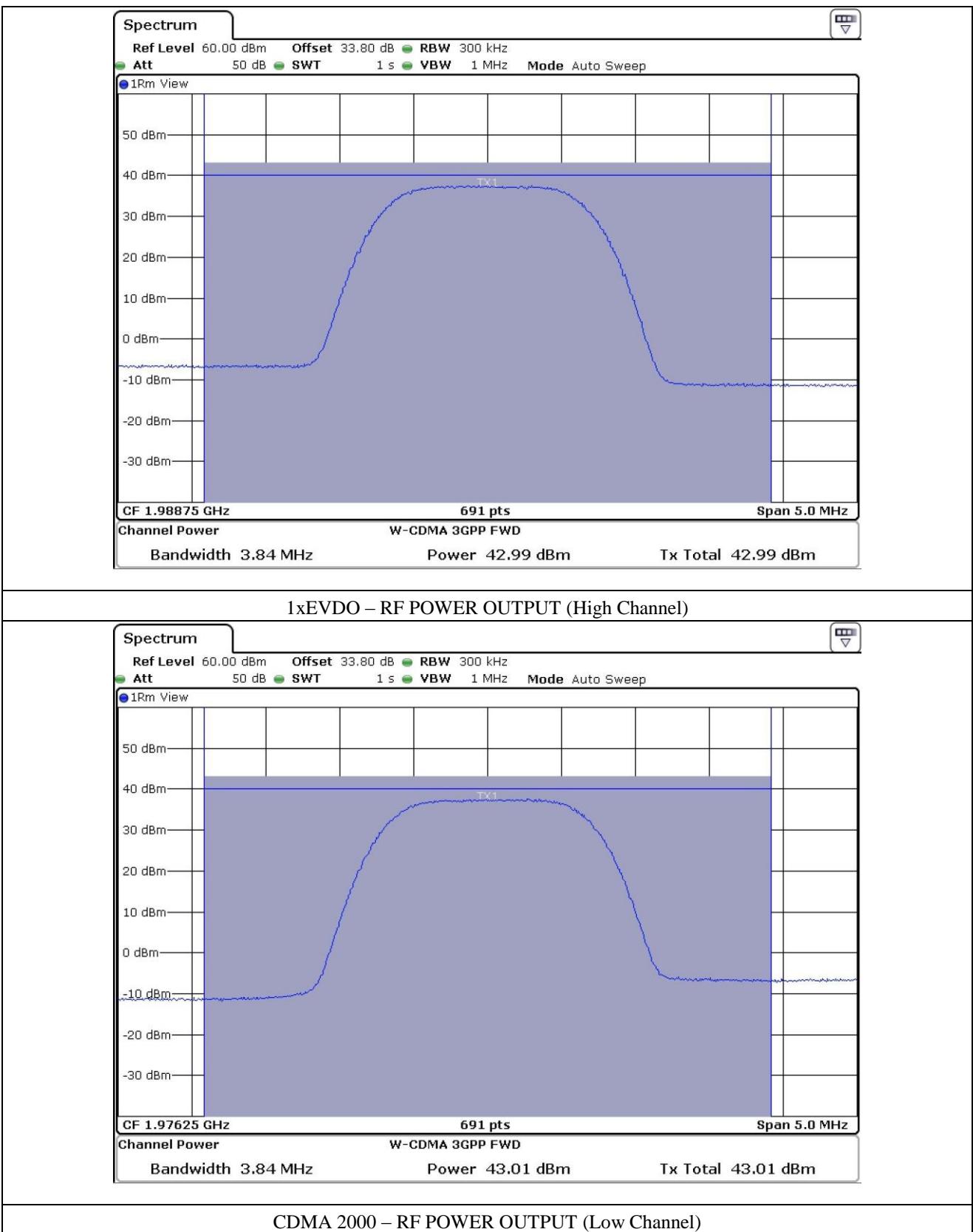
5.4 Test data for Downlink

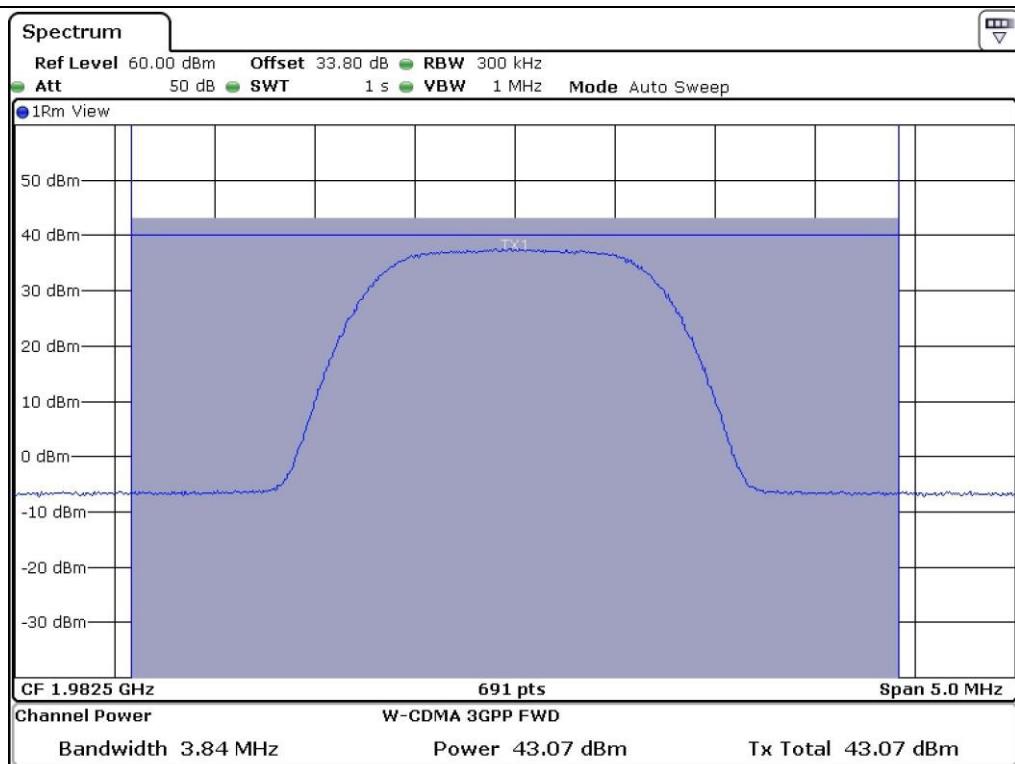
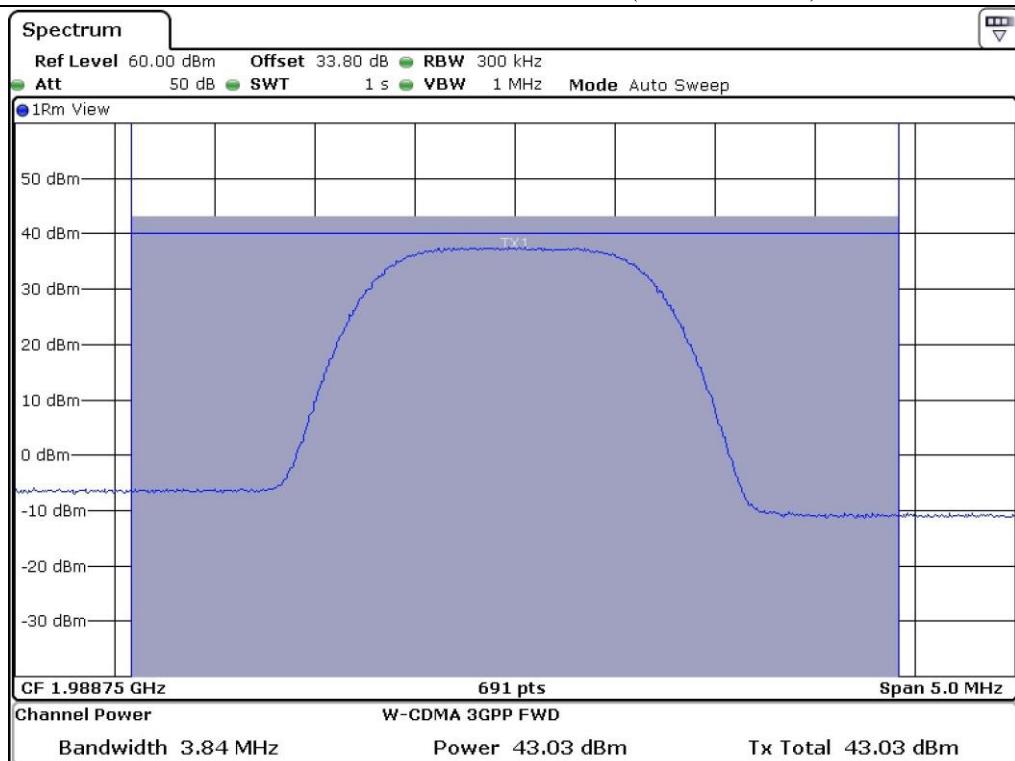
- Test Date : November 03, 2014
- Measurement Function : Channel Power
- Detector Mode : RMS detector
- Test Result : Pass

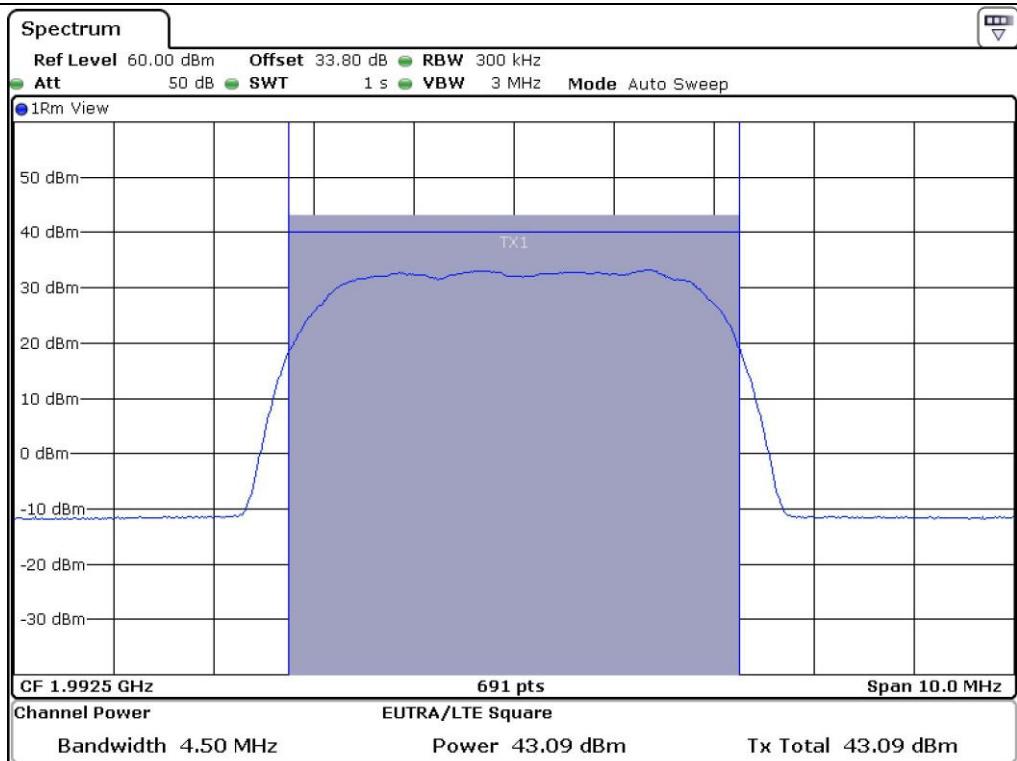
Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)
1xEVDO	Low	1 976.25	-57.02	43.02	20.044 720
	Middle	1 982.50	-57.08	43.00	19.952 623
	High	1 988.75	-56.96	42.99	19.906 733
CDMA 2000	Low	1 976.25	-56.99	43.01	19.998 619
	Middle	1 982.50	-56.96	43.07	20.276 827
	High	1 988.75	-57.02	43.03	20.090 928
LTE 5 M	QPSK	1 992.50	-57.03	43.09	20.370 421
	16 QAM		-57.01	43.00	19.952 623
	64 QAM		-57.06	43.01	19.998 619
LTE 10 M	QPSK	1 980.00	-57.00	43.02	20.044 720
	16 QAM		-56.98	42.99	19.906 733
	64 QAM		-56.97	43.00	19.952 623
LTE 15 M	QPSK	1 982.50	-57.04	43.04	20.137 242
	16 QAM		-57.08	43.00	19.952 623
	64 QAM		-57.03	42.98	19.860 949

Tested by: hyung-kwon, Oh / Project Engineer

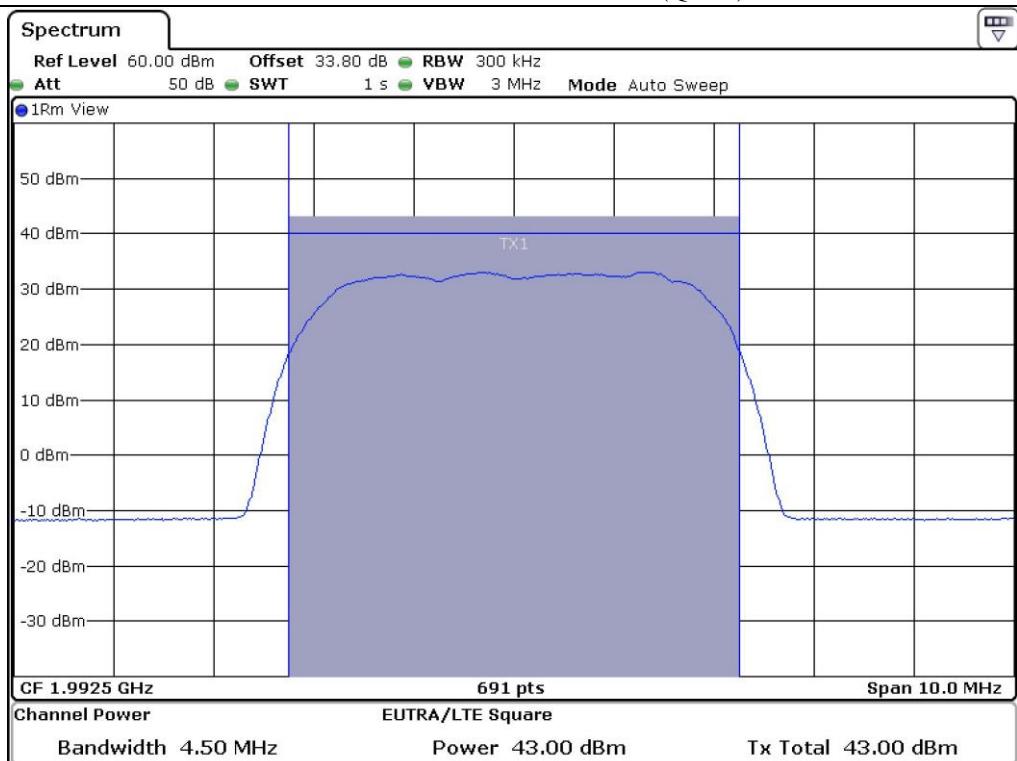

1xEVDO – RF POWER OUTPUT (Low Channel)

