

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LICENSED TRANSMITTER

Test Report No. : E14NR-084

AGR No. : A148A-124

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. : WYFAWE43LC15A

Model Name : IRES-1900US20-20 A-Prototype

Serial number : N/A

Total page of Report : 122 pages (including this page)

Date of Incoming : October 16, 2014

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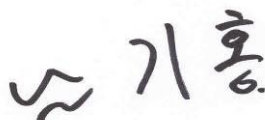
SUMMARY

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:



Ki-Hong, Nam / Senior Engineer
ONETECH Corp.

Approved by:



Gea-Won, Lee / Managing Director
ONETECH Corp.

CONTENTS

	PAGE
1. VERIFICATION OF COMPLIANCE	6
2. TEST SUMMARY.....	7
2.1 TEST ITEMS AND RESULTS	7
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS.....	7
2.3 RELATED SUBMITTAL(S) / GRANT(S)	7
2.4 PURPOSE OF THE TEST	7
2.5 TEST METHODOLOGY.....	7
2.6 TEST FACILITY.....	8
3. GENERAL INFORMATION.....	9
3.1 PRODUCT DESCRIPTION.....	9
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....	9
3.3 PERIPHERAL EQUIPMENT	9
3.4 MODE OF OPERATION DURING THE TEST	10
4. EUT MODIFICATIONS.....	10
5. RF POWER OUTPUT AT ANTENNA TERMINAL.....	11
5.1 OPERATING ENVIRONMENT	11
5.2 TEST SET-UP	11
5.3 TEST EQUIPMENT USED	11
5.4 TEST DATA FOR DOWNLINK.....	12
6.1 OPERATING ENVIRONMENT	30
6.2 TEST SET-UP	30
6.3 TEST EQUIPMENT USED	30
6.4 TEST DATA FOR DOWNLINK.....	31
6.5 TEST DATA FOR UPLINK	44
7. SPURIOUS EMISSION AT ANTENNA TERMINAL	57
7.1 OPERATING ENVIRONMENT	57
7.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	57
7.3 TEST EQUIPMENT USED	57

7.4 TEST DATA FOR DOWNLINK.....	58
7.5 TEST DATA FOR UPLINK	65
8. BAND EDGE MEASUREMENT	72
8.1 OPERATING ENVIRONMENT	72
8.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	72
8.3 TEST EQUIPMENT USED	72
8.4 TEST DATA FOR DOWNLINK.....	73
8.5 TEST DATA FOR UPLINK	78
9. INTERMODULATION TEST	83
9.1 OPERATING ENVIRONMENT	83
9.2 TEST SET-UP	83
9.3 TEST EQUIPMENT USED	83
9.4.1 Test Result for peak power	84
9.4.2 Test Result for Spurious emission	88
9.5 TEST DATA FOR UPLINK	92
9.5.1 Test Result for peak power	92
9.5.2 Test Result for Spurious emission	96
10. FIELD STRENGTH OF SPURIOUS RADIATION	100
10.1 OPERATING ENVIRONMENT	100
10.2 TEST SET-UP	100
10.3 TEST EQUIPMENT USED	100
10.4 TEST DATA FOR RADIATED EMISSION.....	101
10.4.1 Test Result for DC - 48 V Power Supply with CDMA	101
10.4.2 Test Result for DC - 48 V Power Supply with LTE 5 M	105
10.4.3 Test Result for DC - 48 V Power Supply with LTE 10 M	109
10.4.4 Test Result for DC - 48 V Power Supply with LTE 15 M	113
11.1 OPERATING ENVIRONMENT	117
11.2 TEST SET-UP	117
11.3 TEST EQUIPMENT USED	117
11.4 TEST DATA FOR DOWNLINK WITH DC -48 V POWER SUPPLY	118
11.5 TEST DATA FOR UPLINK WITH DC -48 V POWER SUPPLY	119

12. FREQUENCY STABILITY WITH VOLTAGE VARIATION.....	120
12.1 OPERATING ENVIRONMENT	120
12.2 TEST SET-UP	120
12.3 TEST EQUIPMENT USED	120
12.4 TEST DATA FOR DOWNLINK WITH DC -48 V POWER SUPPLY	121
12.5 TEST DATA FOR UPLINK WITH DC -48 V POWER SUPPLY	122

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E14NR-084	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 : WYFAWE43LC15A
 MODEL NAME : IRES-1900US20-20 A-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 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 A-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	1 930 MHz ~ 1 945 MHz
	Uplink	1 850 MHz ~ 1 865 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 A-Prototype	Airpoint Co., Ltd.	WYFAWE43LC15A	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 form 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	1 931.25	LTE 5 M	QPSK	1 932.50	LTE 15 M	QPSK	1 937.50
	Middle	1 937.50		16 QAM				
	High	1 943.75		64 QAM				
CDMA 2000	Low	1 931.25	LTE 10 M	QPSK	1 935.00	N/A		
	Middle	1 937.50		16 QAM				
	High	1 943.75		64 QAM				

2. Mode: Uplink

Modulation	Channel	Frequency	Modulation	Channel	Frequency	Modulation	Channel	Frequency
1xEVDO	Low	1 851.25	LTE 5 M	QPSK	1 852.50	LTE 15 M	QPSK	1 857.50
	Middle	1 857.50		16 QAM			16 QAM	
	High	1 863.75		64 QAM			64 QAM	
CDMA 2000	Low	1 851.25	LTE 10 M	QPSK	1 855.00	N/A		
	Middle	1 857.50		16 QAM				
	High	1 863.75		64 QAM				

4. EUT MODIFICATIONS

-. None

5. RF POWER OUTPUT at ANTENNA TERMINAL

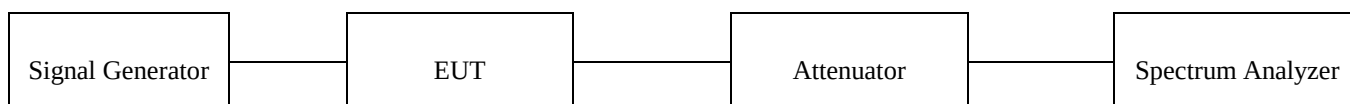
5.1 Operating environment

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)

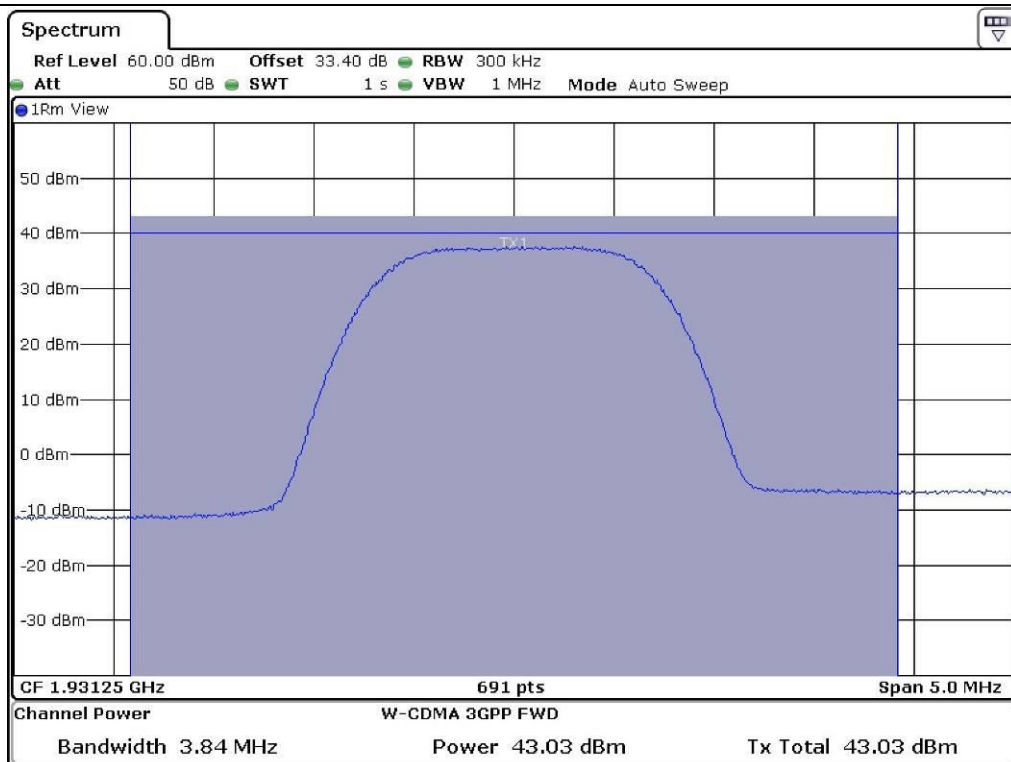
All test equipment used is calibrated on a regular basis.

5.4 Test data for Downlink

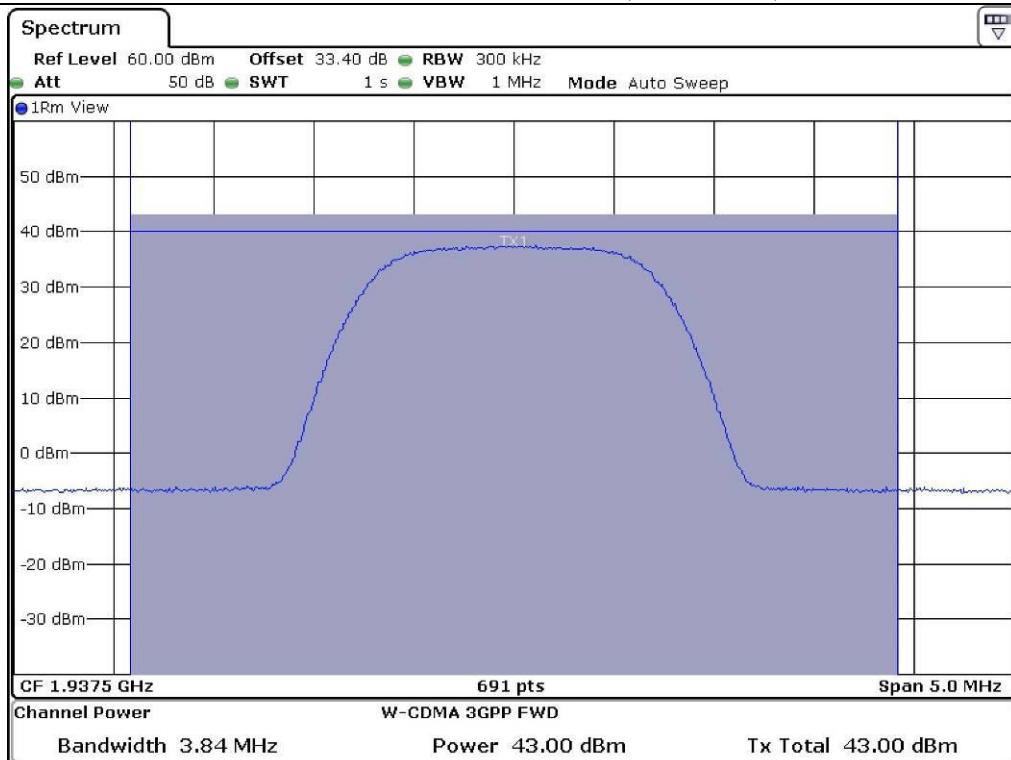
-. Test Date : October 22, 2014
-. Measurement Function : Channel Power
-. Detector Mode : RMS detector
-. Test Result : Pass

Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)
1xEVDO	Low	1 931.25	-57.02	43.03	20.090 928
	Middle	1 937.50	-56.97	43.00	19.952 623
	High	1 943.75	-57.05	43.02	20.044 720
CDMA 2000	Low	1 931.25	-56.99	43.04	20.137 242
	Middle	1 937.50	-57.01	43.05	20.183 664
	High	1 943.75	-57.02	43.02	20.044 720
LTE 5 M	QPSK	1 932.50	-56.97	43.07	20.276 827
	16 QAM		-56.94	43.05	20.183 664
	64 QAM		-57.03	43.06	20.230 192
LTE 10 M	QPSK	1 935.00	-57.02	43.07	20.276 827
	16 QAM		-57.05	43.02	20.044 720
	64 QAM		-57.06	43.06	20.230 192
LTE 15 M	QPSK	1 937.50	-57.02	43.06	20.230 192
	16 QAM		-57.00	43.02	20.044 720
	64 QAM		-56.99	43.01	19.998 619

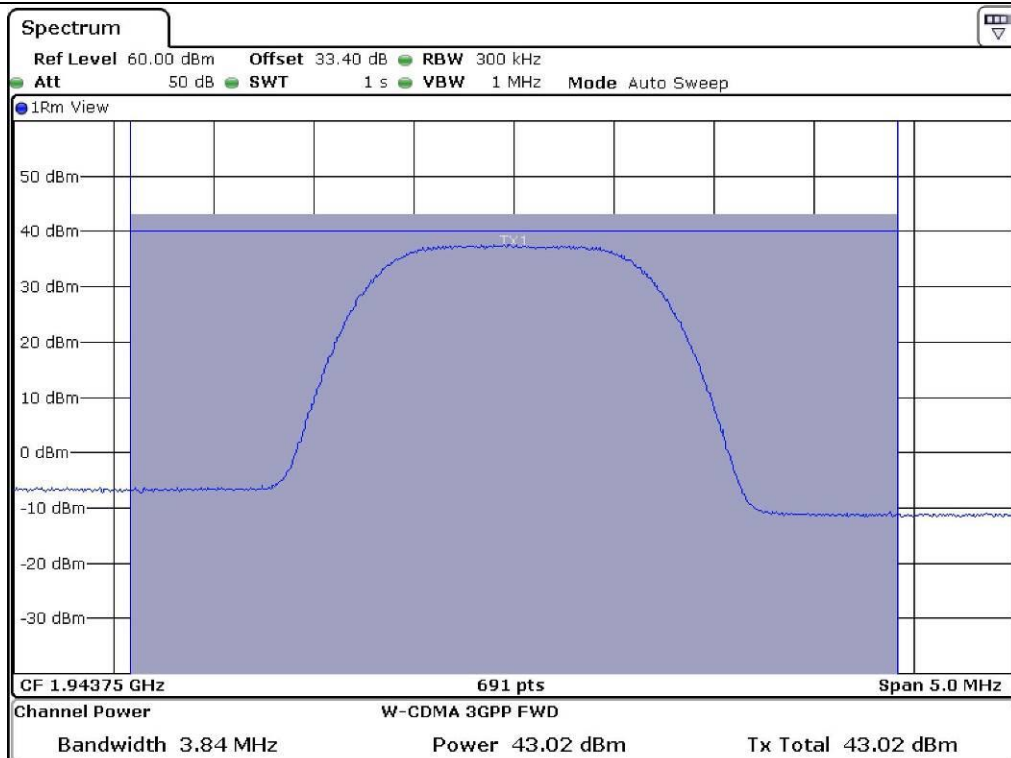

Tested by: hyung-kwon, Oh / Project Engineer



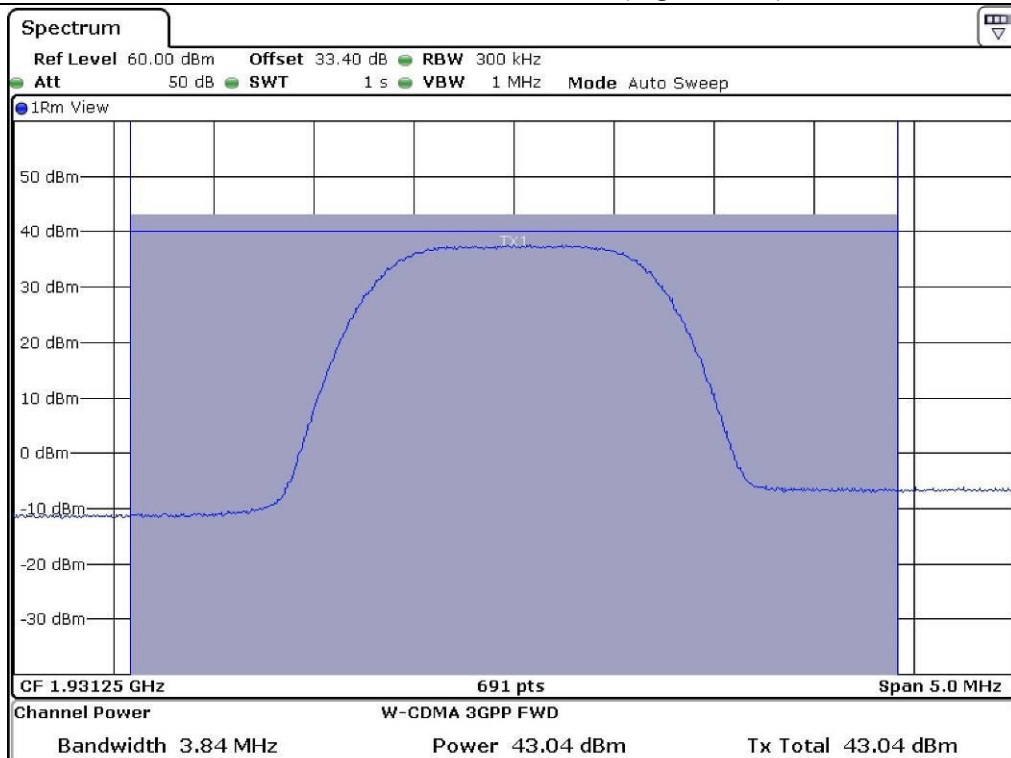
1xEVDO – RF POWER OUTPUT (Low Channel)



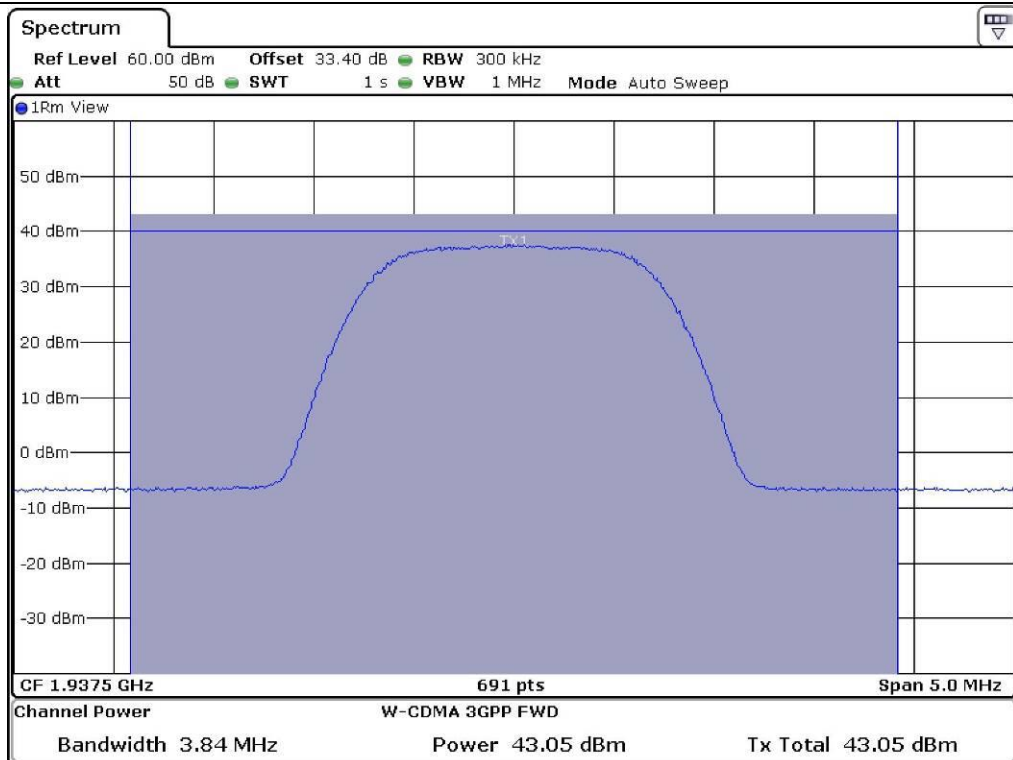
1xEVDO – RF POWER OUTPUT (Middle Channel)



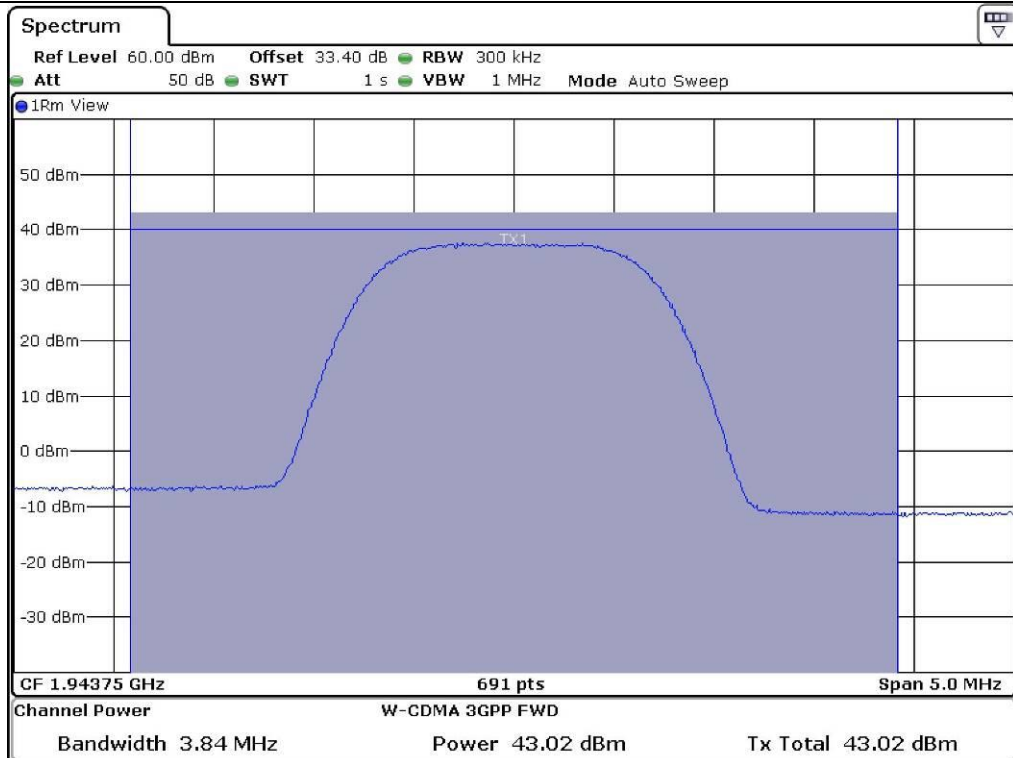
1xEVDO – RF POWER OUTPUT (High Channel)