1xEVDO – RF POWER OUTPUT (Middle Channel)



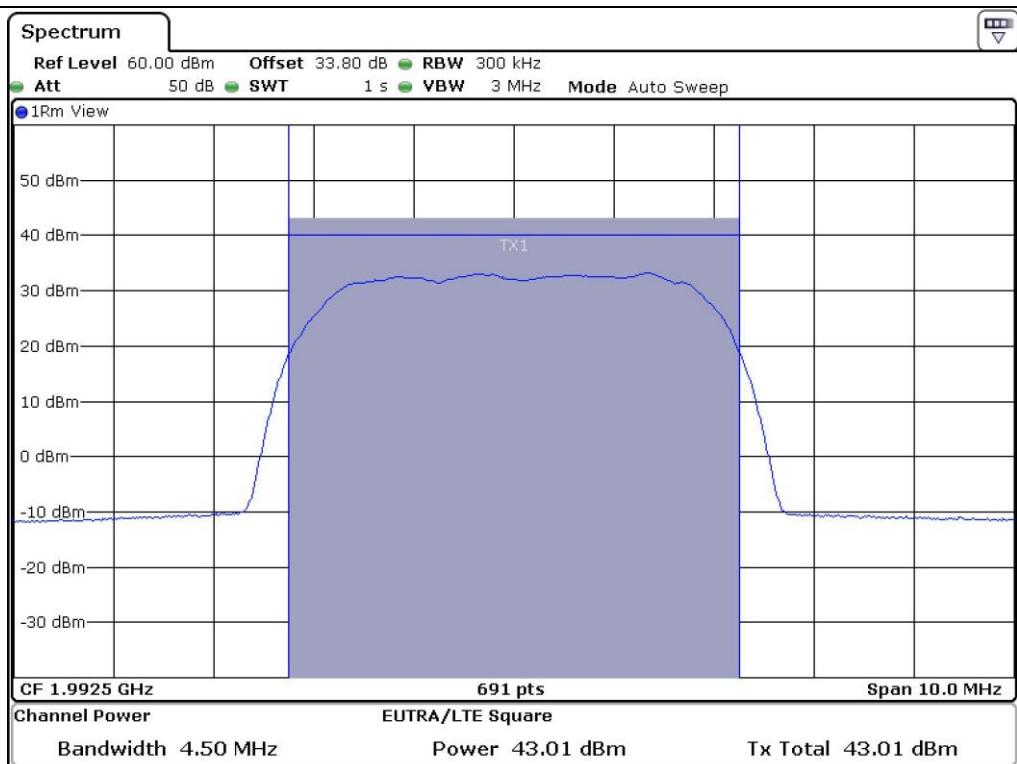

CDMA 2000 – RF POWER OUTPUT (Middle Channel)

CDMA 2000 – RF POWER OUTPUT (High Channel)



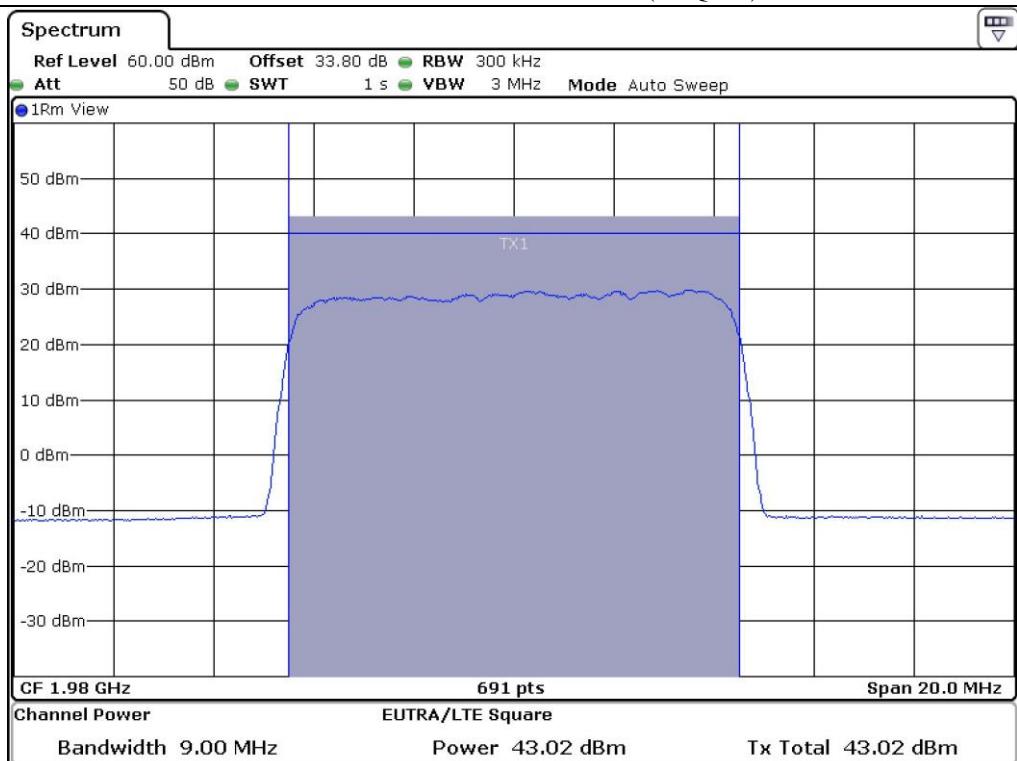
LTE 5 M – RF POWER OUTPUT (QPSK)



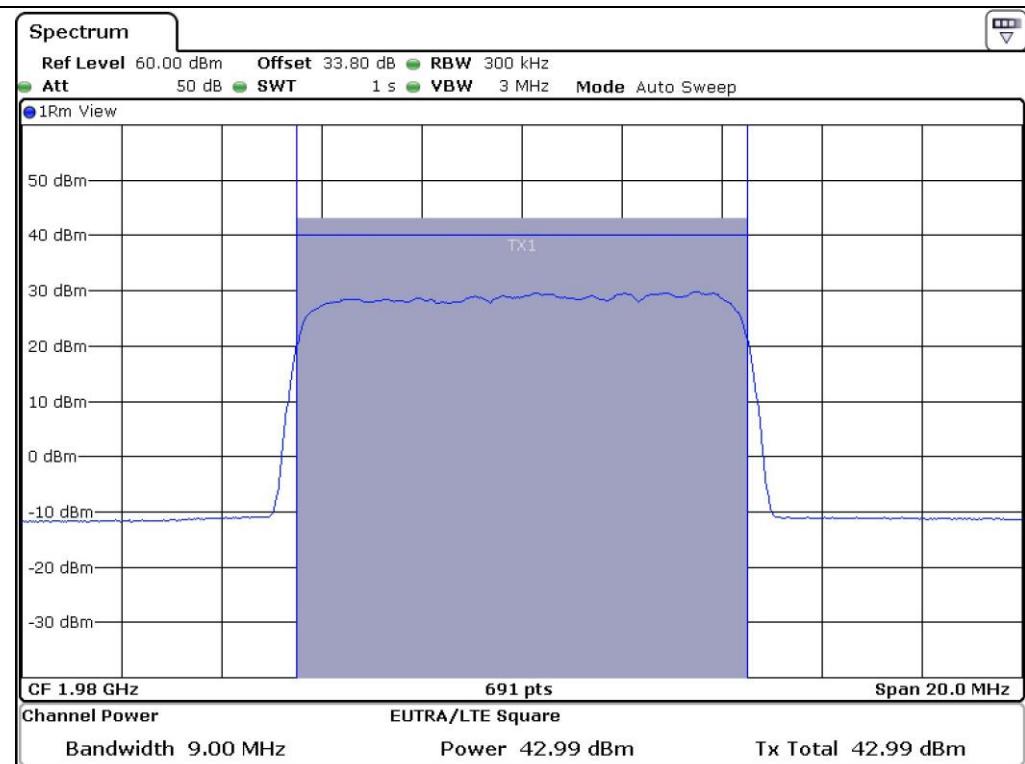
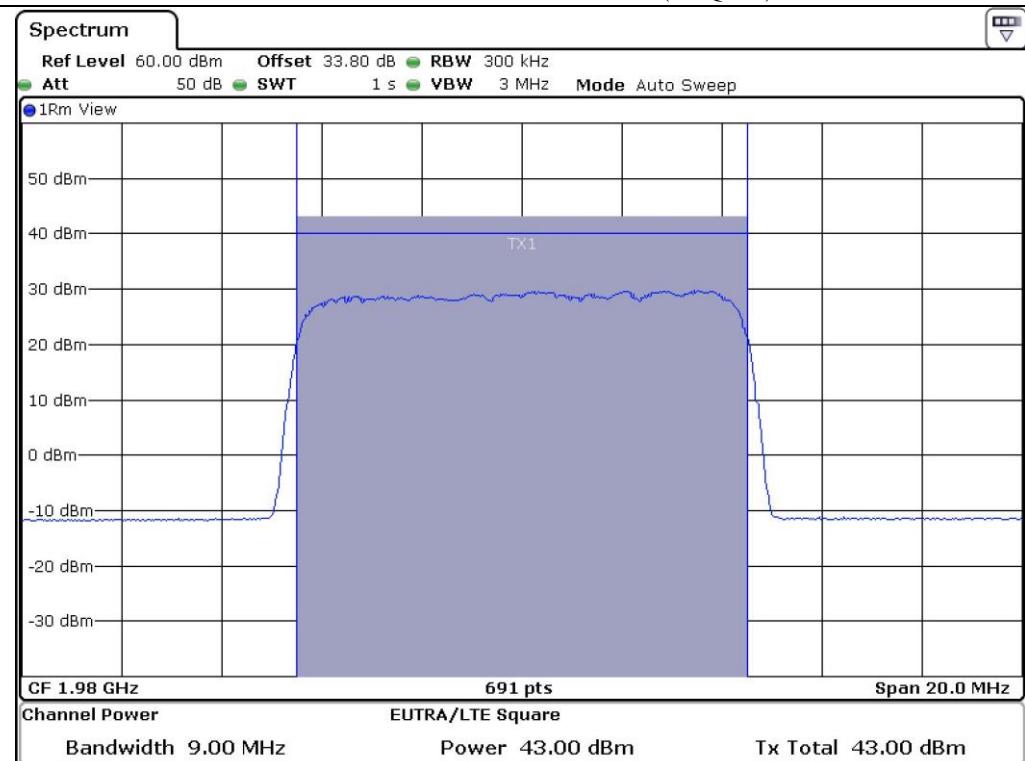
LTE 5 M – RF POWER OUTPUT (16 QAM)

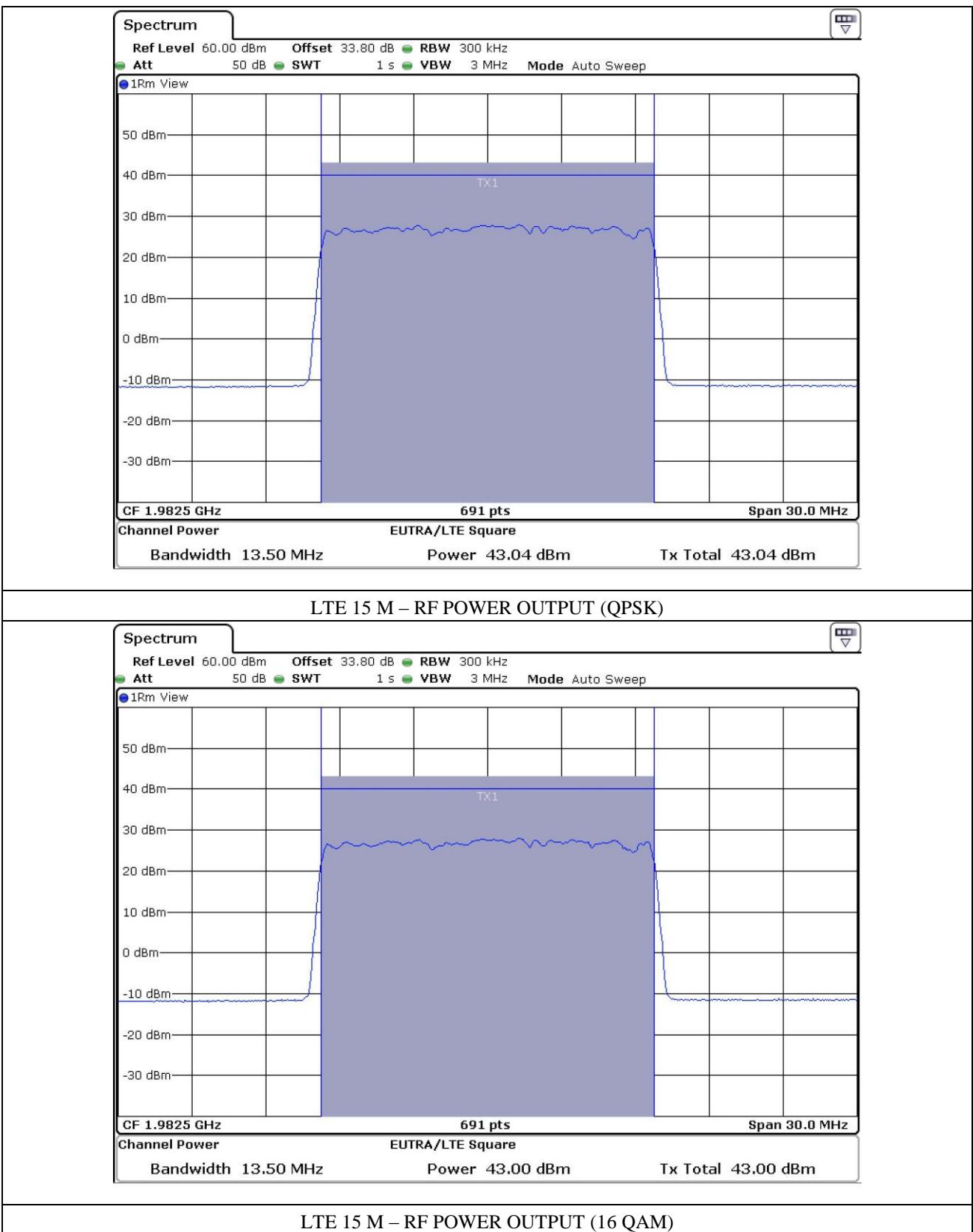


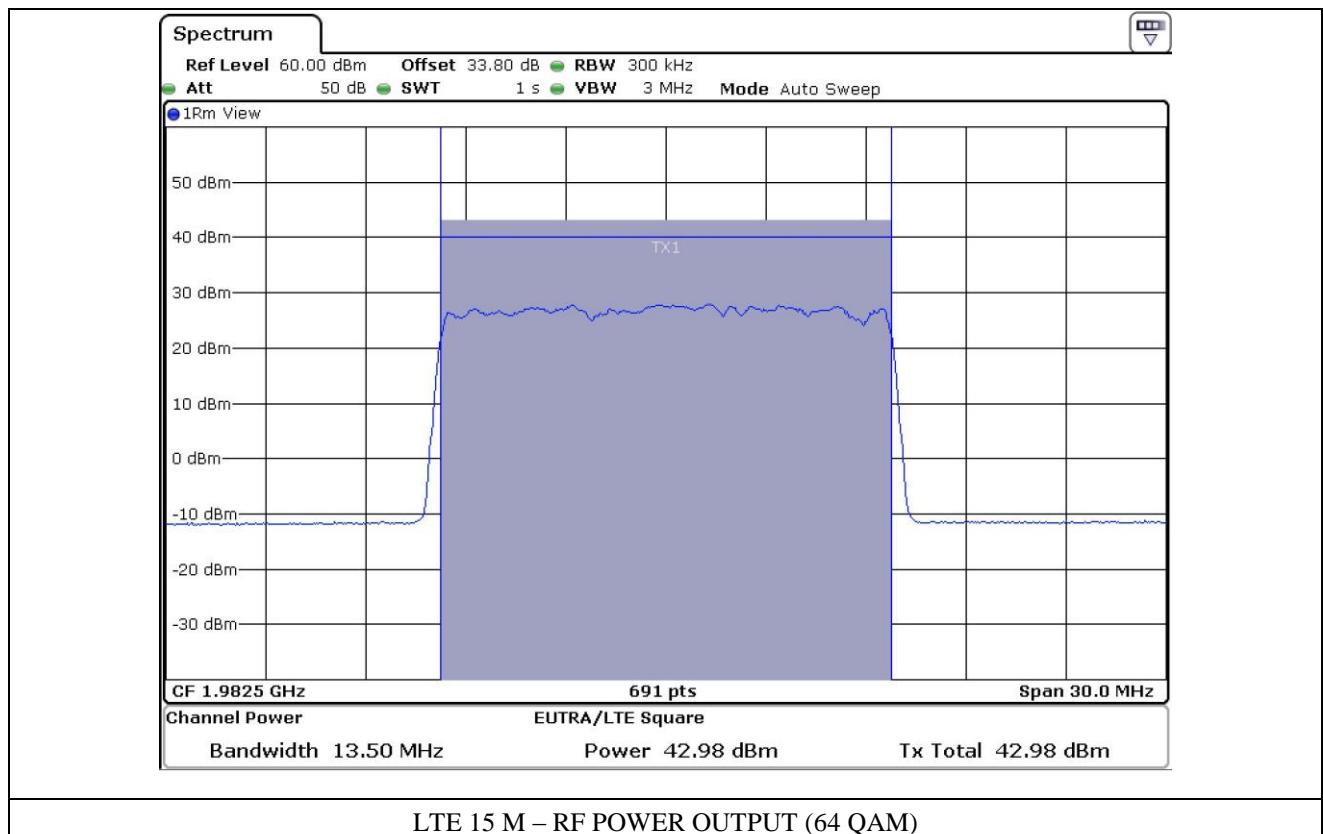
LTE 5 M – RF POWER OUTPUT (64 QAM)



LTE 10 M – RF POWER OUTPUT (QPSK)

**LTE 10 M – RF POWER OUTPUT (16 QAM)****LTE 10 M – RF POWER OUTPUT (64 QAM)**



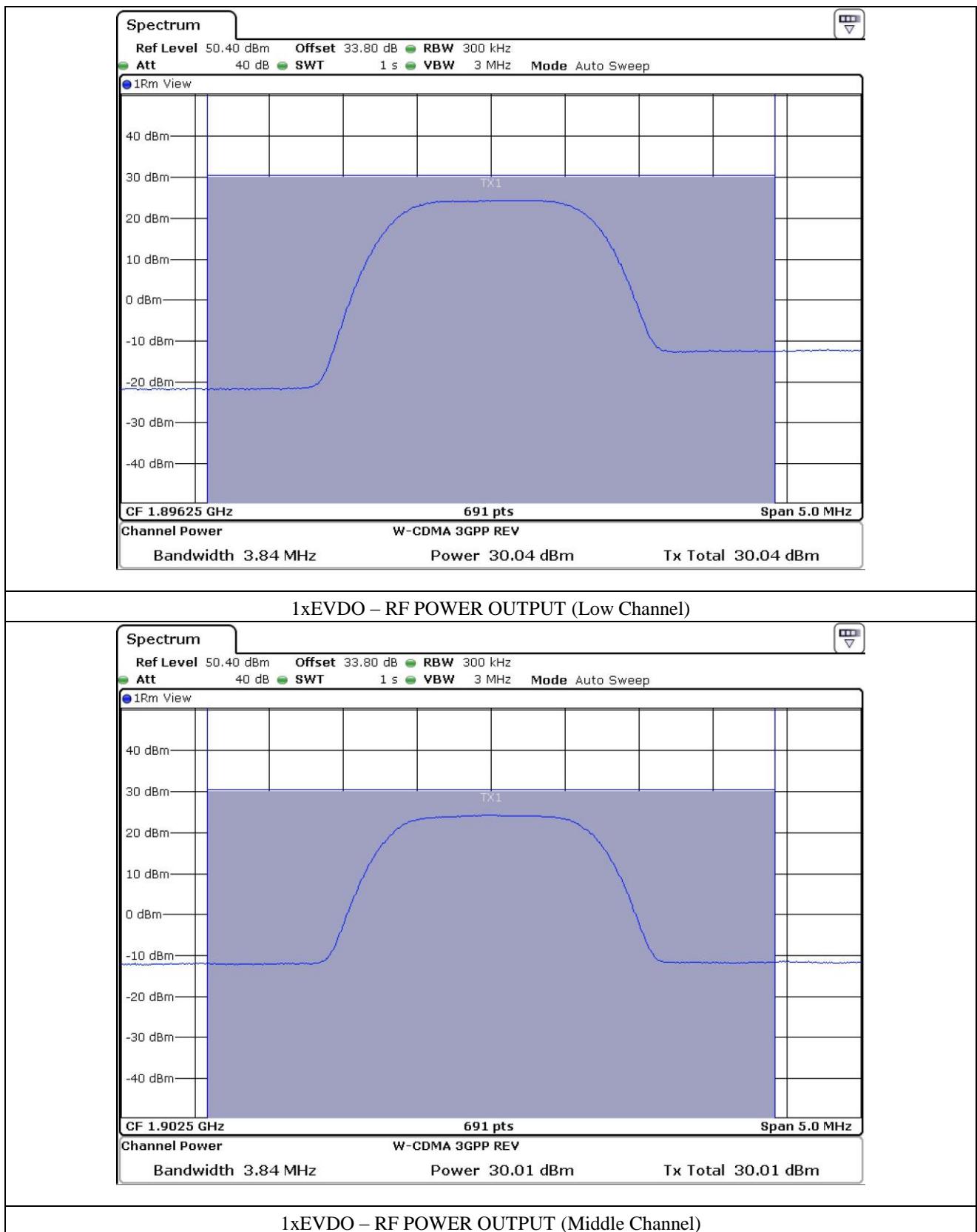


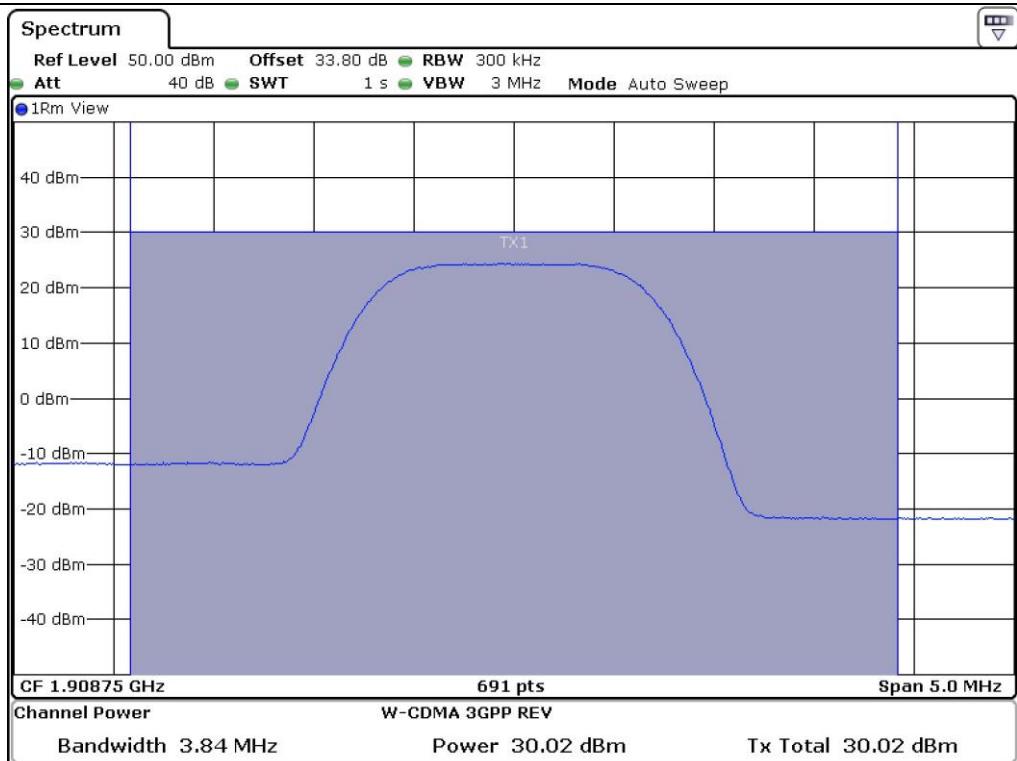
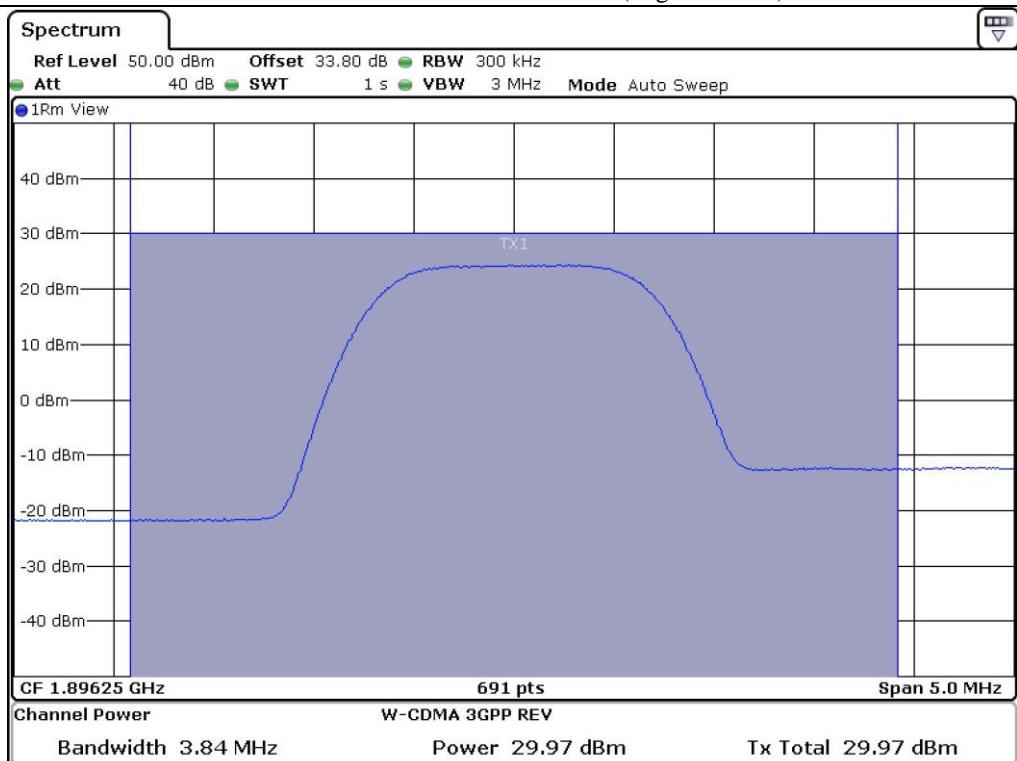
5.5 Test data for Uplink

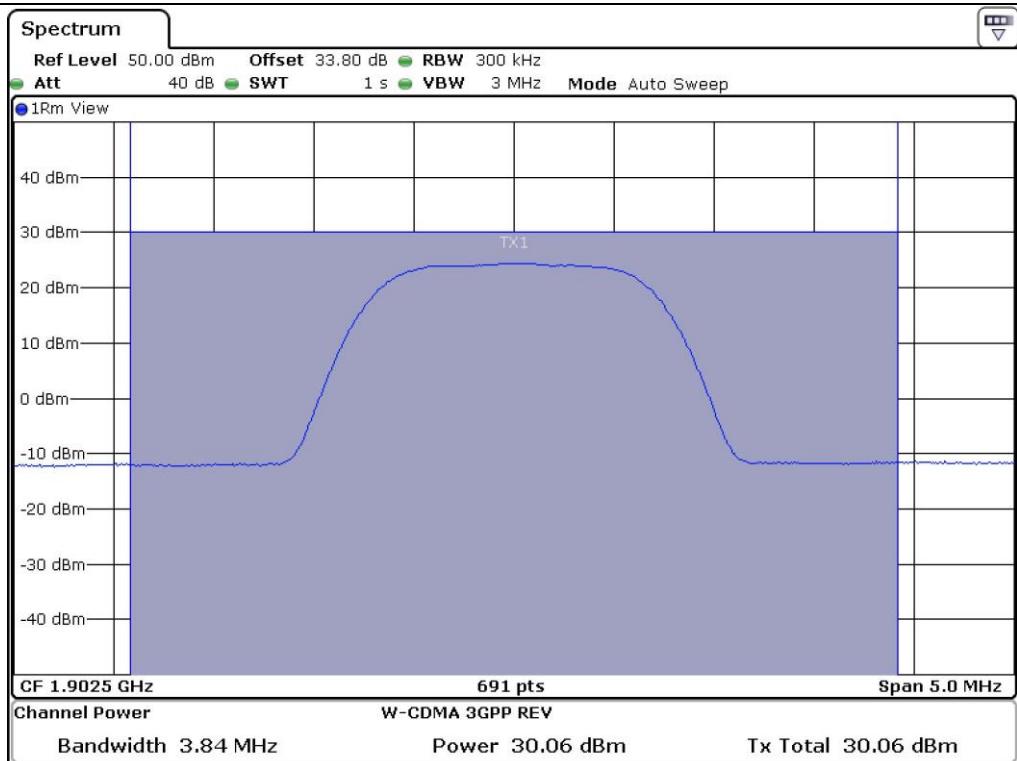
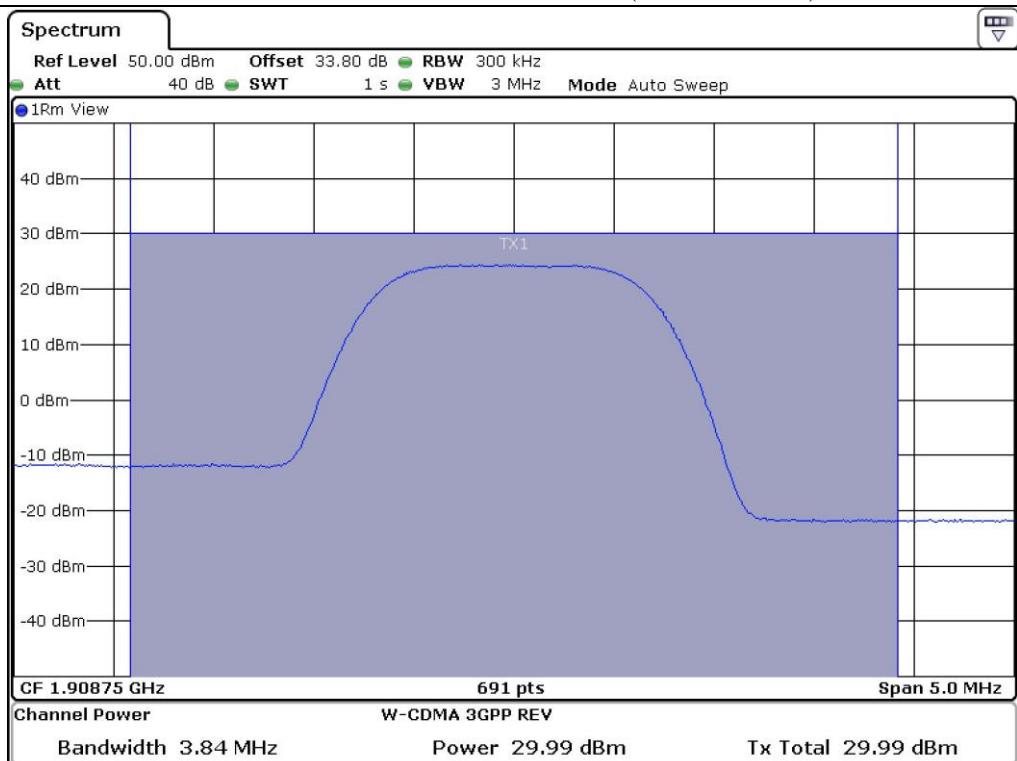
- Test Date : November 03, 2014
- Measurement Function : Channel Power
- Detector Mode : RMS detector
- Test Result : Pass