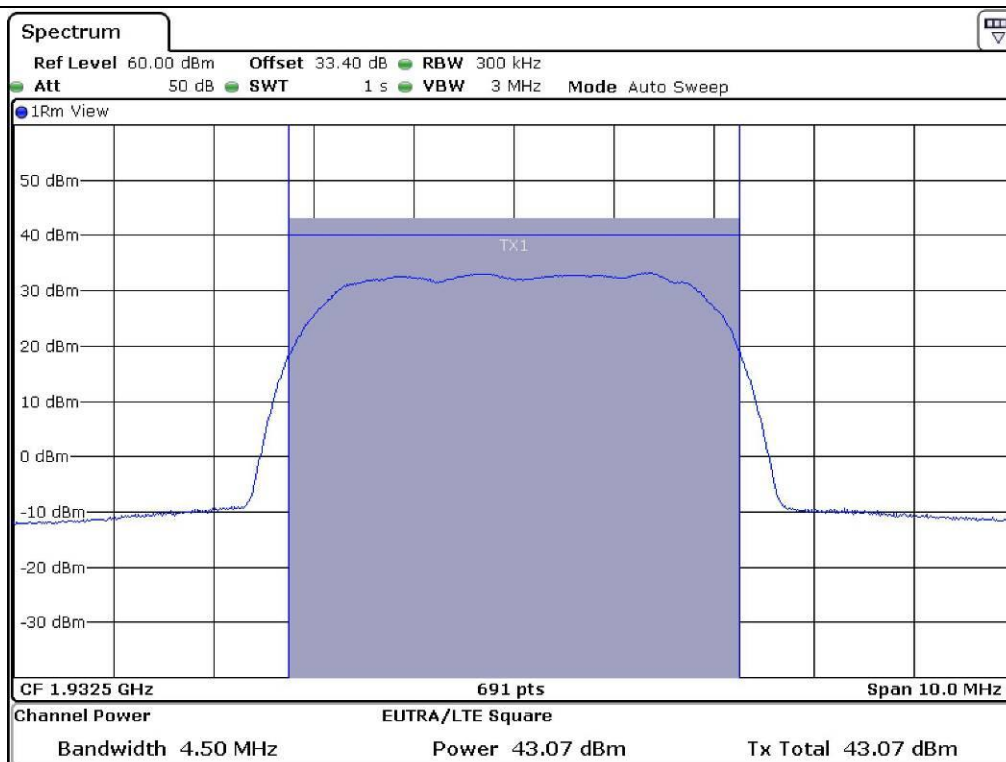
CDMA 2000 – RF POWER OUTPUT (Low Channel)



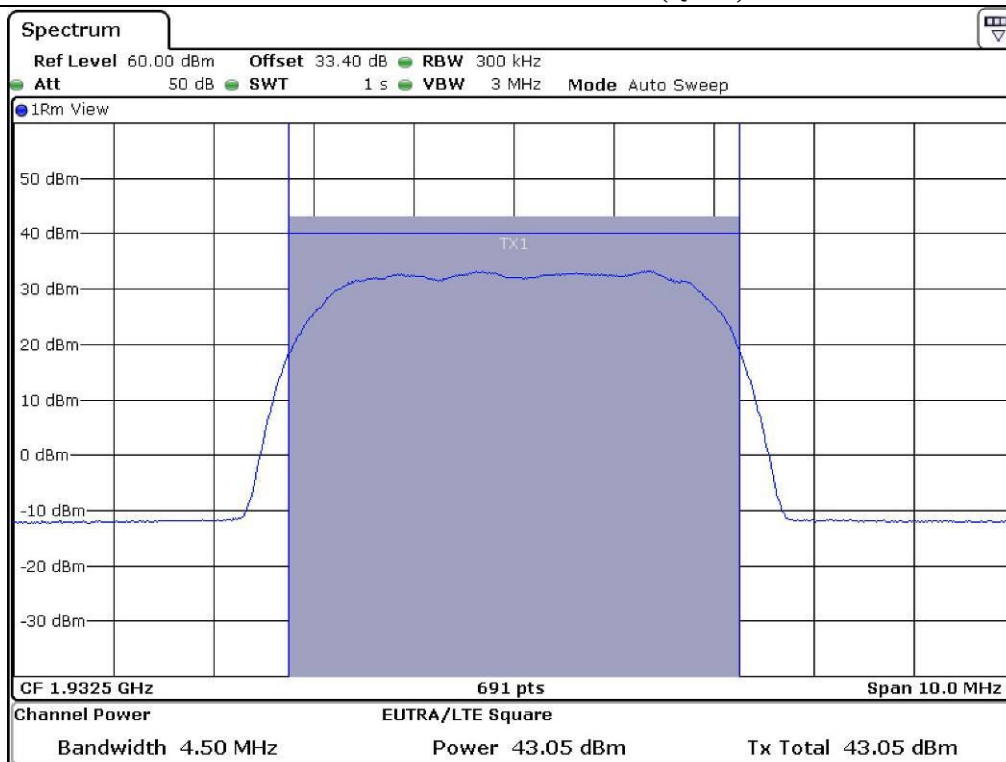
CDMA 2000 – RF POWER OUTPUT (Middle Channel)



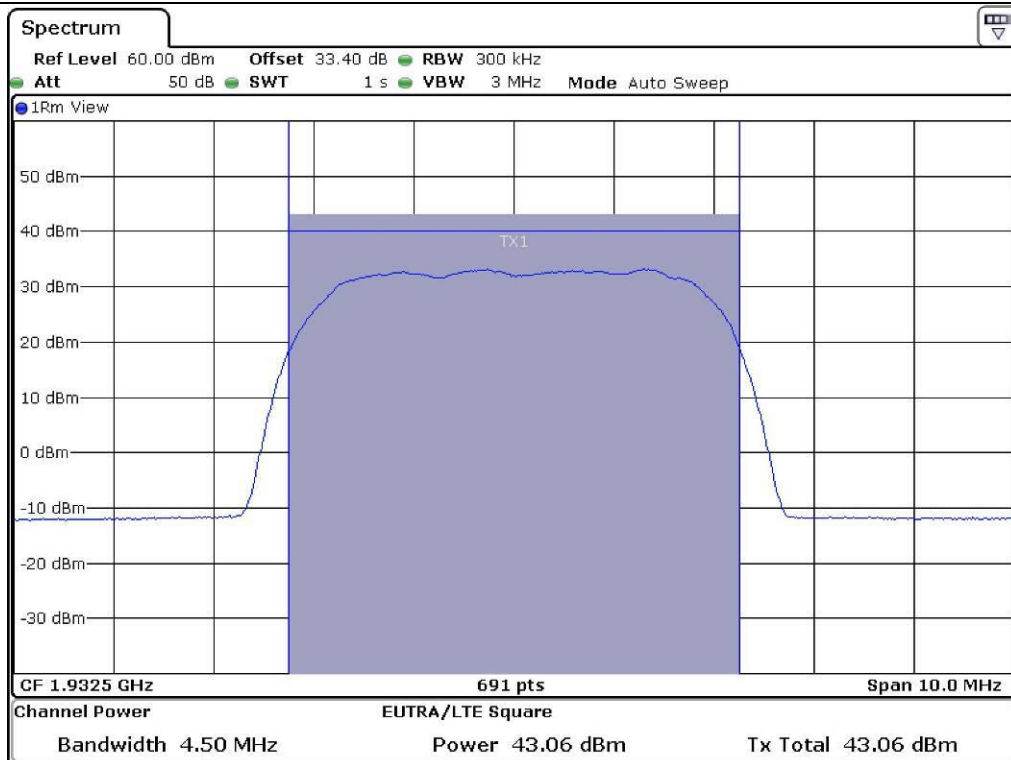
CDMA 2000 – RF POWER OUTPUT (High Channel)



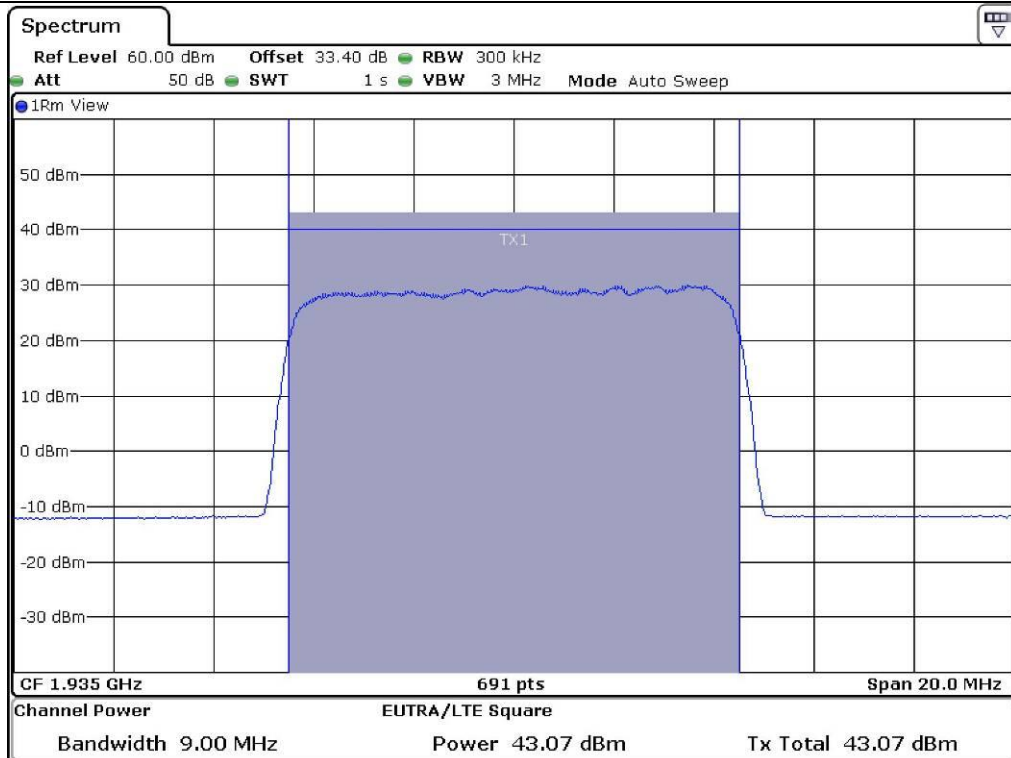
LTE 5 M – RF POWER OUTPUT (QPSK)



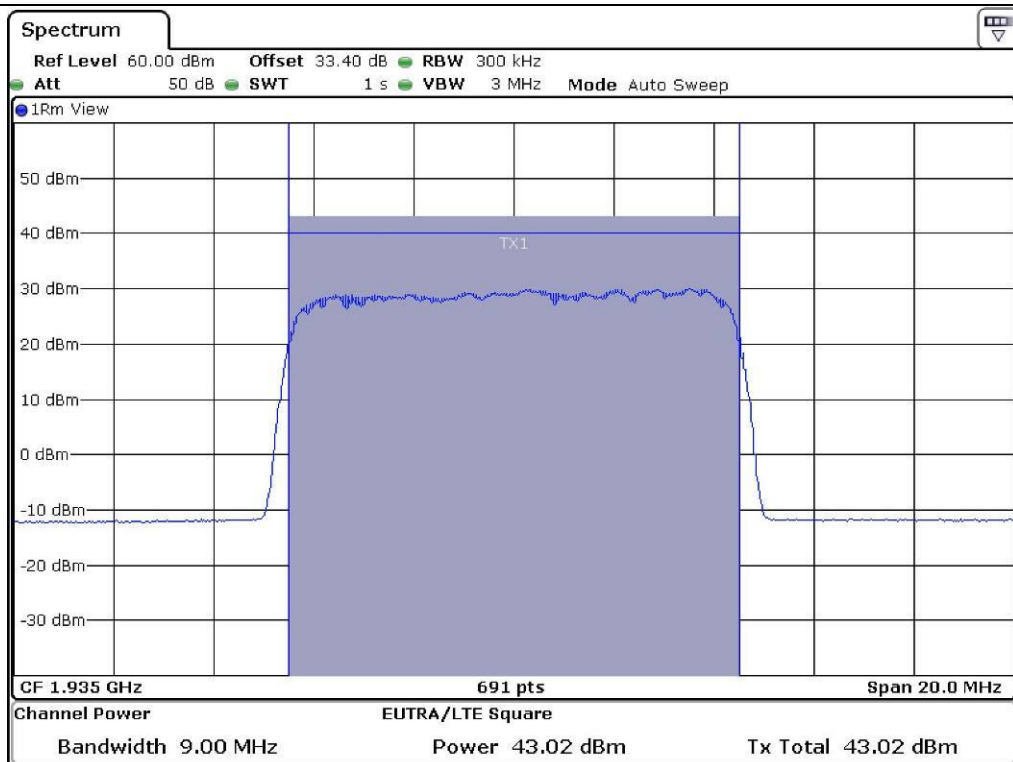
LTE 5 M – RF POWER OUTPUT (16 QAM)