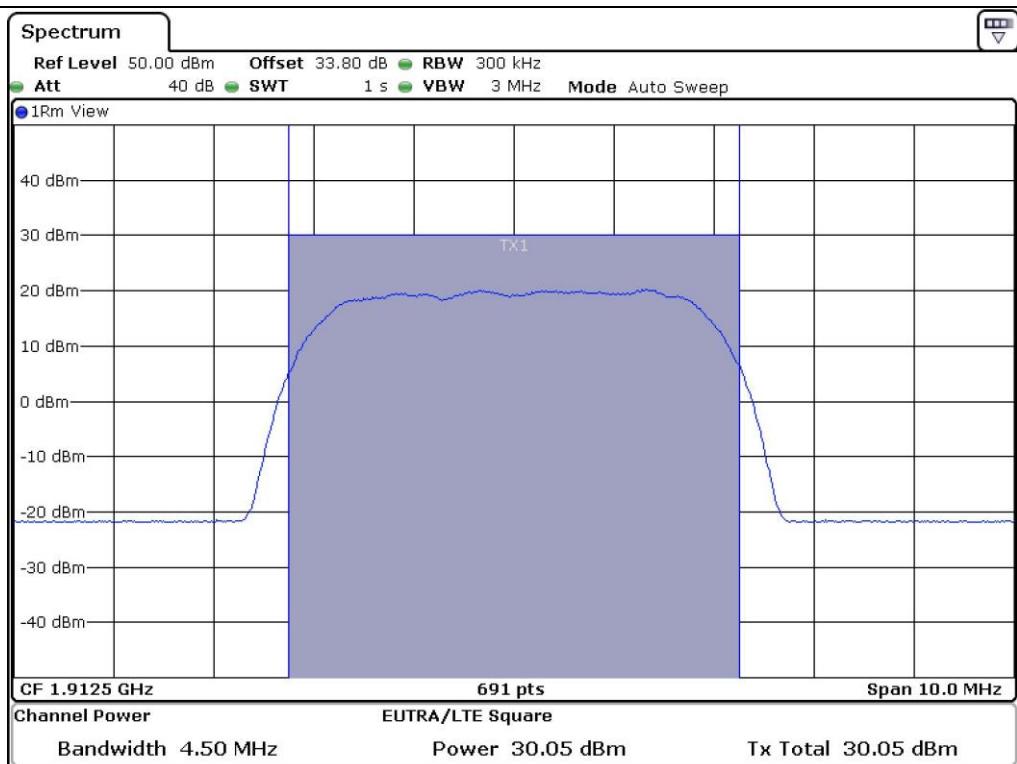
Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)
1xEVDO	Low	1 896.25	-69.97	30.04	1.009 253
	Middle	1 902.50	-70.05	30.01	1.002 305
	High	1 908.75	-70.03	30.02	1.004 616
CDMA 2000	Low	1 896.25	-70.02	29.97	0.993 116
	Middle	1 902.50	-70.08	30.06	1.013 911
	High	1 908.75	-69.97	29.99	0.997 700
LTE 5 M	QPSK	1 912.50	-69.95	30.05	1.011 579
	16 QAM		-69.99	30.01	1.002 305
	64 QAM		-70.05	29.98	0.995 405
LTE 10 M	QPSK	1 900.00	-70.07	30.04	1.009 253
	16 QAM		-70.06	30.02	1.004 616
	64 QAM		-70.04	29.99	0.997 700
LTE 15 M	QPSK	1 902.50	-69.97	30.05	1.011 579
	16 QAM		-69.99	30.00	1.000 000
	64 QAM		-70.04	30.02	1.004 616

Tested by: hyung-kwon, Oh / Project Engineer

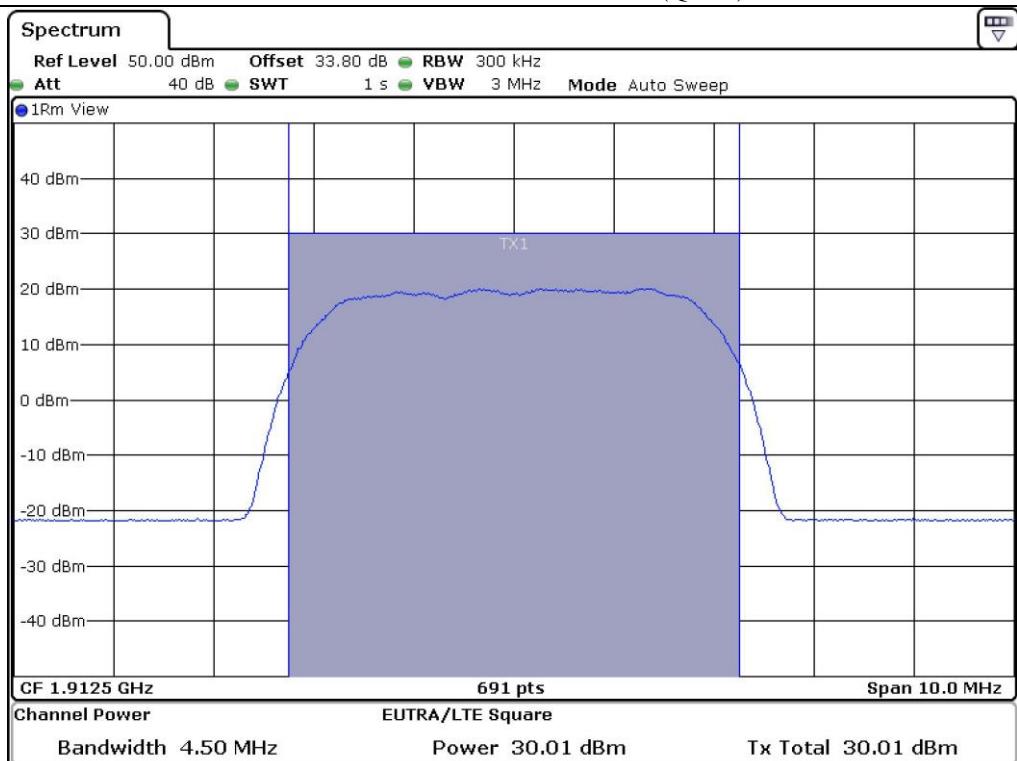



1xEVDO – RF POWER OUTPUT (High Channel)

CDMA 2000 – RF POWER OUTPUT (Low Channel)

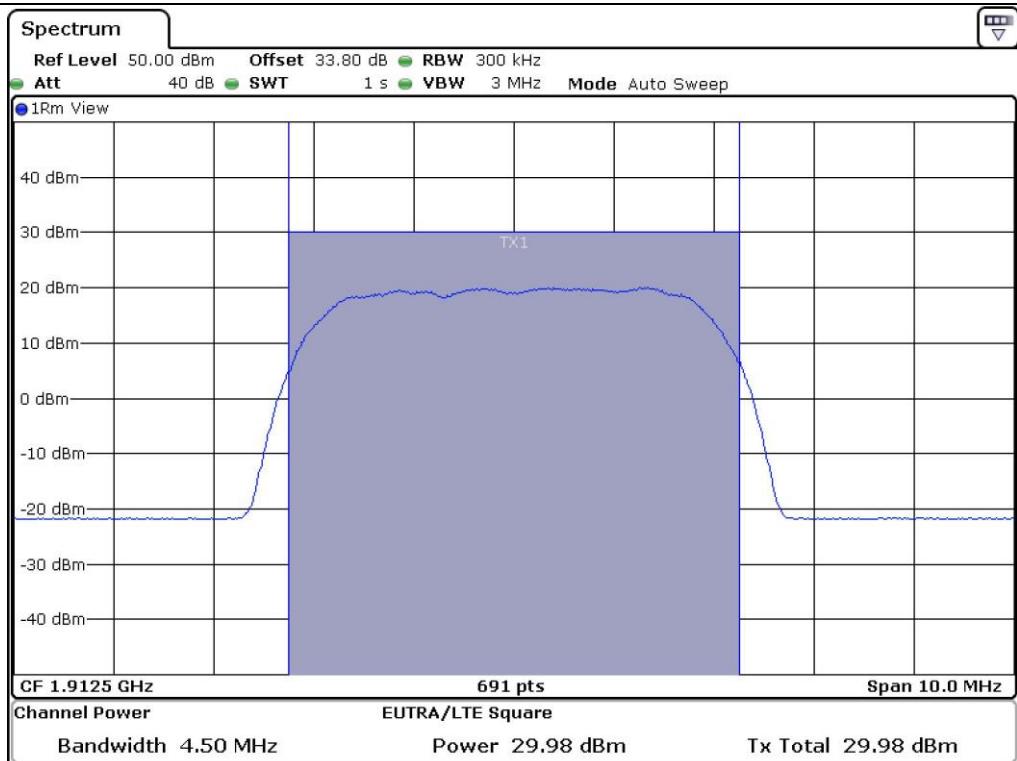

CDMA 2000 – RF POWER OUTPUT (Middle Channel)

CDMA 2000 – RF POWER OUTPUT (High Channel)



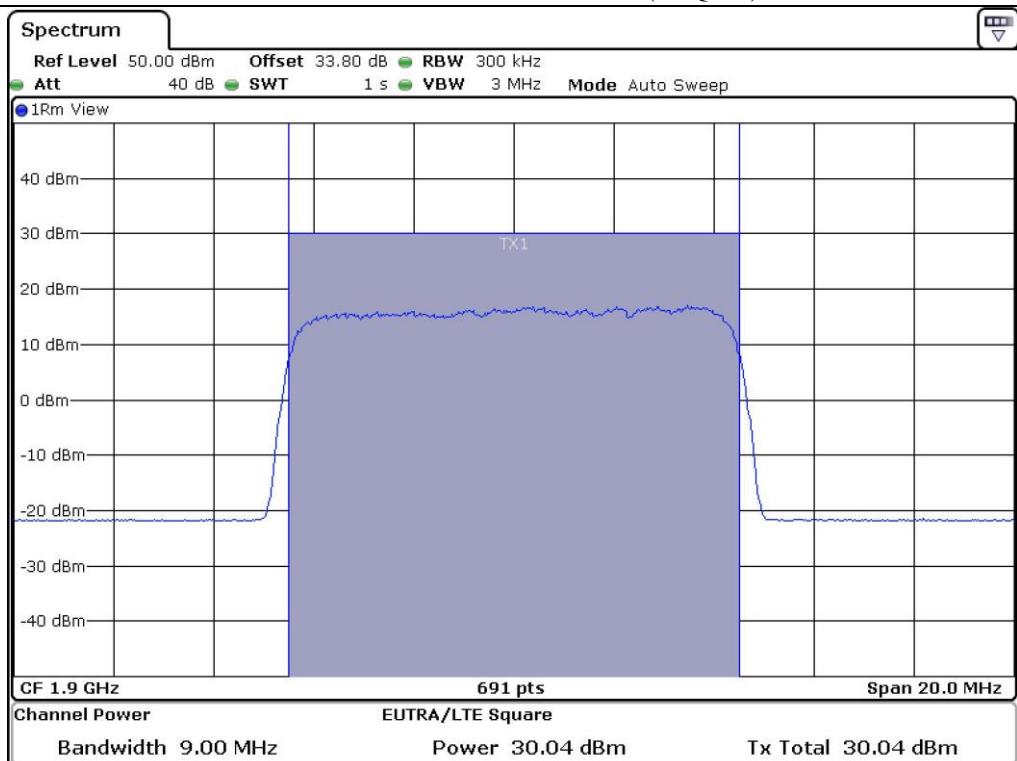
LTE 5 M – RF POWER OUTPUT (QPSK)



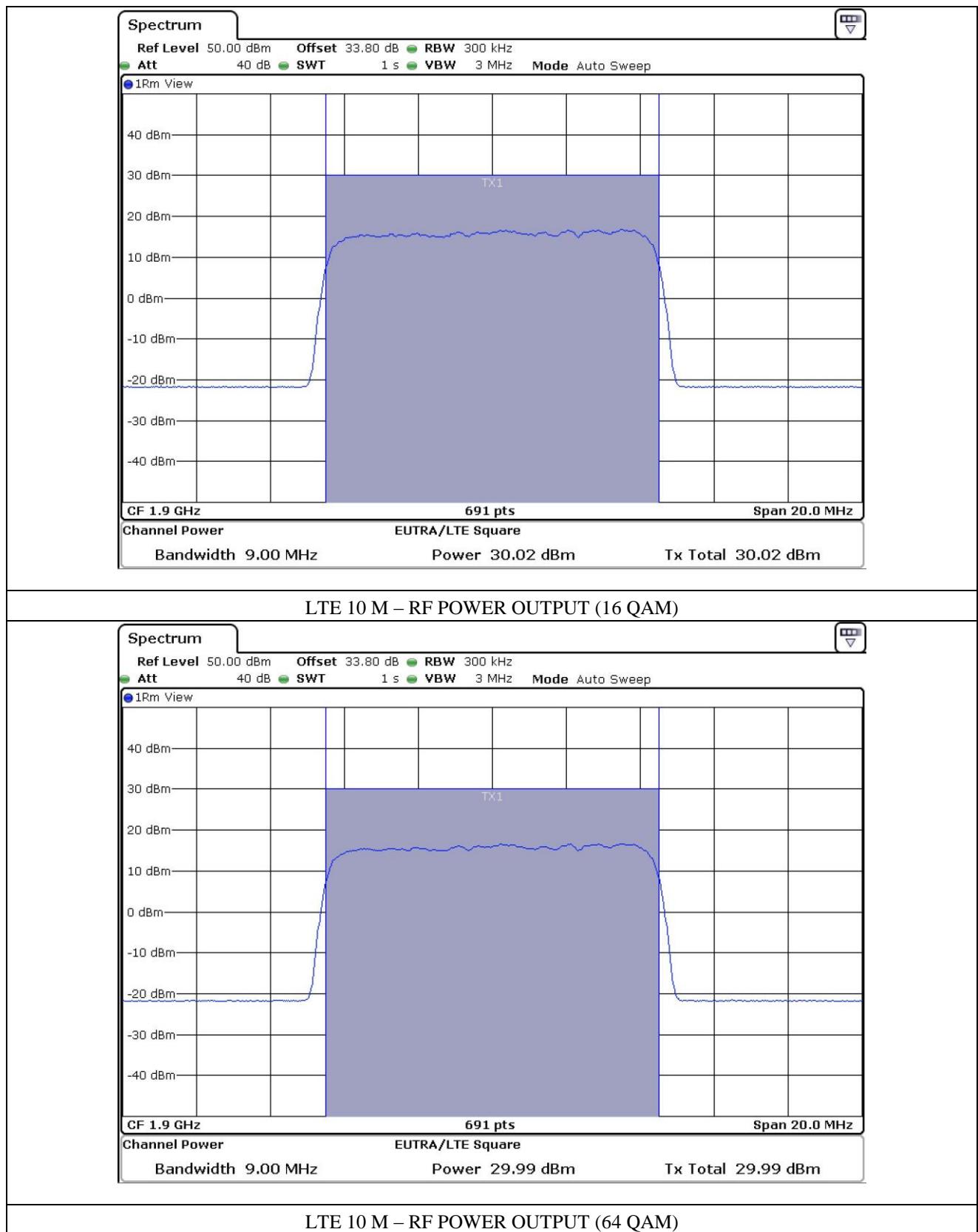
LTE 5 M – RF POWER OUTPUT (16 QAM)

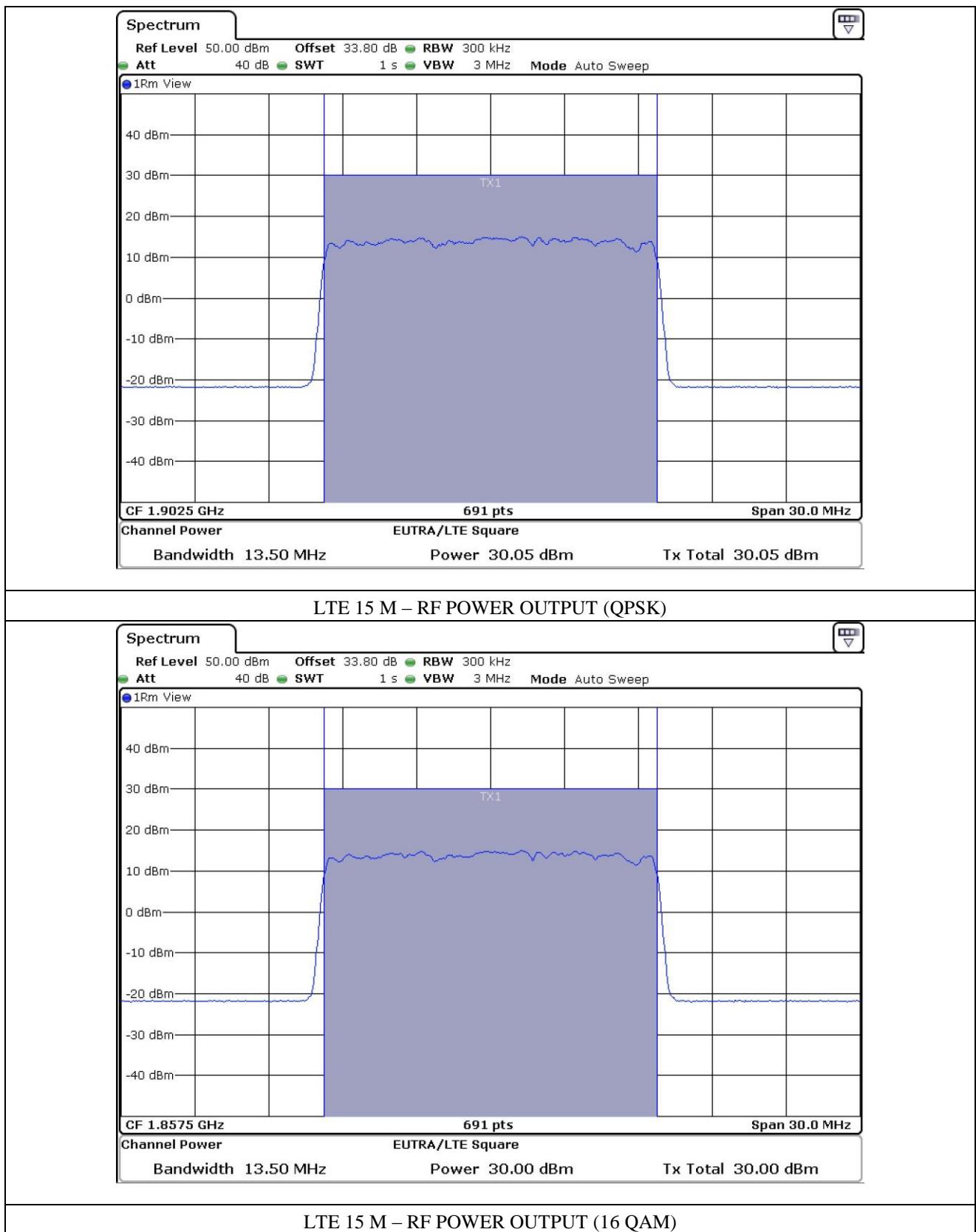


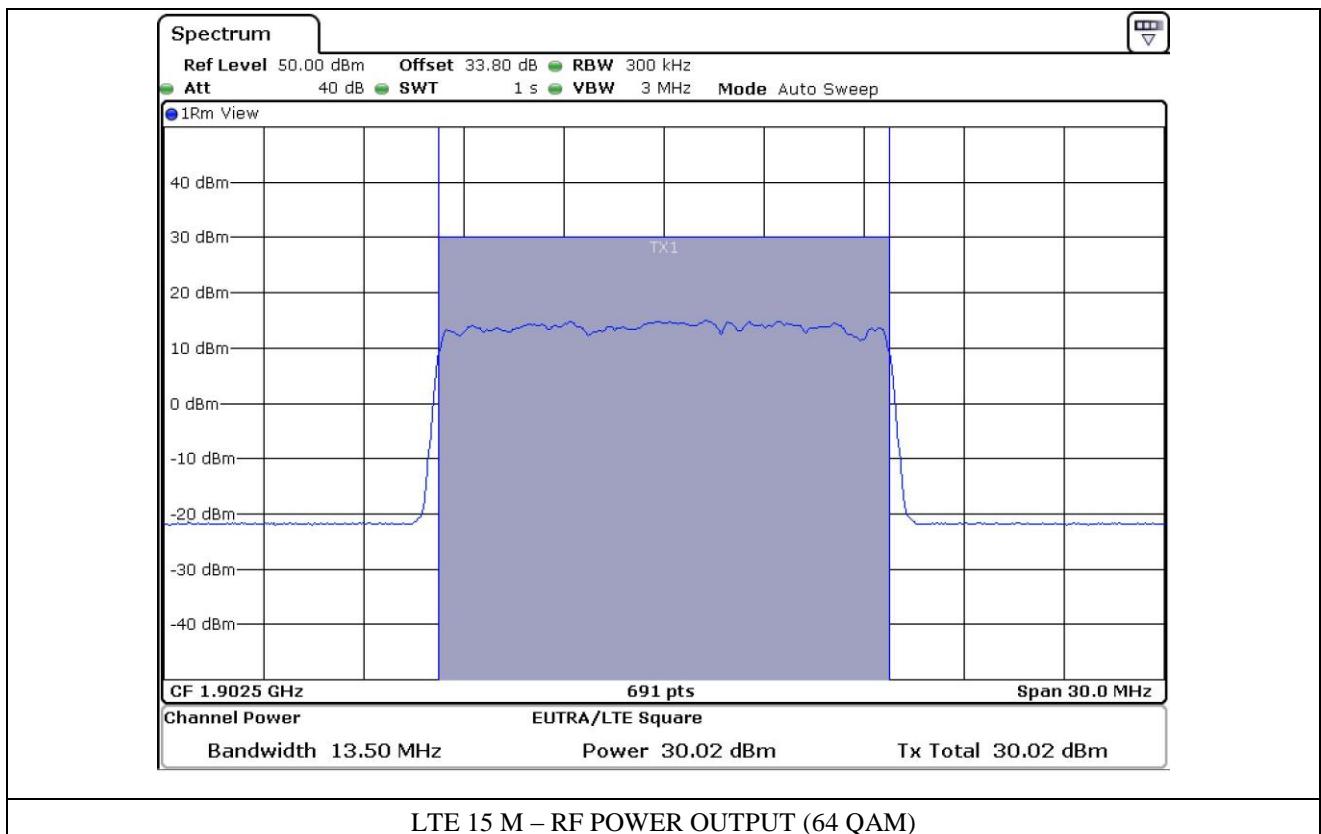
LTE 5 M – RF POWER OUTPUT (64 QAM)



LTE 10 M – RF POWER OUTPUT (QPSK)







6. OCCUPIED BANDWIDTH

6.1 Operating environment

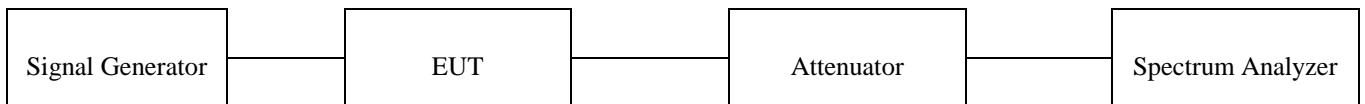
Temperature : 25 °C

Relative humidity : 50 % R.H.

6.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

For the testing, the RBW was set to 1 % to 3 % of the - 26 dB bandwidth. The VBW is set to 3 times the RBW and sweep time is coupled.



6.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - SMJ100A	Rohde & Schwarz	Signal Generator	101038	Oct. 08, 2014 (1Y)
■ - FSV30	Rohde & Schwarz	Signal Analyzer	101372	Apr. 28, 2014(1Y)

All test equipment used is calibrated on a regular basis.

6.4 Test data for Downlink

- Test Date : November 03, 2014
- Test Result : Pass

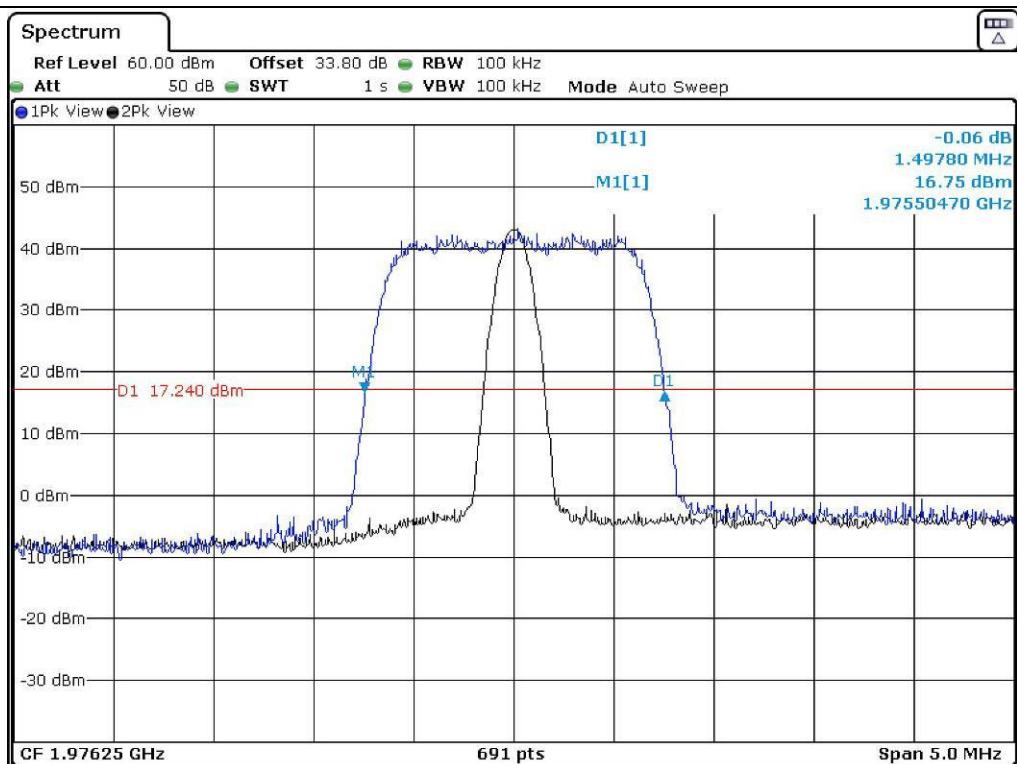
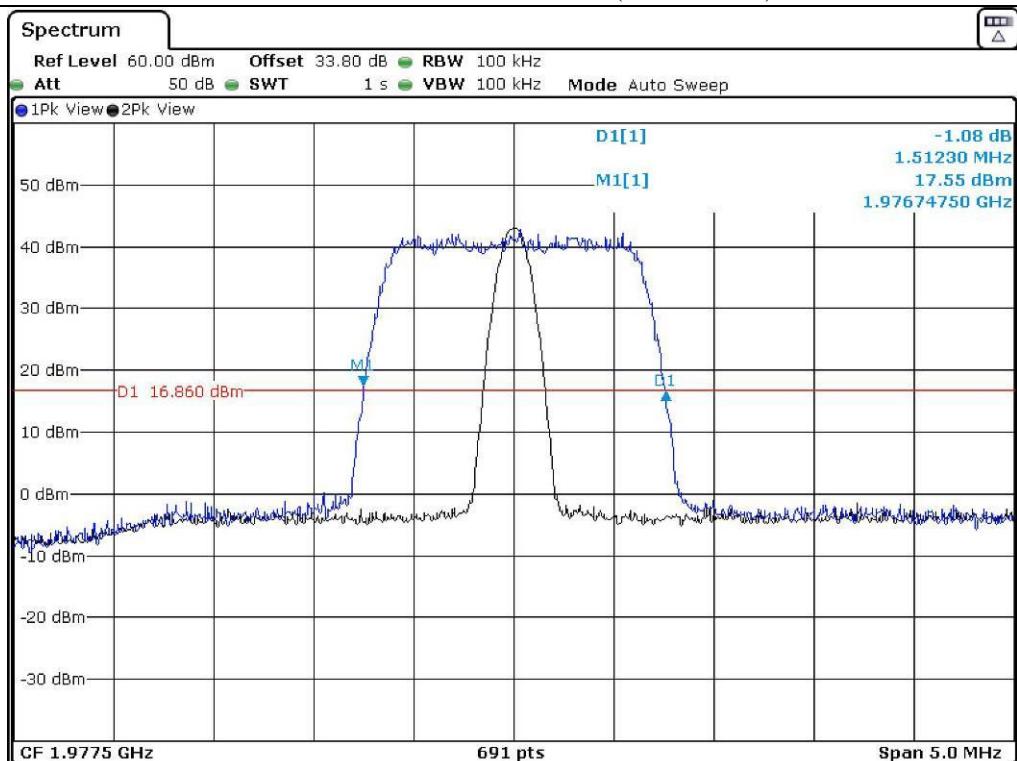
Modulation	Channel	26 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)
CDMA 2000	Low	1.50	1.31
	Middle	1.51	1.32
	High	1.51	1.32
LTE 5 M	QPSK	4.63	4.11
LTE 10 M	QPSK	9.35	8.68
LTE 15 M	QPSK	13.98	13.24