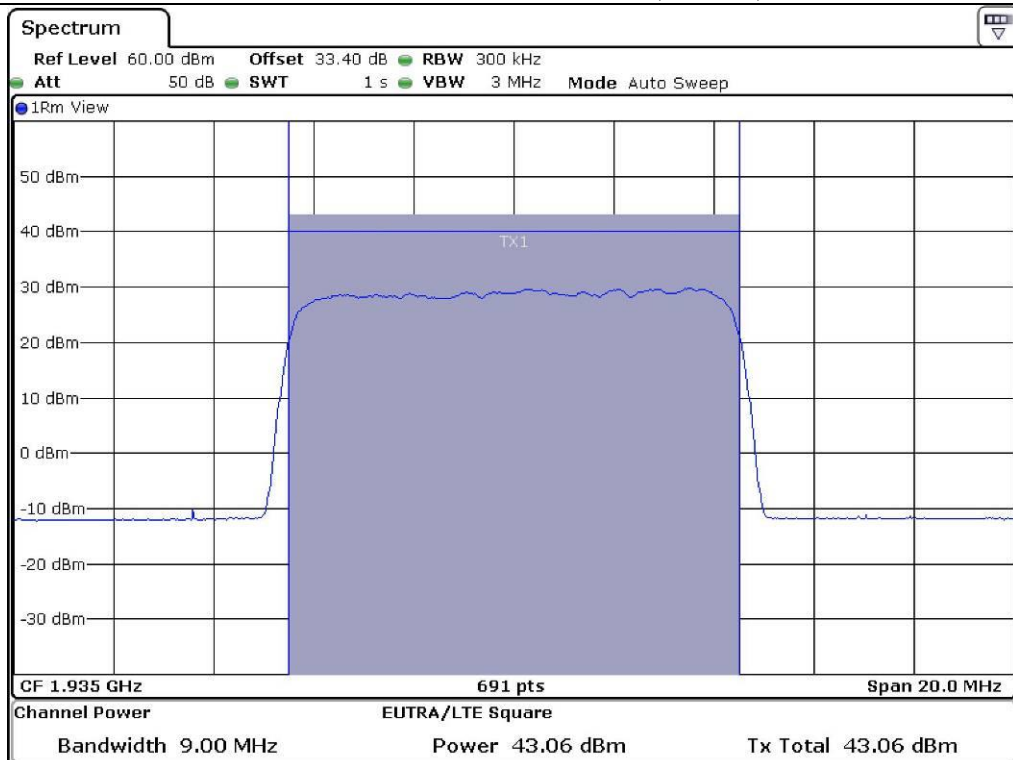
LTE 5 M – RF POWER OUTPUT (64 QAM)



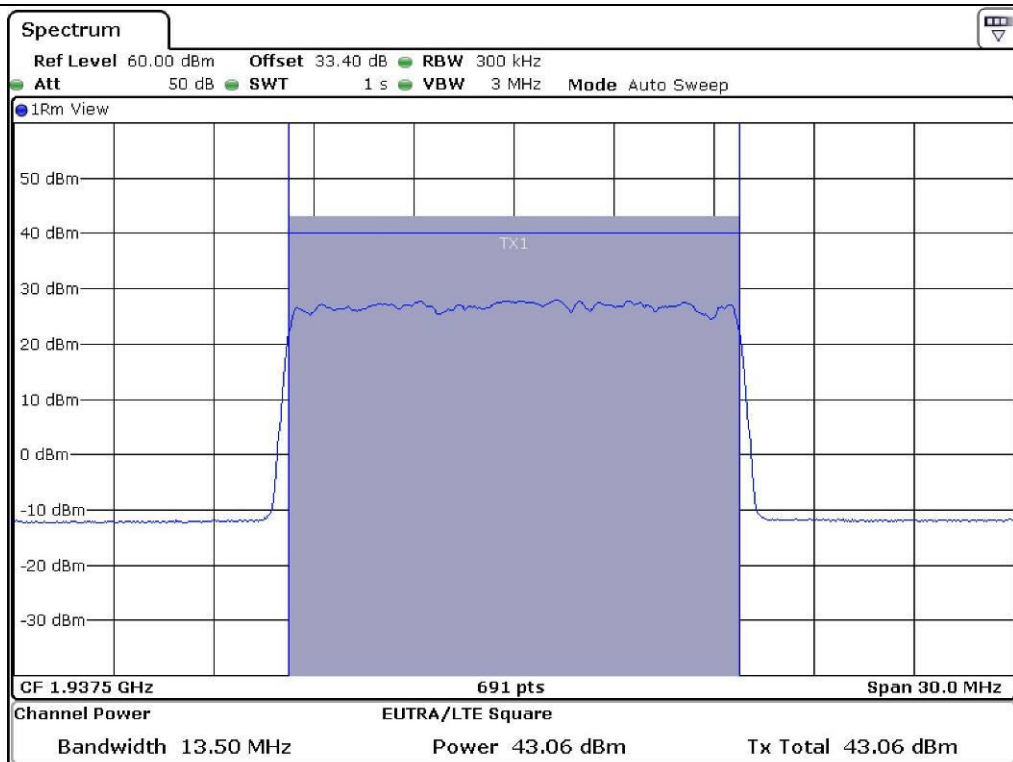
LTE 10 M – RF POWER OUTPUT (QPSK)



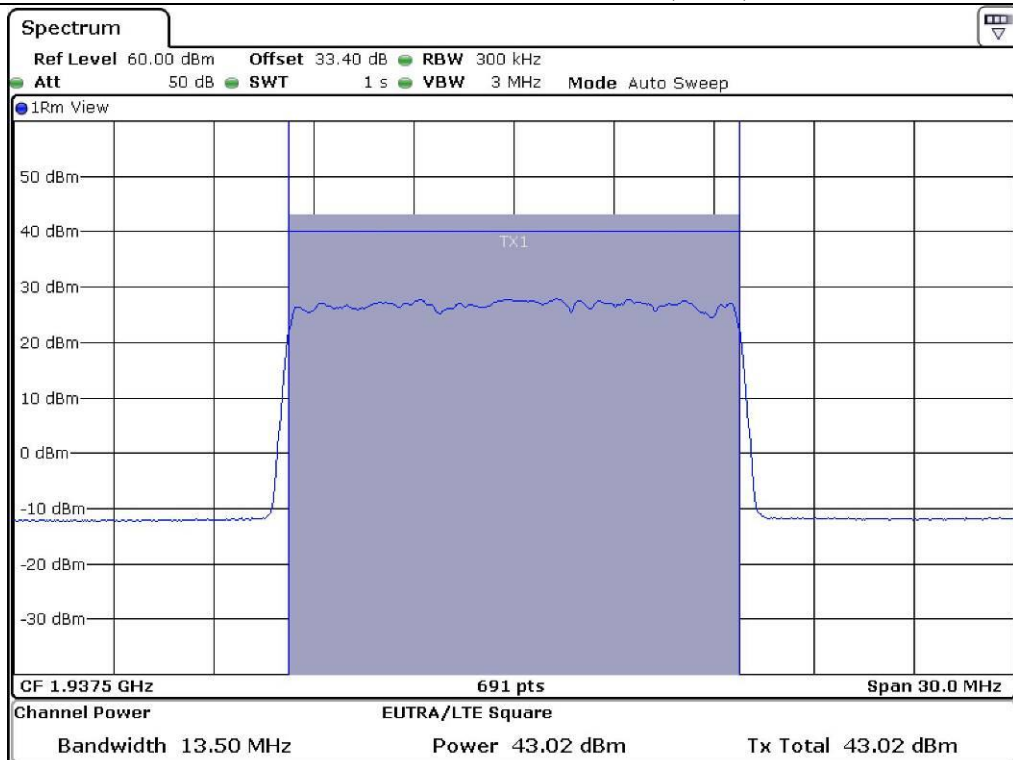
LTE 10 M – RF POWER OUTPUT (16 QAM)



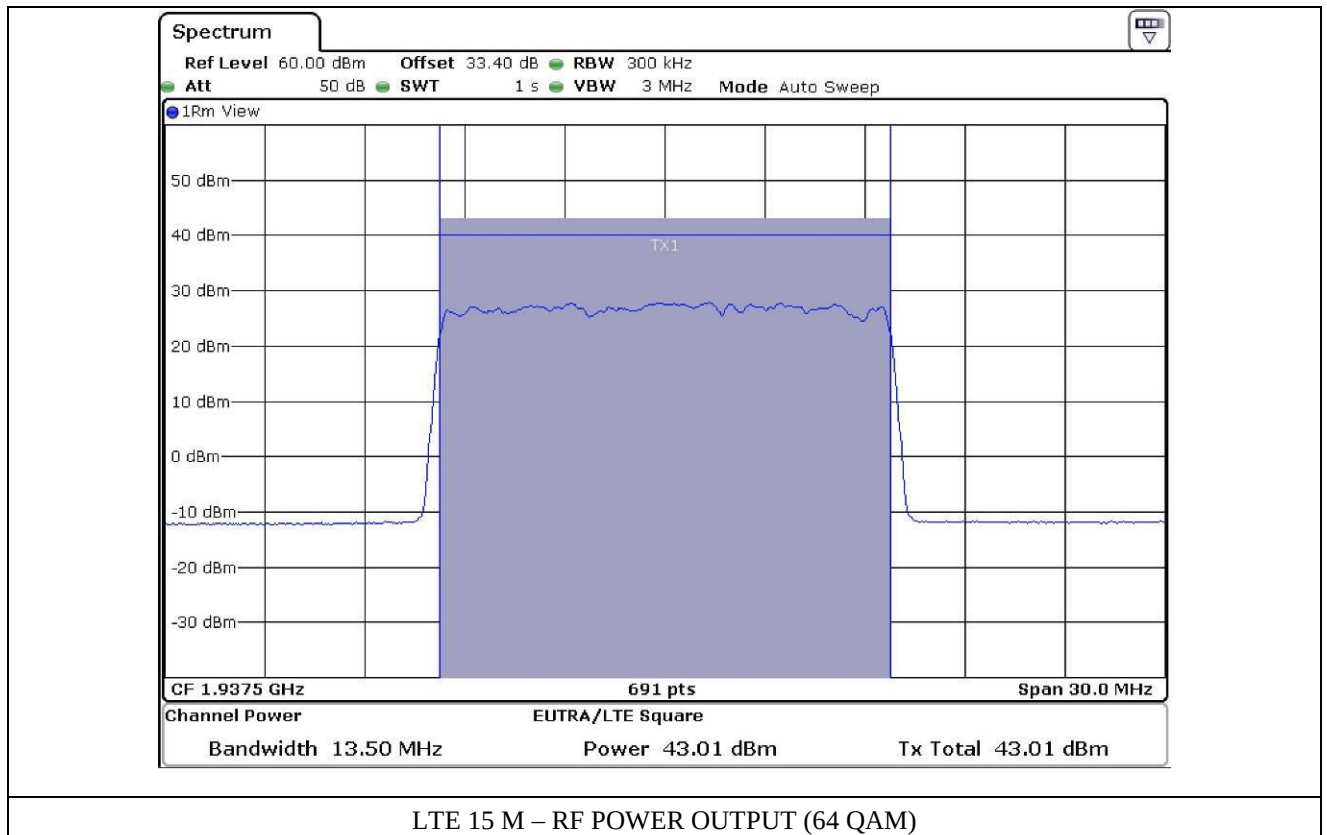
LTE 10 M – RF POWER OUTPUT (64 QAM)



LTE 15 M – RF POWER OUTPUT (QPSK)