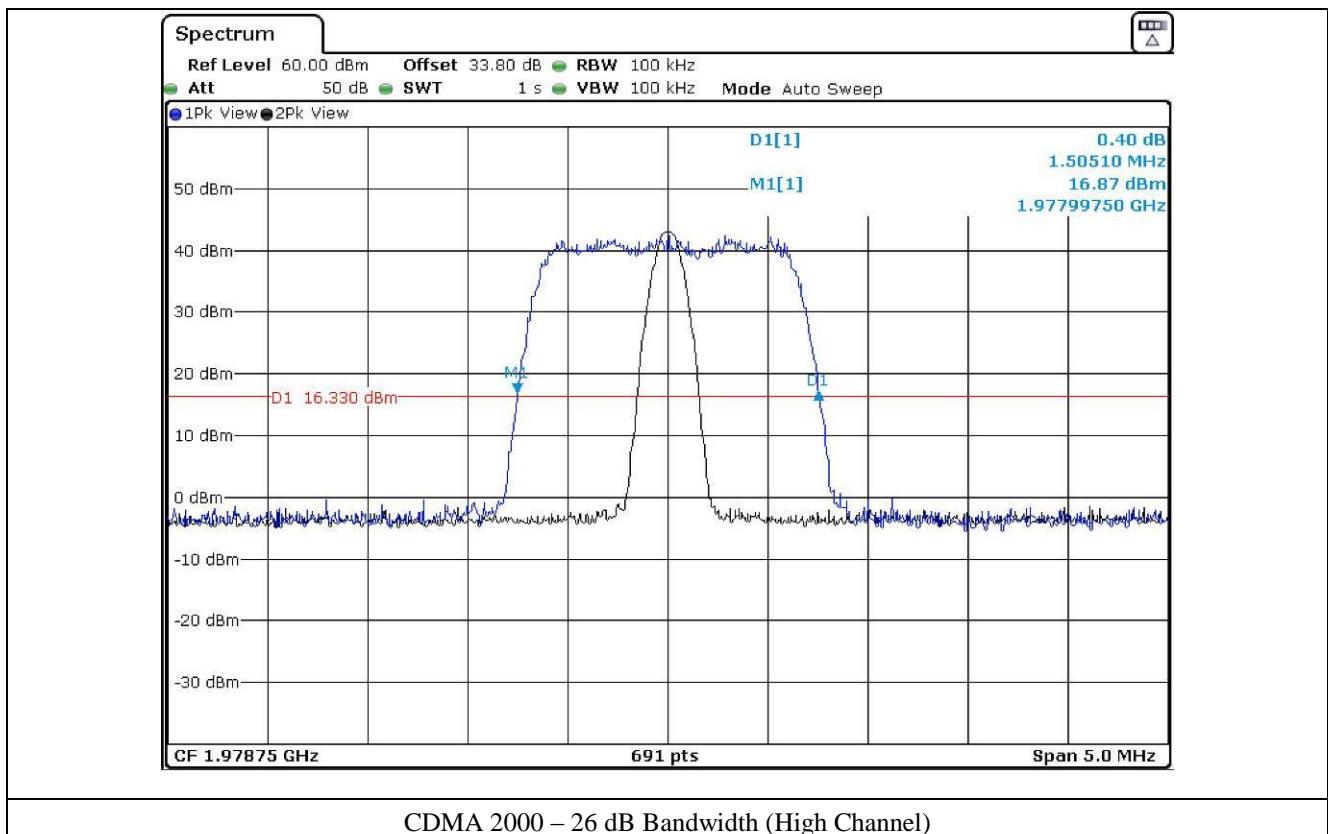
Remark: 1. According to above result, the carrier frequency shall be within the frequency block edges.

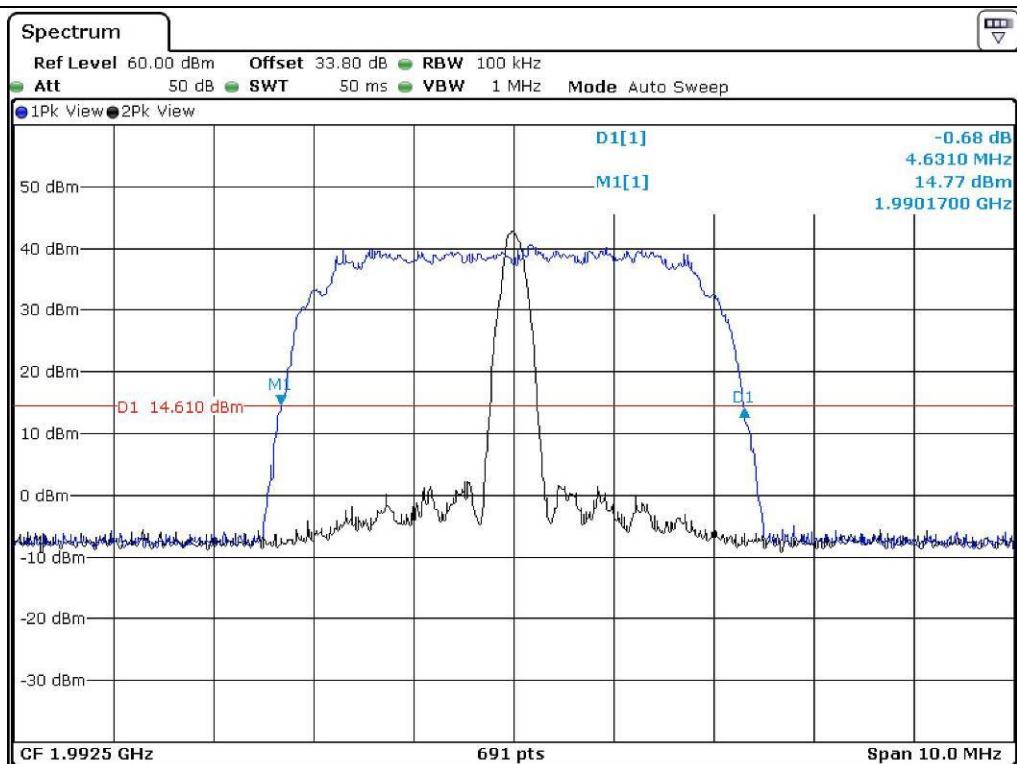
2. As a result of preliminary testing., the formal test was performed with the maximum payload mode of worst cases for QPSK.



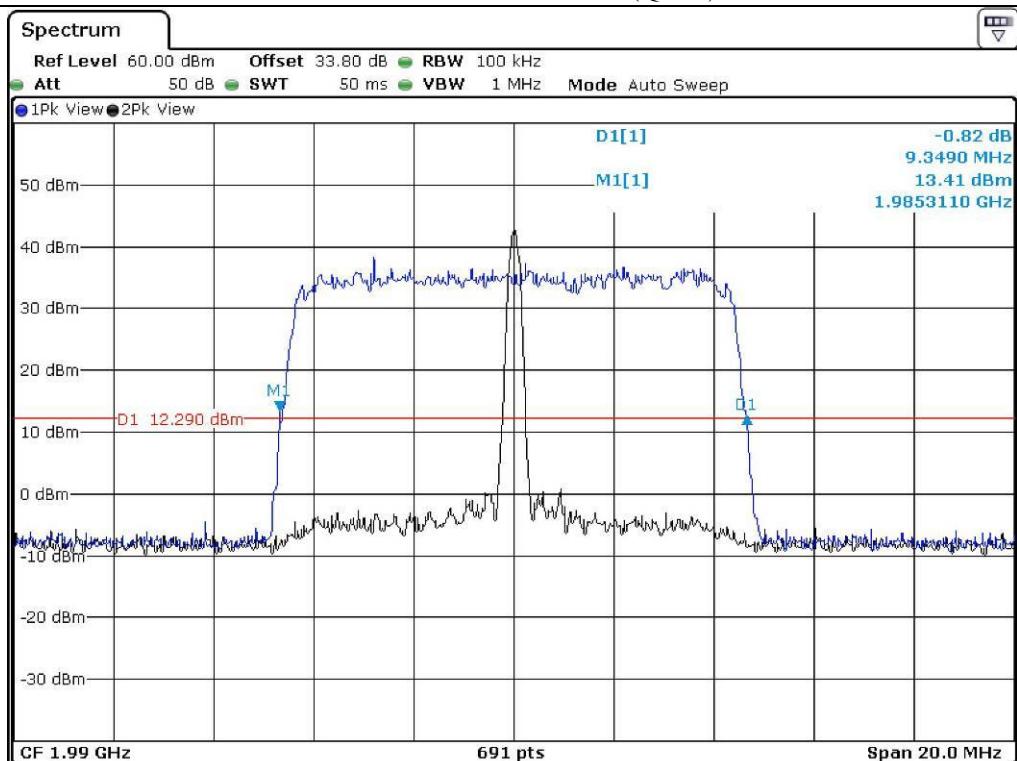
Tested by: hyung-kwon, Oh / Project Engineer


CDMA 2000 – 26 dB Bandwidth (Low Channel)

CDMA 2000 – 26 dB Bandwidth (Middle Channel)