LTE 15 M – RF POWER OUTPUT (16 QAM)

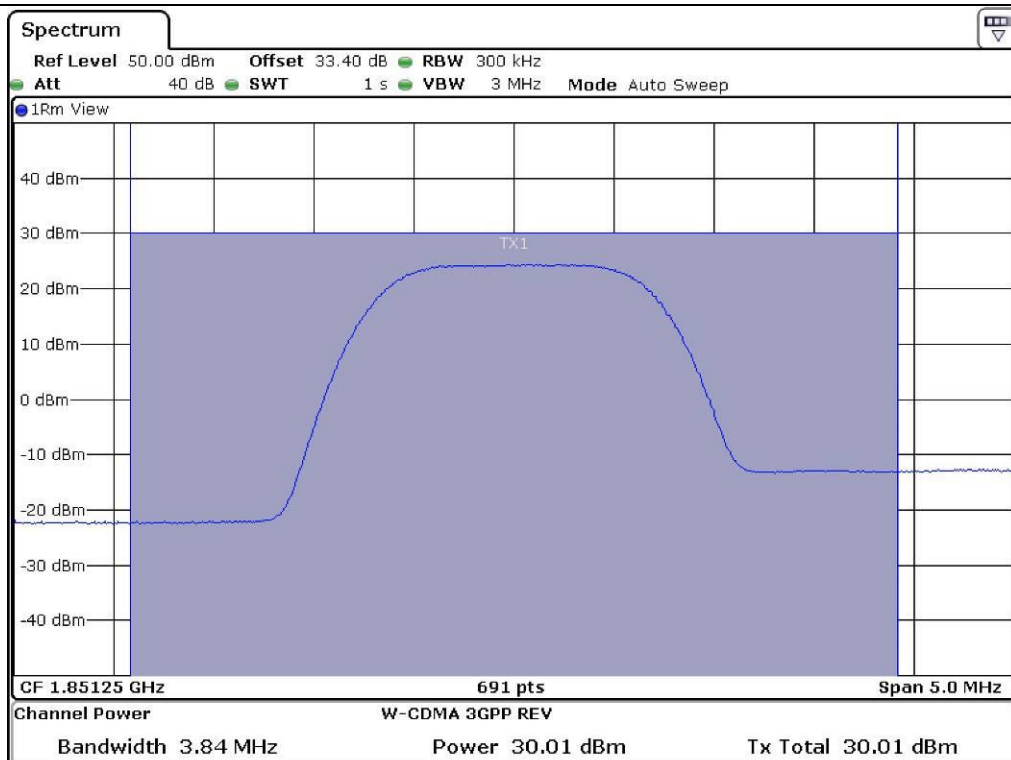


5.5 Test data for Uplink

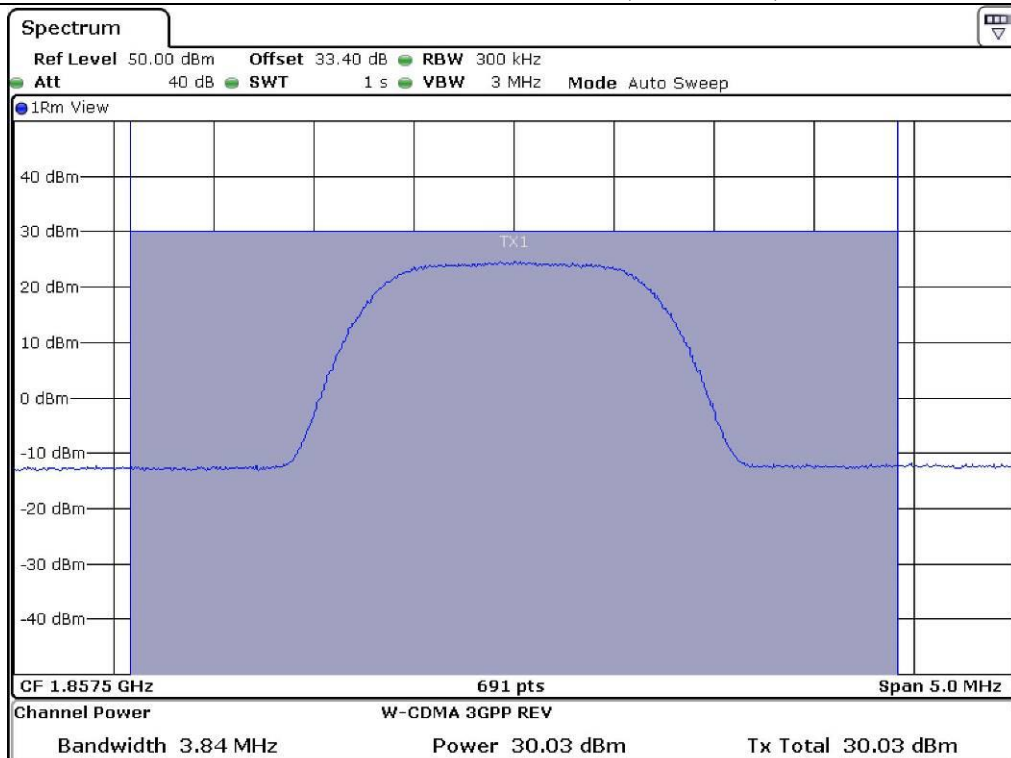
-. Test Date : October 22, 2014
-. Measurement Function : Channel Power
-. Detector Mode : RMS detector
-. Test Result : Pass

Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)
1xEVDO	Low	1 851.25	-69.94	30.01	1.002 305
	Middle	1 857.50	-70.05	30.03	1.006 932
	High	1 863.75	-69.99	30.02	1.004 616
CDMA 2000	Low	1 851.25	-69.98	30.02	1.004 616
	Middle	1 857.50	-70.07	30.05	1.011 579
	High	1 863.75	-69.97	30.04	1.009 253
LTE 5 M	QPSK	1 852.50	-70.04	30.07	1.016 249
	16 QAM		-70.05	30.01	1.002 305
	64 QAM		-69.95	30.05	1.011 579
LTE 10 M	QPSK	1 855.00	-70.03	30.07	1.016 249
	16 QAM		-70.05	30.04	1.009 253
	64 QAM		-70.06	30.02	1.004 616
LTE 15 M	QPSK	1 857.50	-70.02	30.06	1.013 911
	16 QAM		-70.03	30.02	1.004 616
	64 QAM		-70.02	29.99	0.997 700

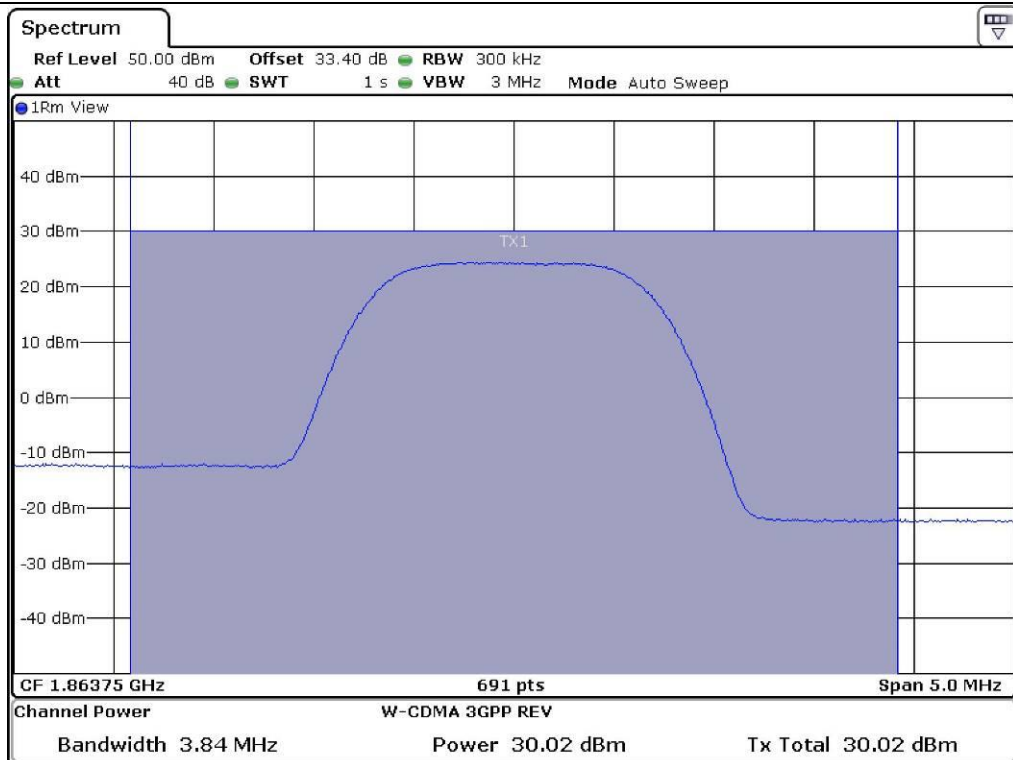

Tested by: hyung-kwon, Oh / Project Engineer



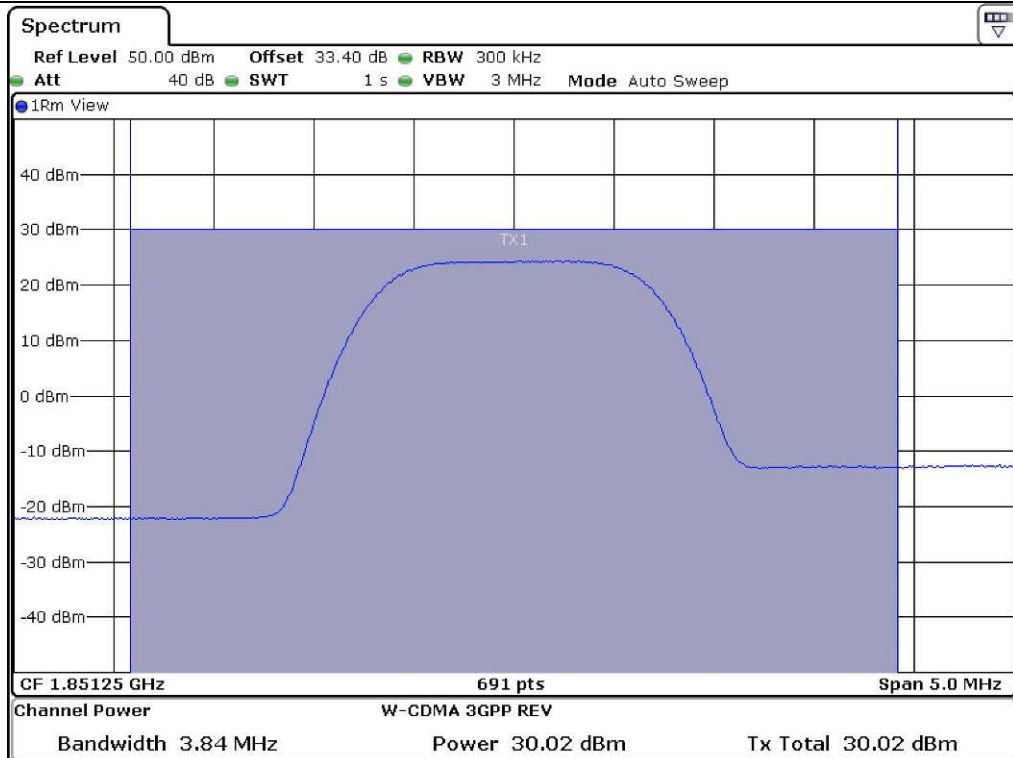
1xEVDO – RF POWER OUTPUT (Low Channel)



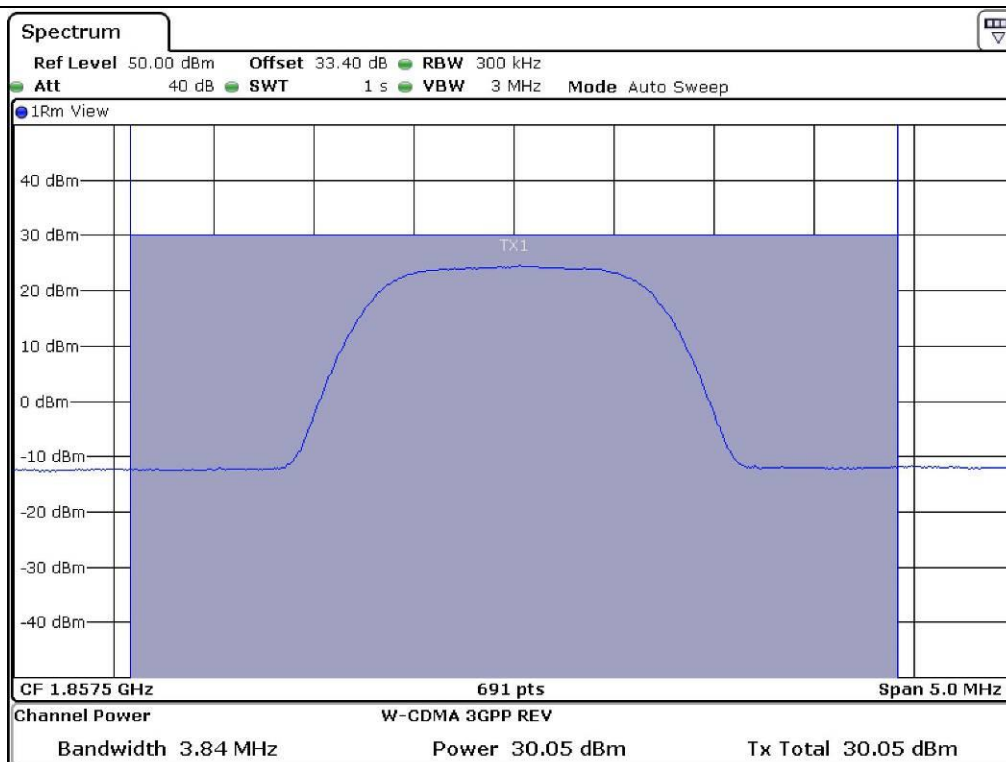
1xEVDO – RF POWER OUTPUT (Middle Channel)



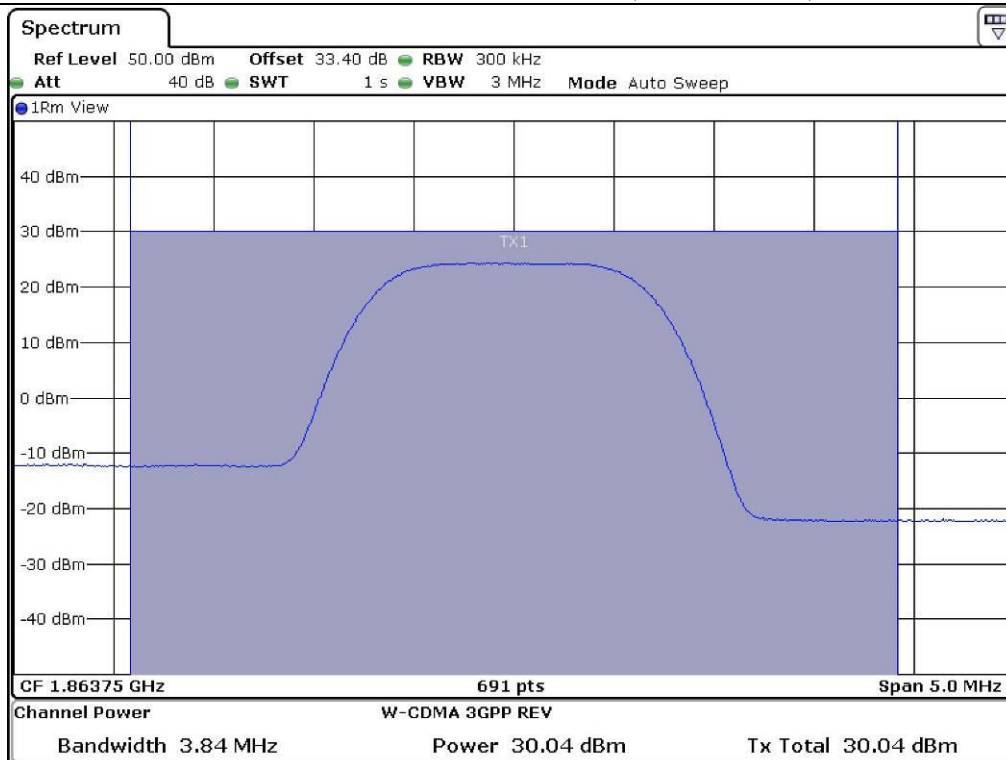
1xEVDO – RF POWER OUTPUT (High Channel)



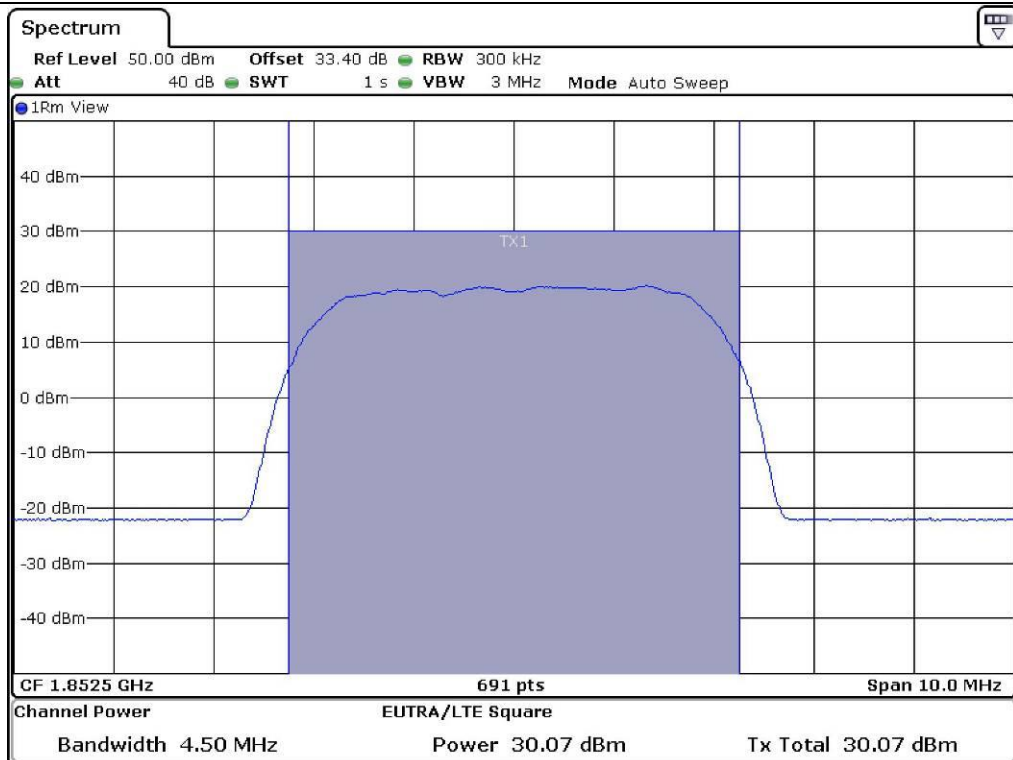
CDMA 2000 – RF POWER OUTPUT (Low Channel)



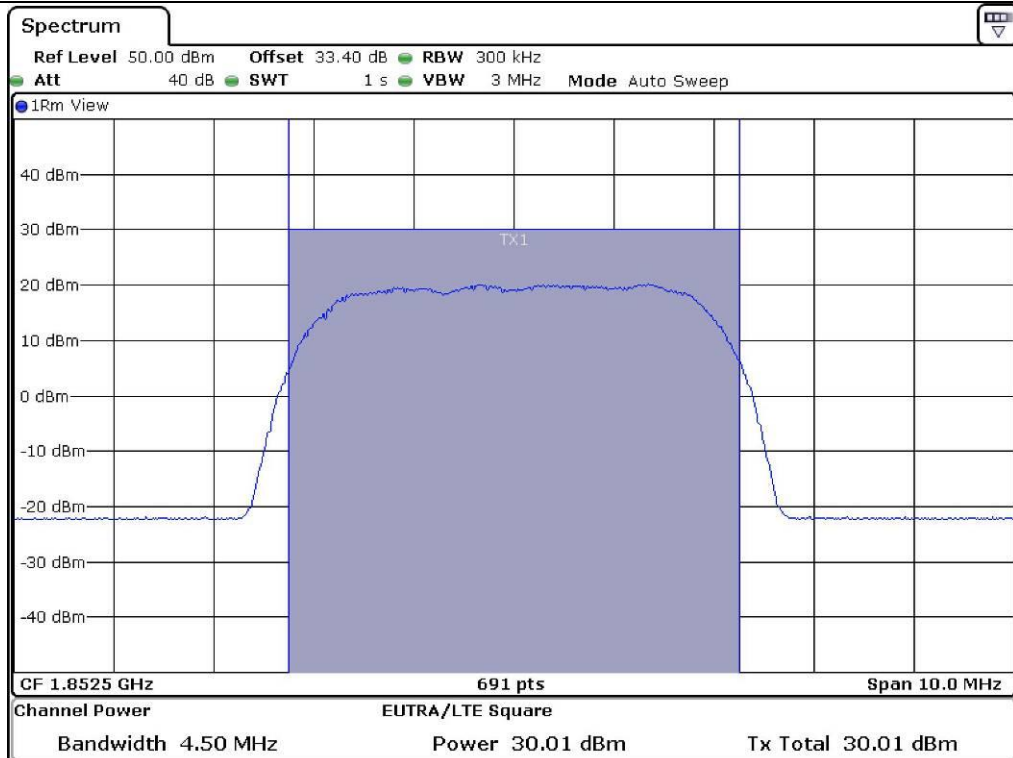
CDMA 2000 – RF POWER OUTPUT (Middle Channel)



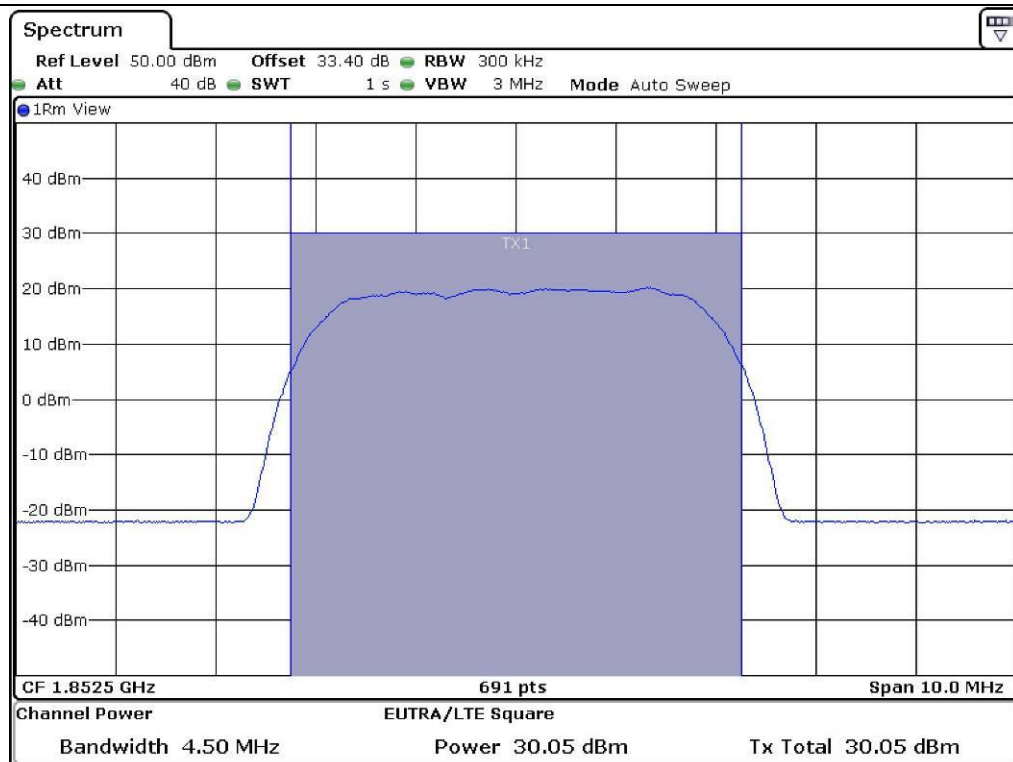
CDMA 2000 – RF POWER OUTPUT (High Channel)