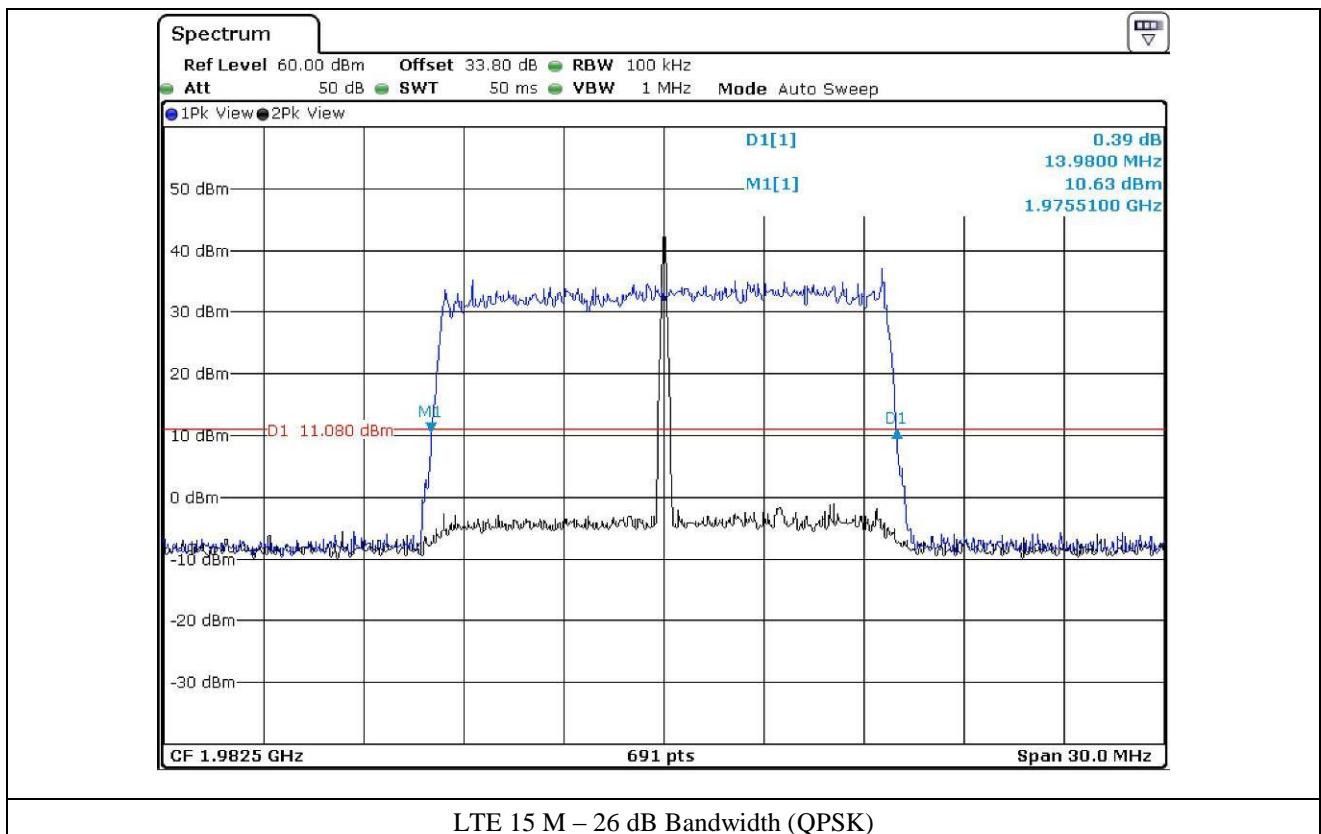


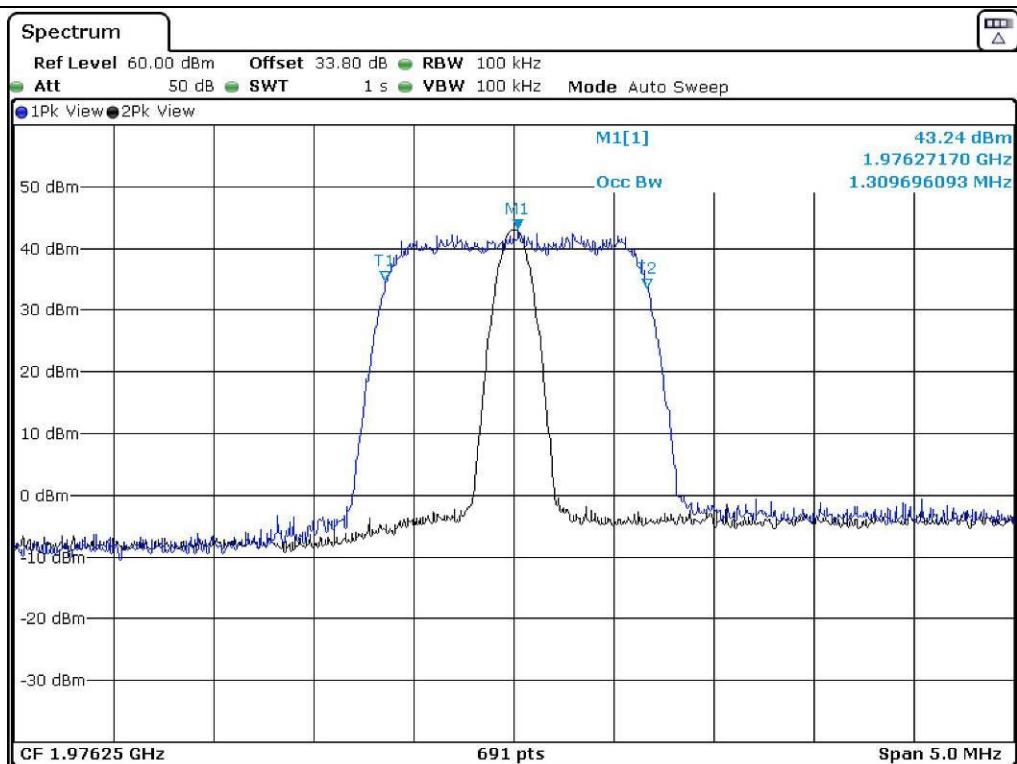
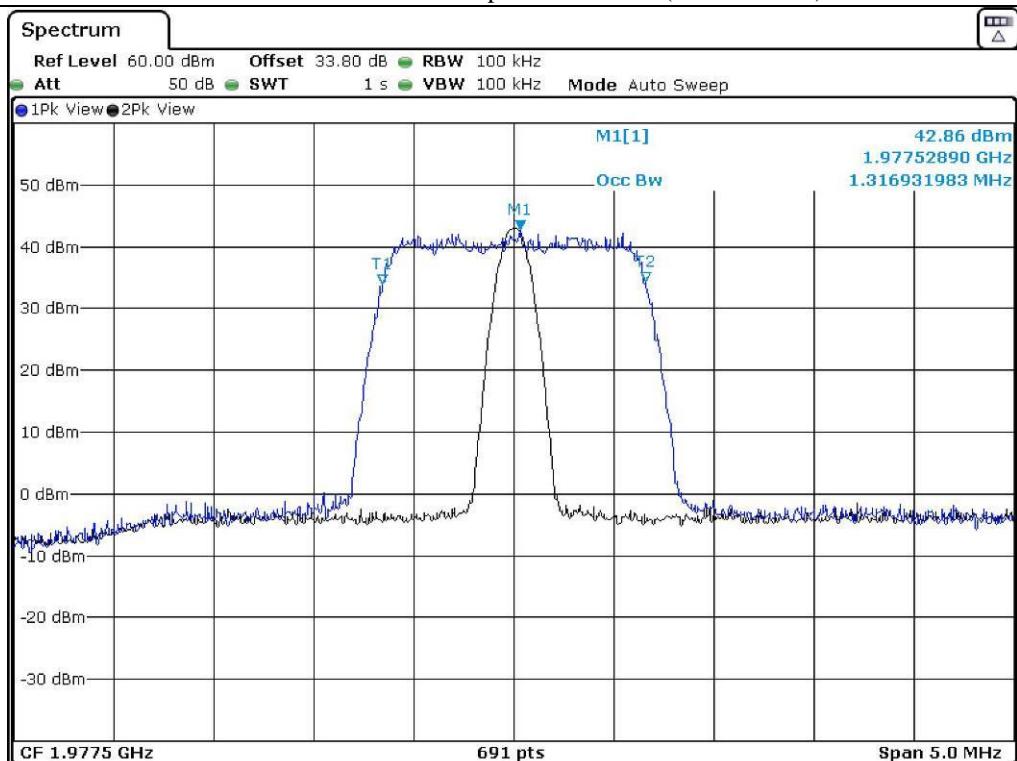


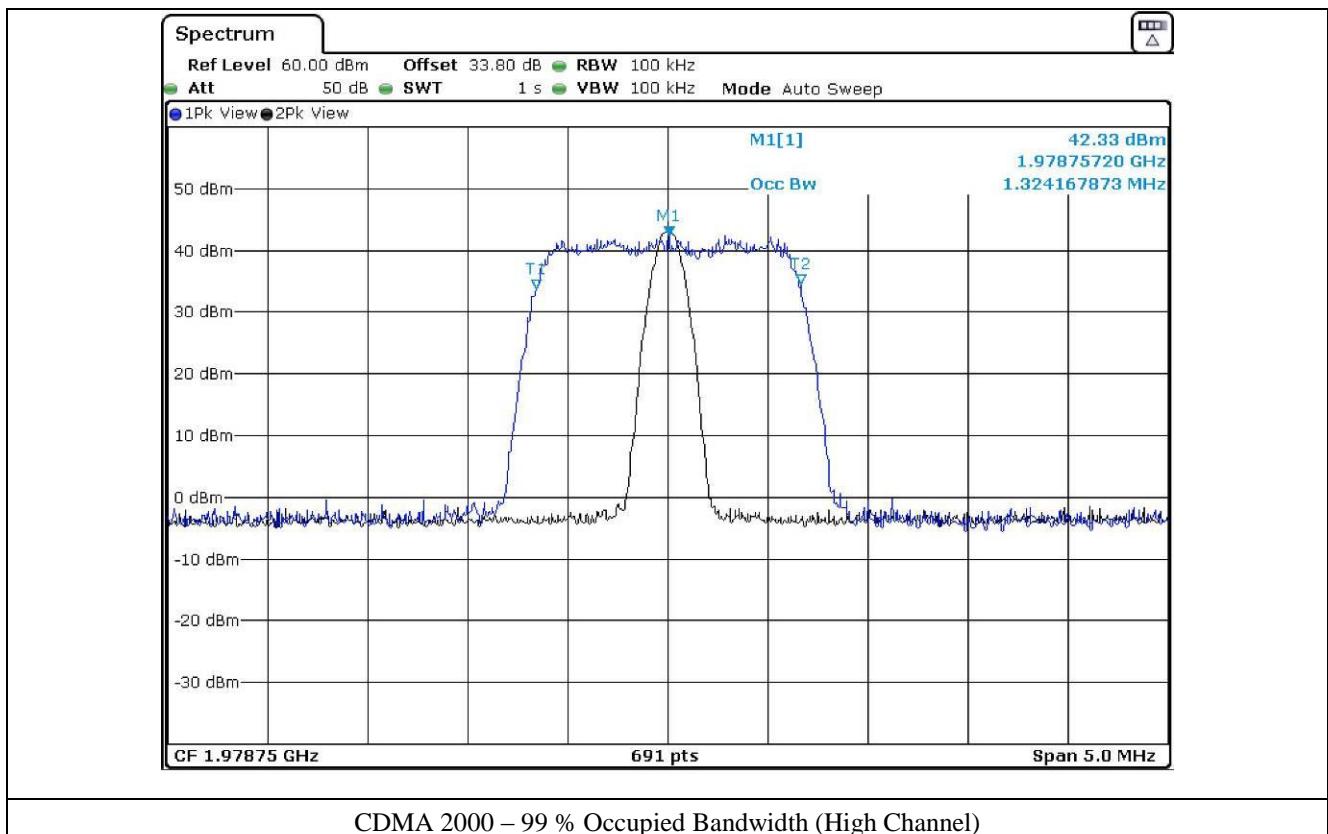
LTE 5 M – 26 dB Bandwidth (QPSK)

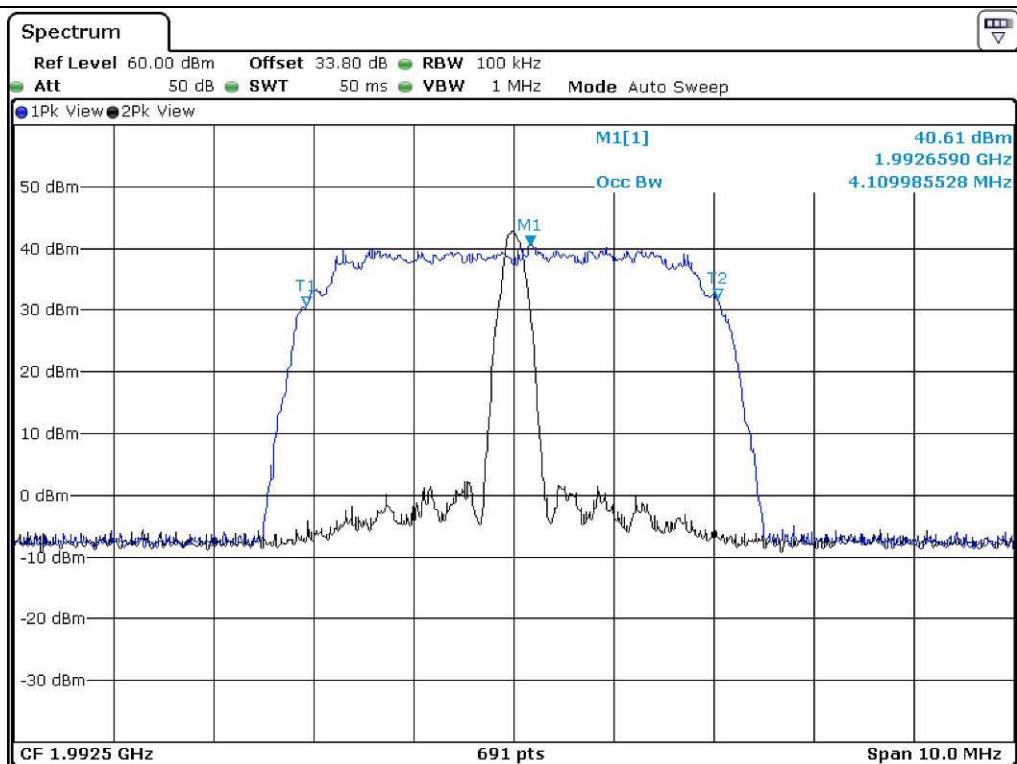


LTE 10 M – 26 dB Bandwidth (QPSK)

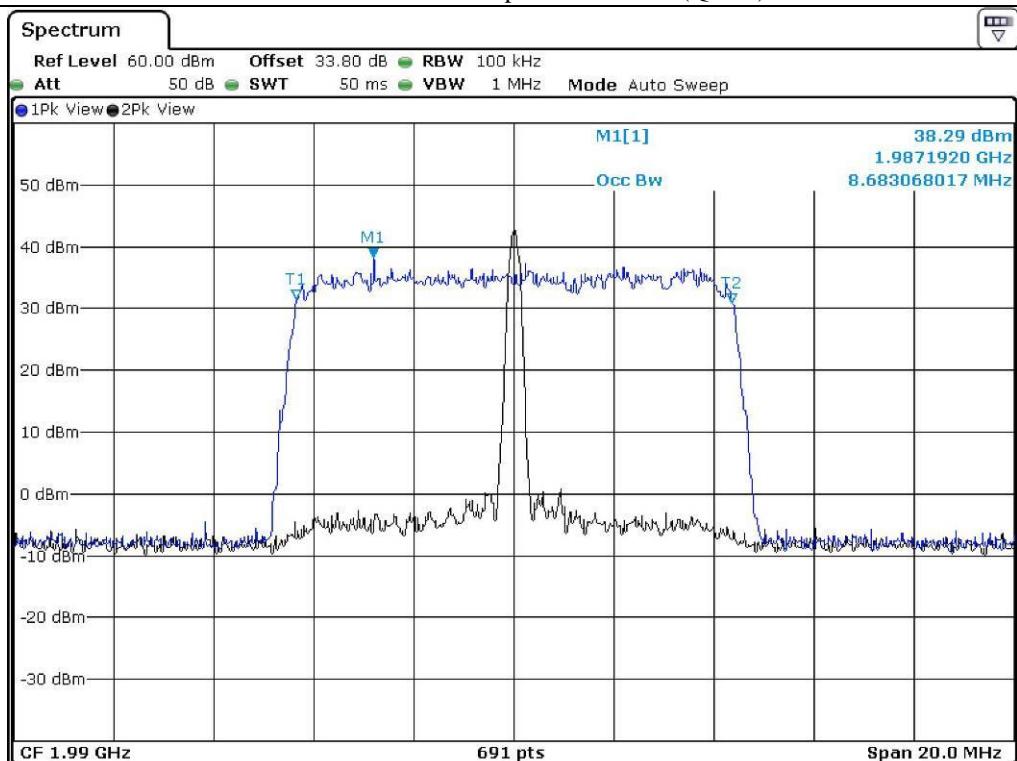



CDMA 2000 – 99 % Occupied Bandwidth (Low Channel)

CDMA 2000 – 99 % Occupied Bandwidth (Middle Channel)