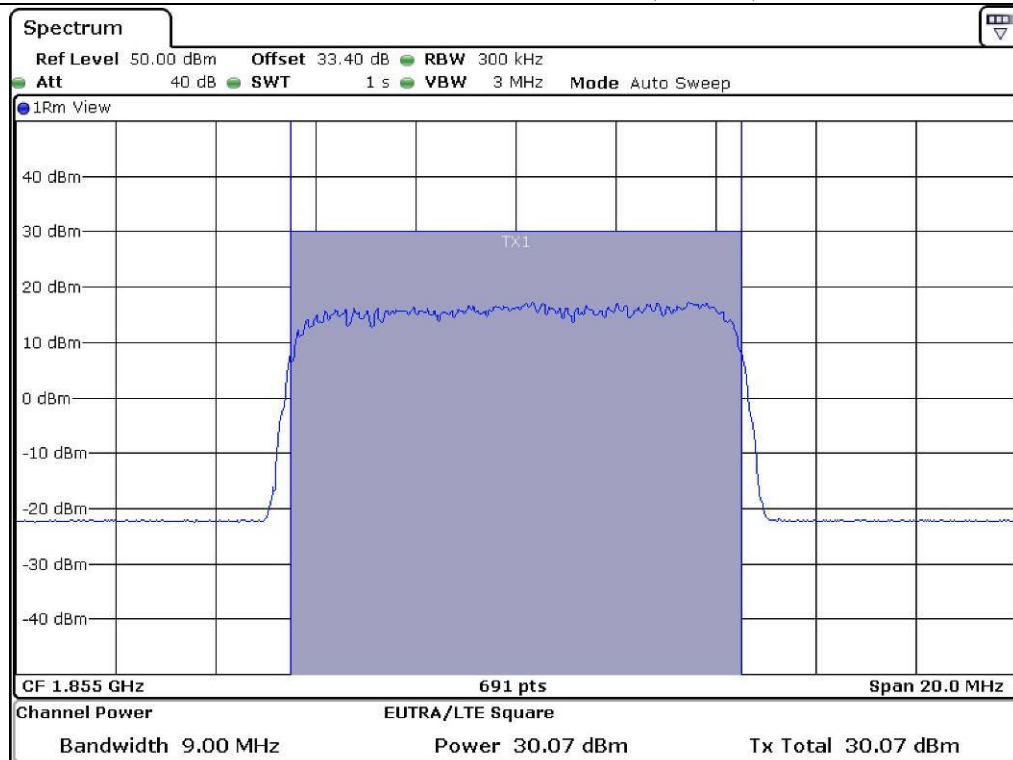
LTE 5 M – RF POWER OUTPUT (QPSK)



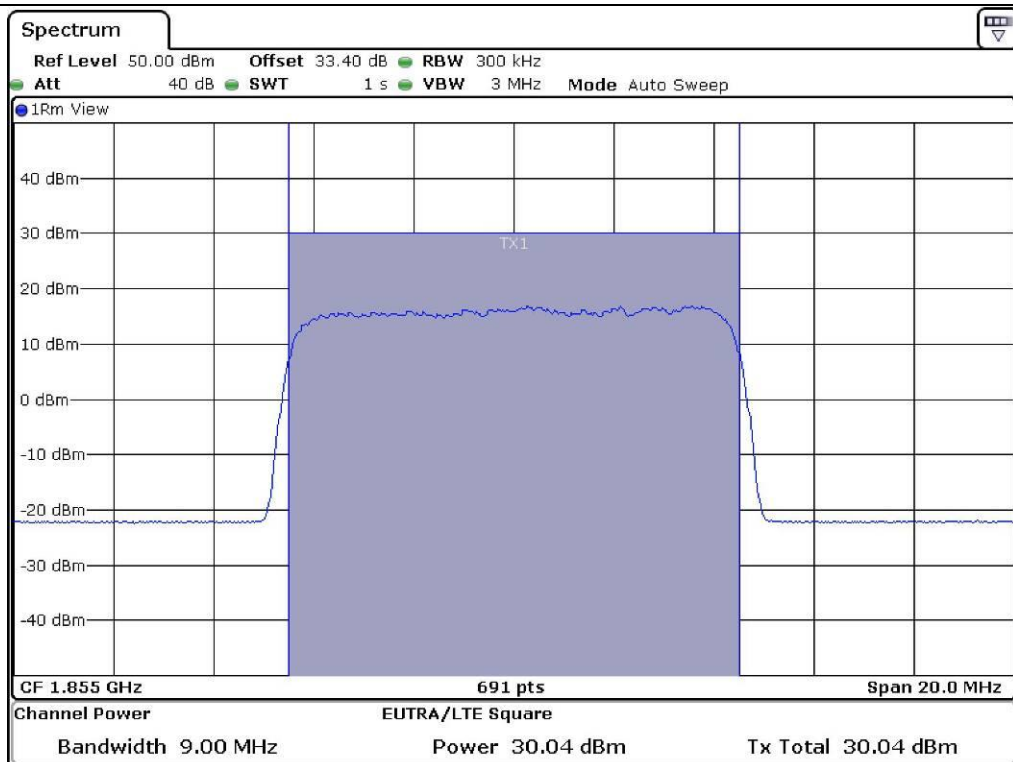
LTE 5 M – RF POWER OUTPUT (16 QAM)



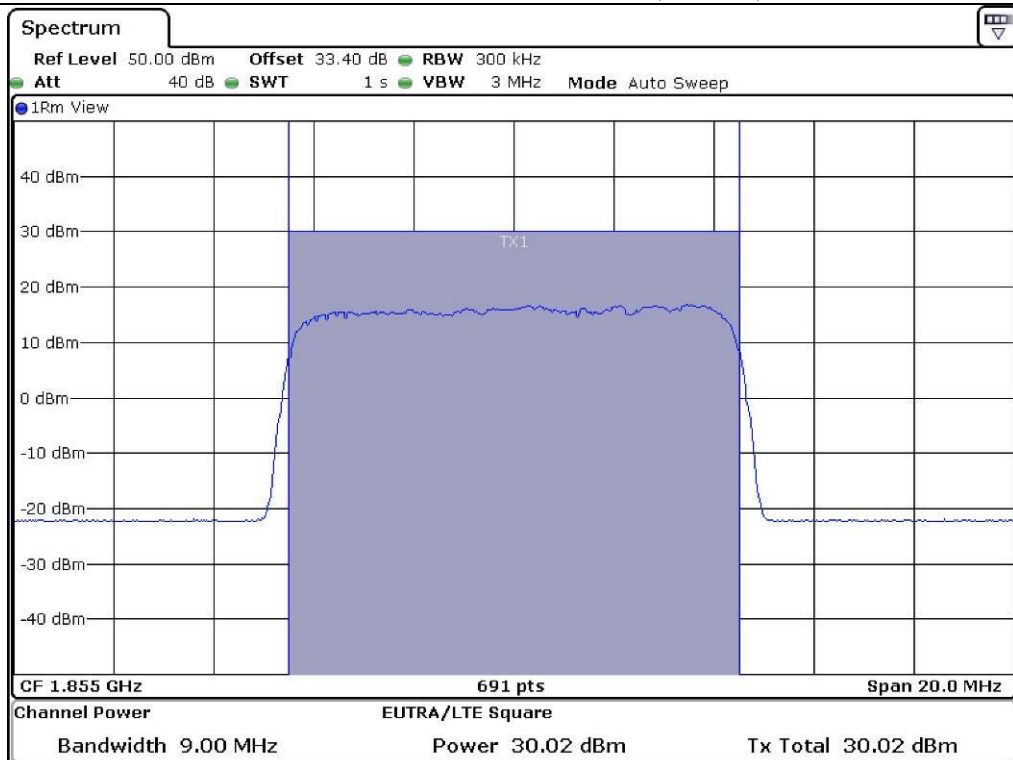
LTE 5 M – RF POWER OUTPUT (64 QAM)



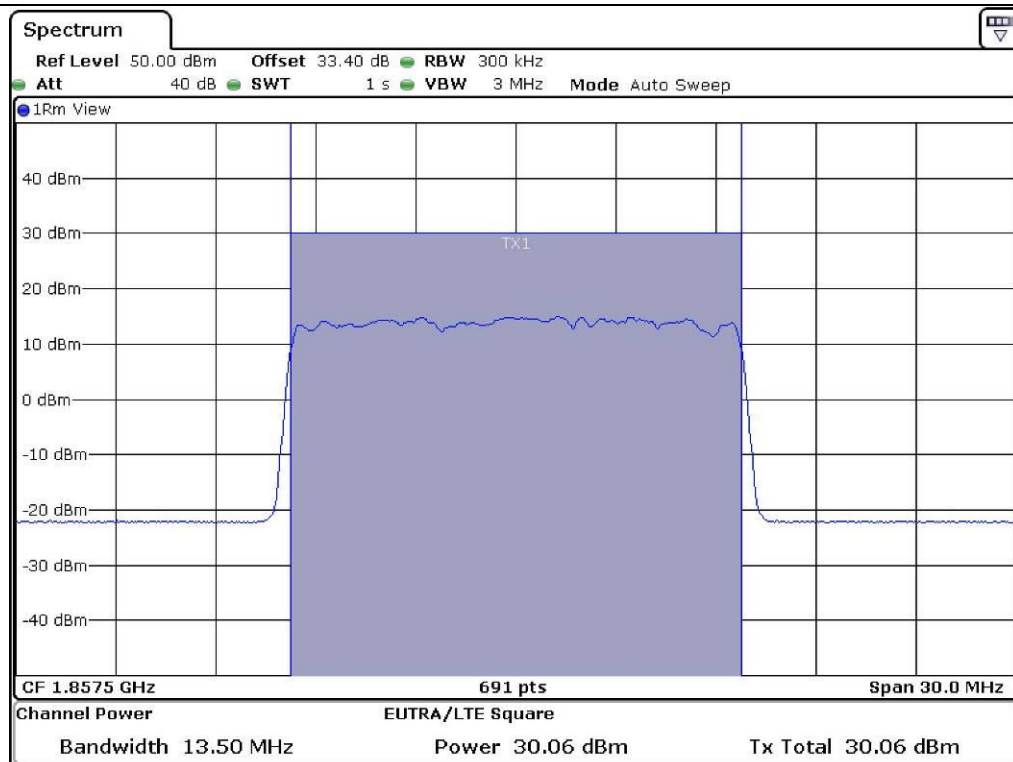
LTE 10 M – RF POWER OUTPUT (QPSK)