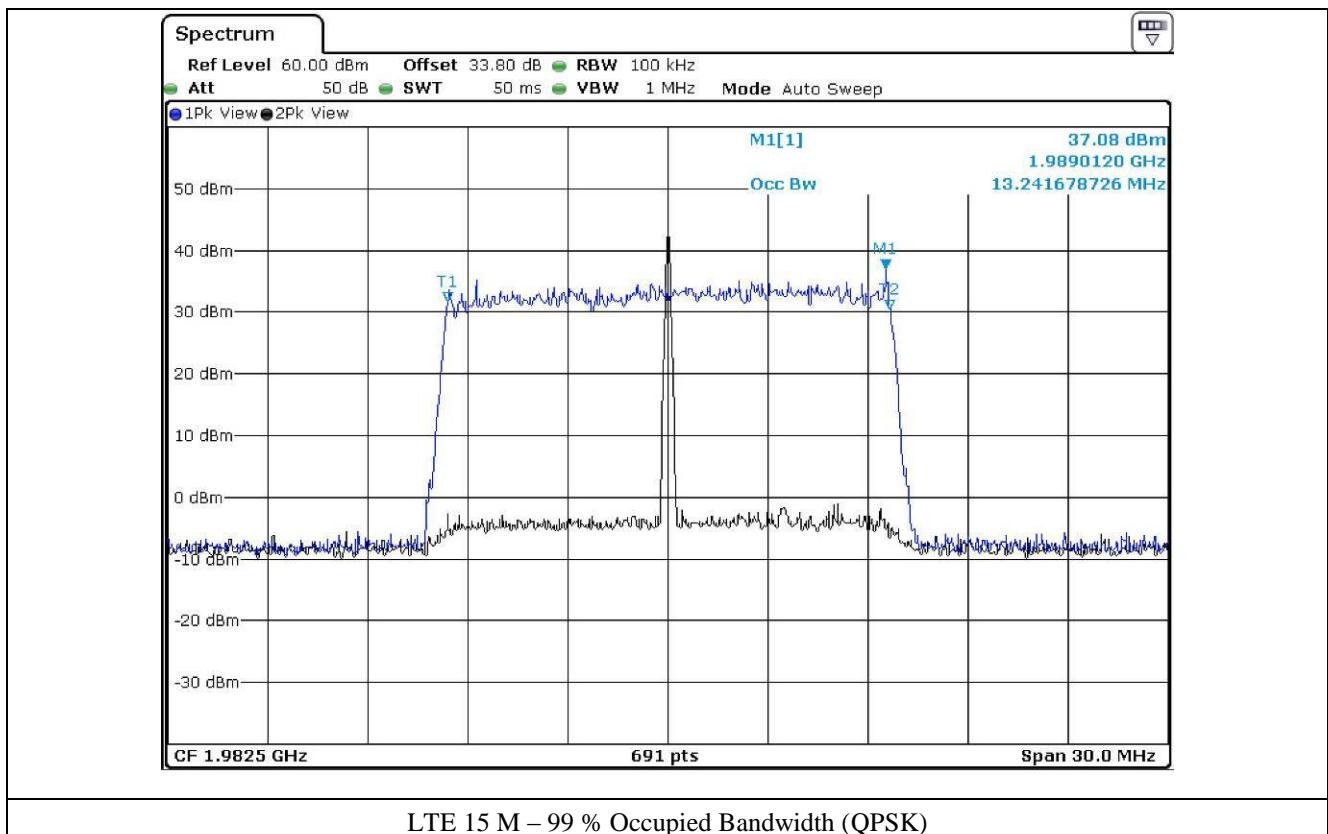


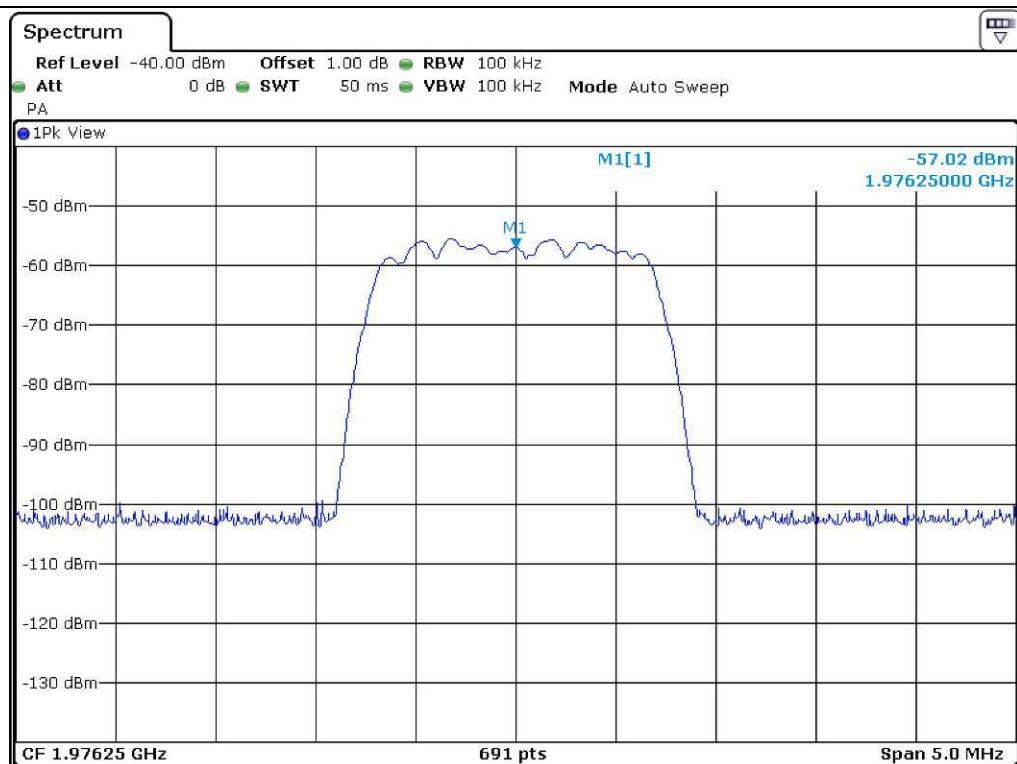


LTE 5 M – 99 % Occupied Bandwidth (QPSK)

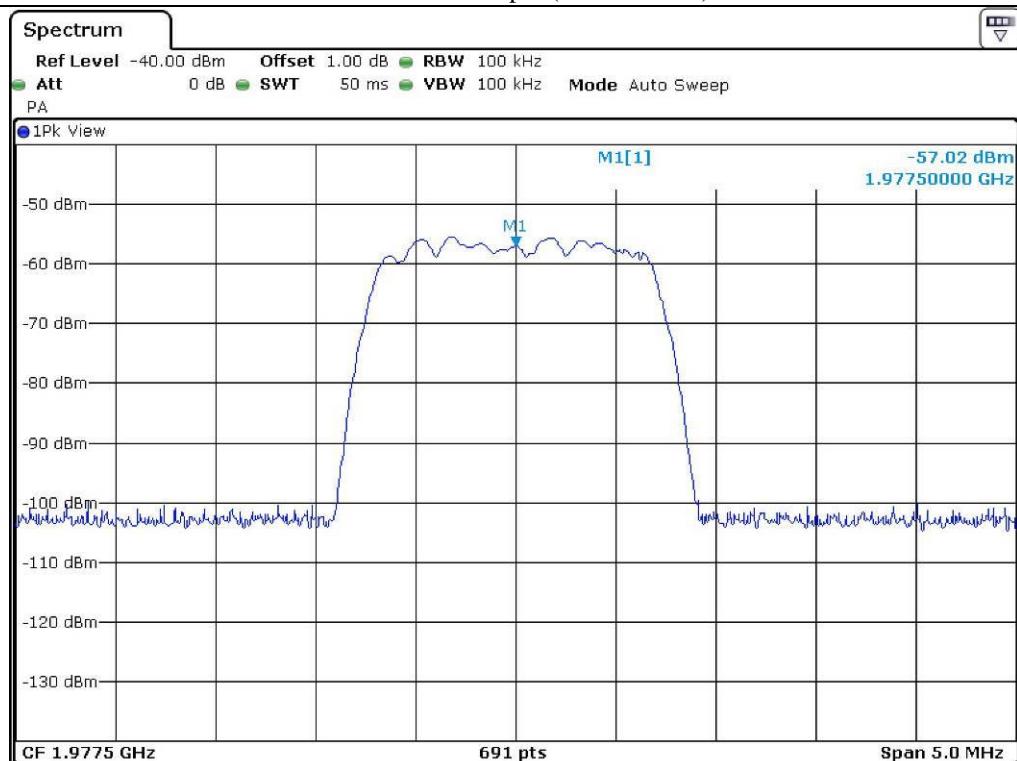


LTE 10 M – 99 % Occupied Bandwidth (QPSK)

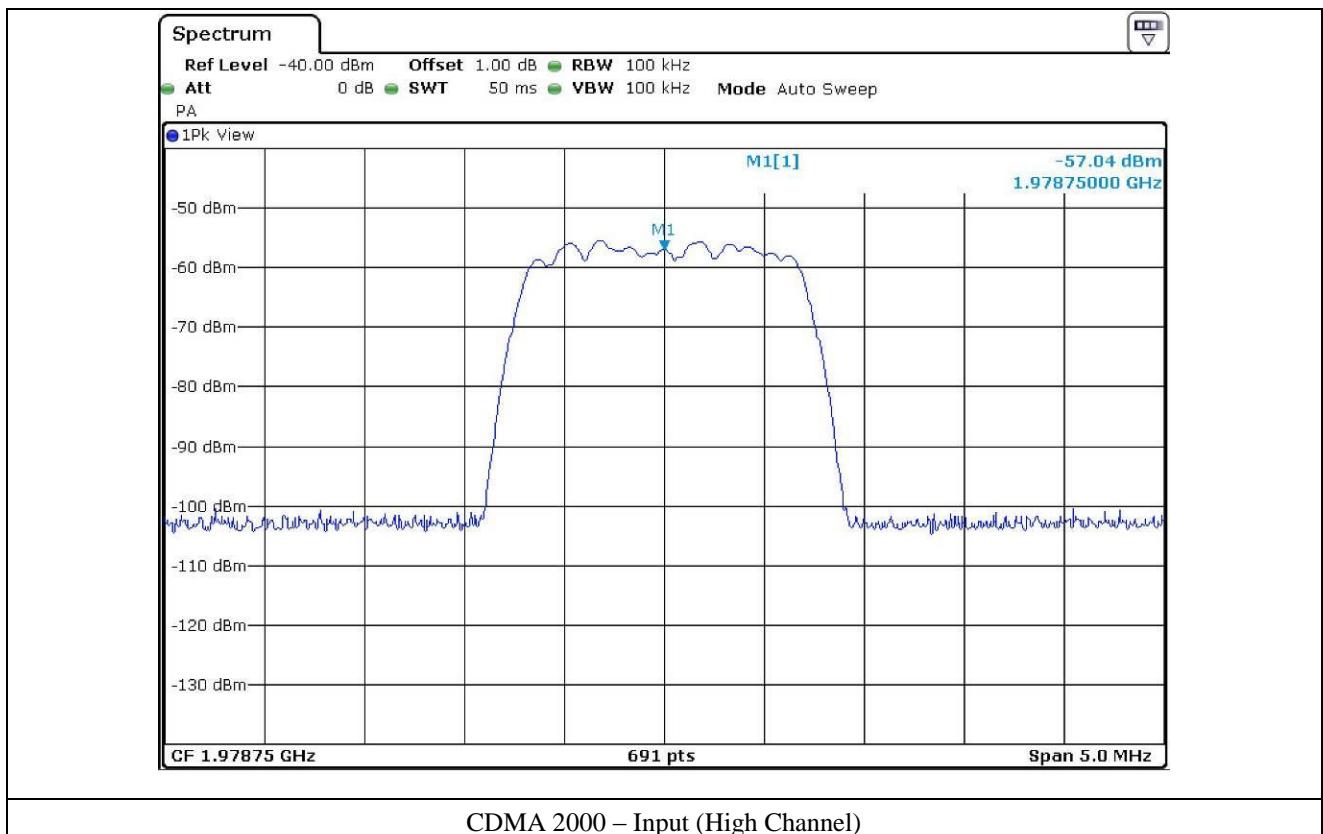


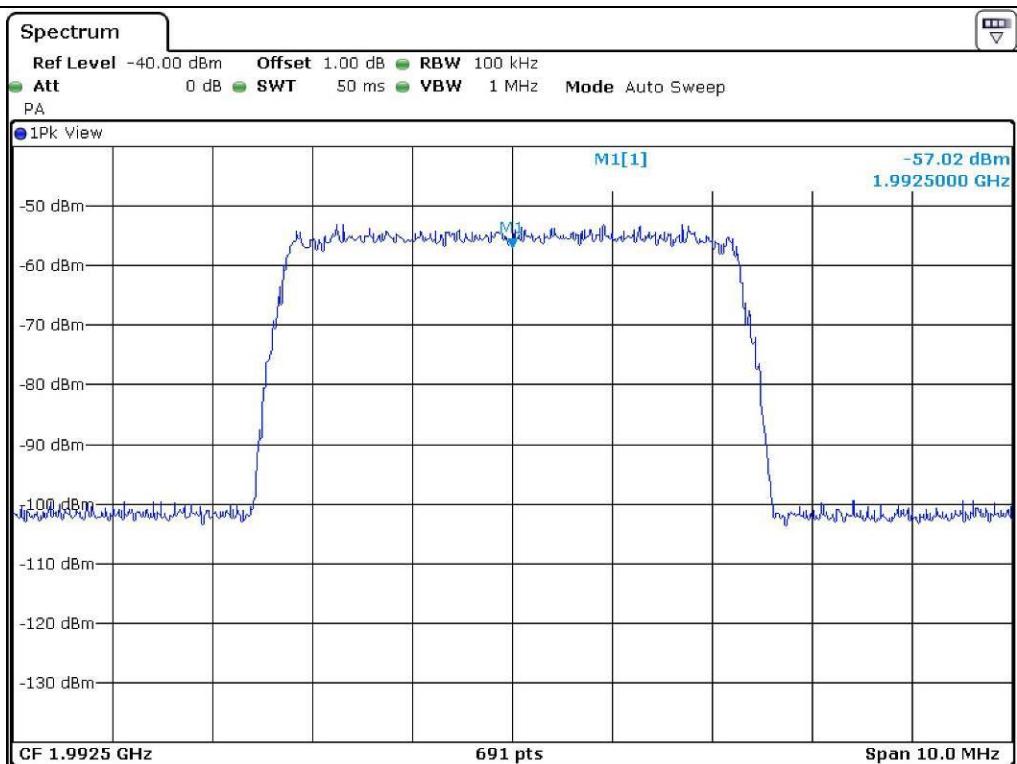


CDMA 2000 – Input (Low Channel)

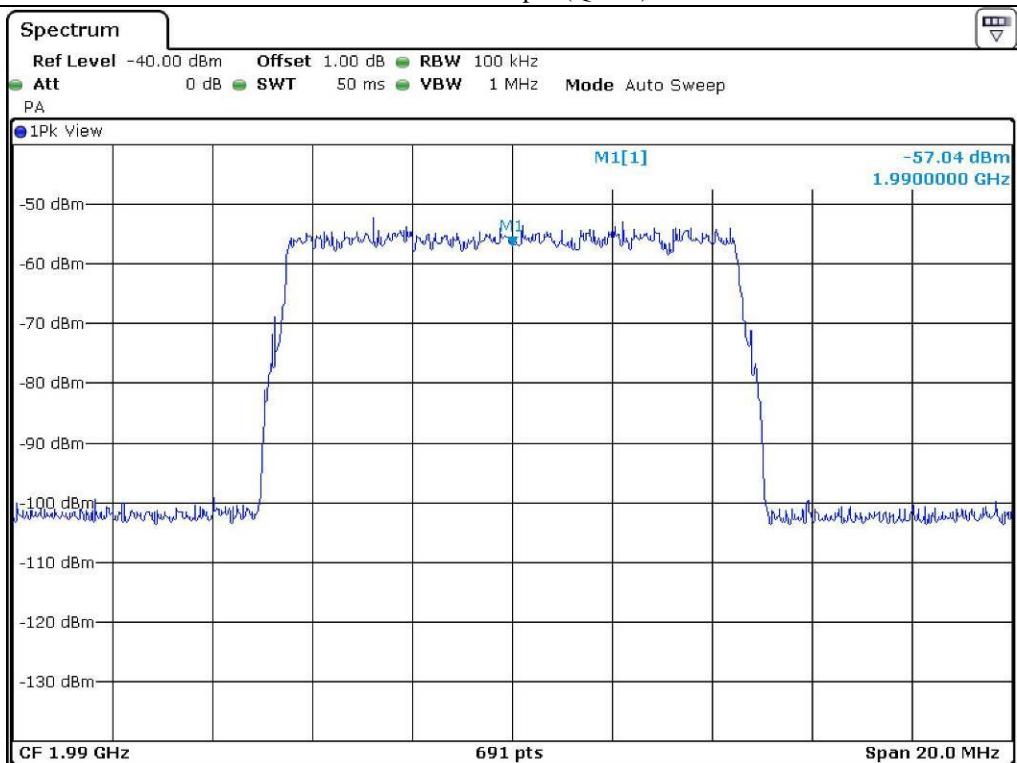


CDMA 2000 – Input (Middle Channel)





LTE 5 M – Input (QPSK)



LTE 10 M – Input (QPSK)