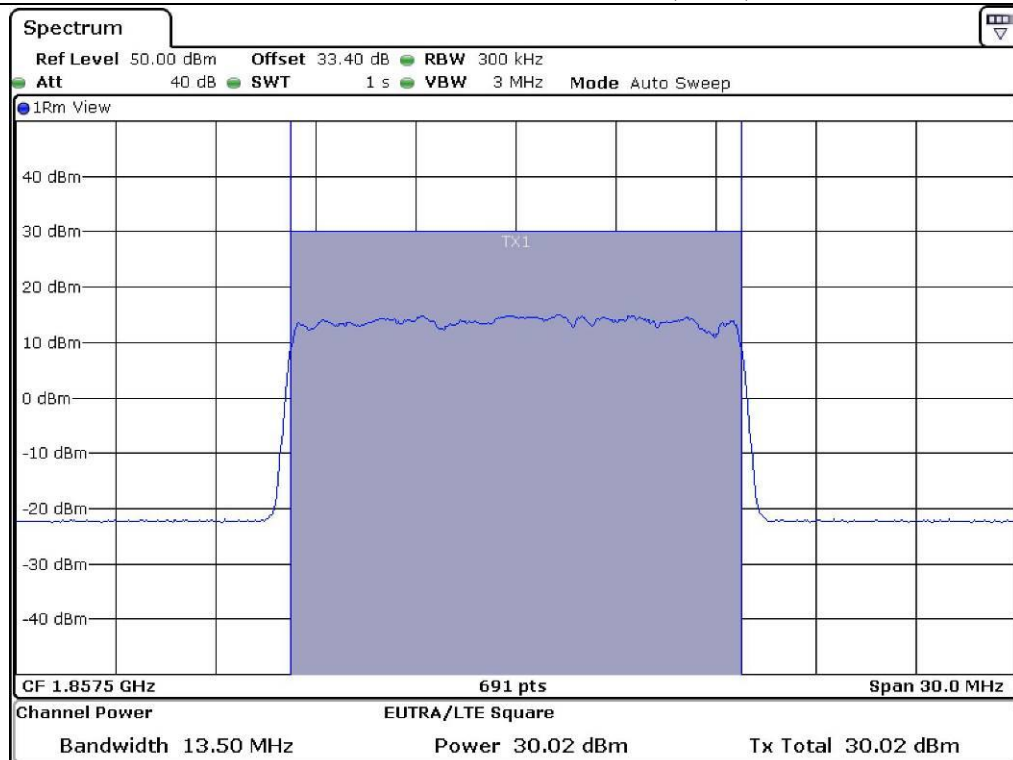
LTE 10 M – RF POWER OUTPUT (16 QAM)



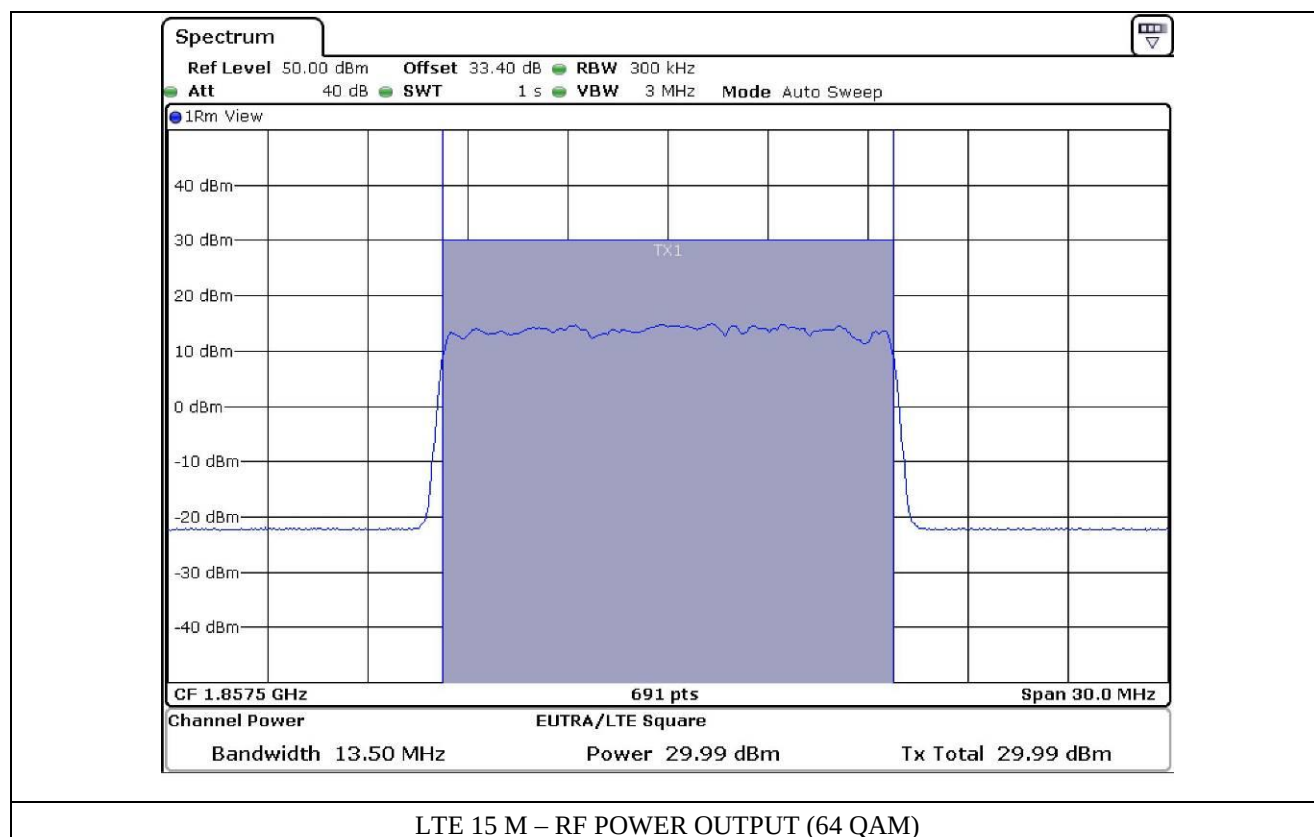
LTE 10 M – RF POWER OUTPUT (64 QAM)



LTE 15 M – RF POWER OUTPUT (QPSK)



LTE 15 M – RF POWER OUTPUT (16 QAM)



6. OCCUPIED BANDWIDTH

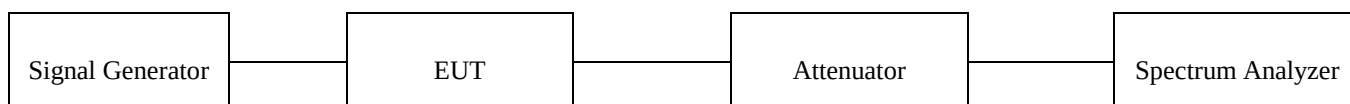
6.1 Operating environment

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 : October 22, 2014

-. Test Result : Pass

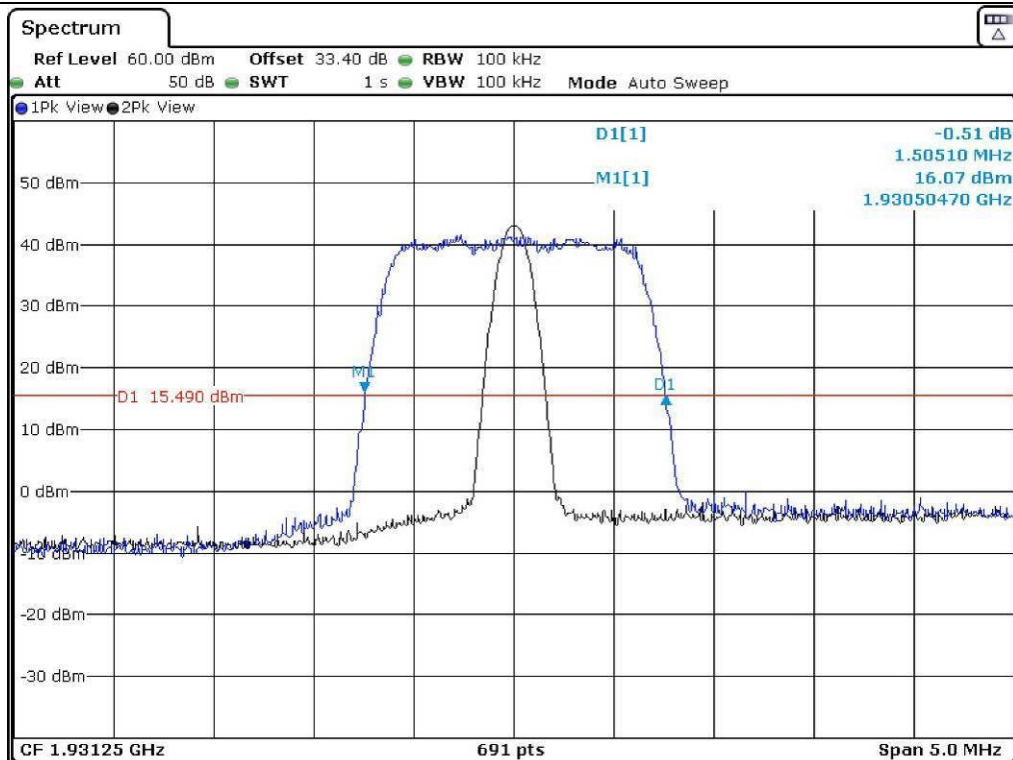
Modulation	Channel	26 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)
CDMA 2000	Low	1.51	1.30
	Middle	1.53	1.32
	High	1.51	1.31
LTE 5 M	QPSK	4.60	4.10
LTE 10 M	QPSK	9.35	8.68
LTE 15 M	QPSK	13.98	13.24

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

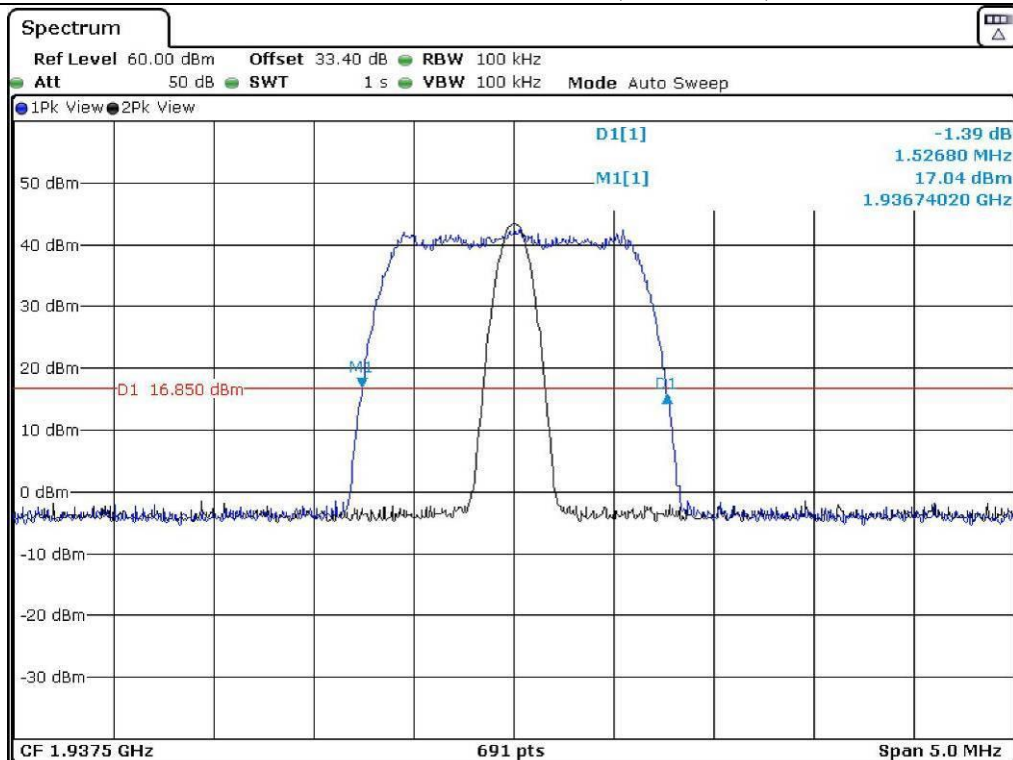
2. As a result of preliminary testing,, the formal test was performed with the maximum payload mode of worst cases for QPSK.



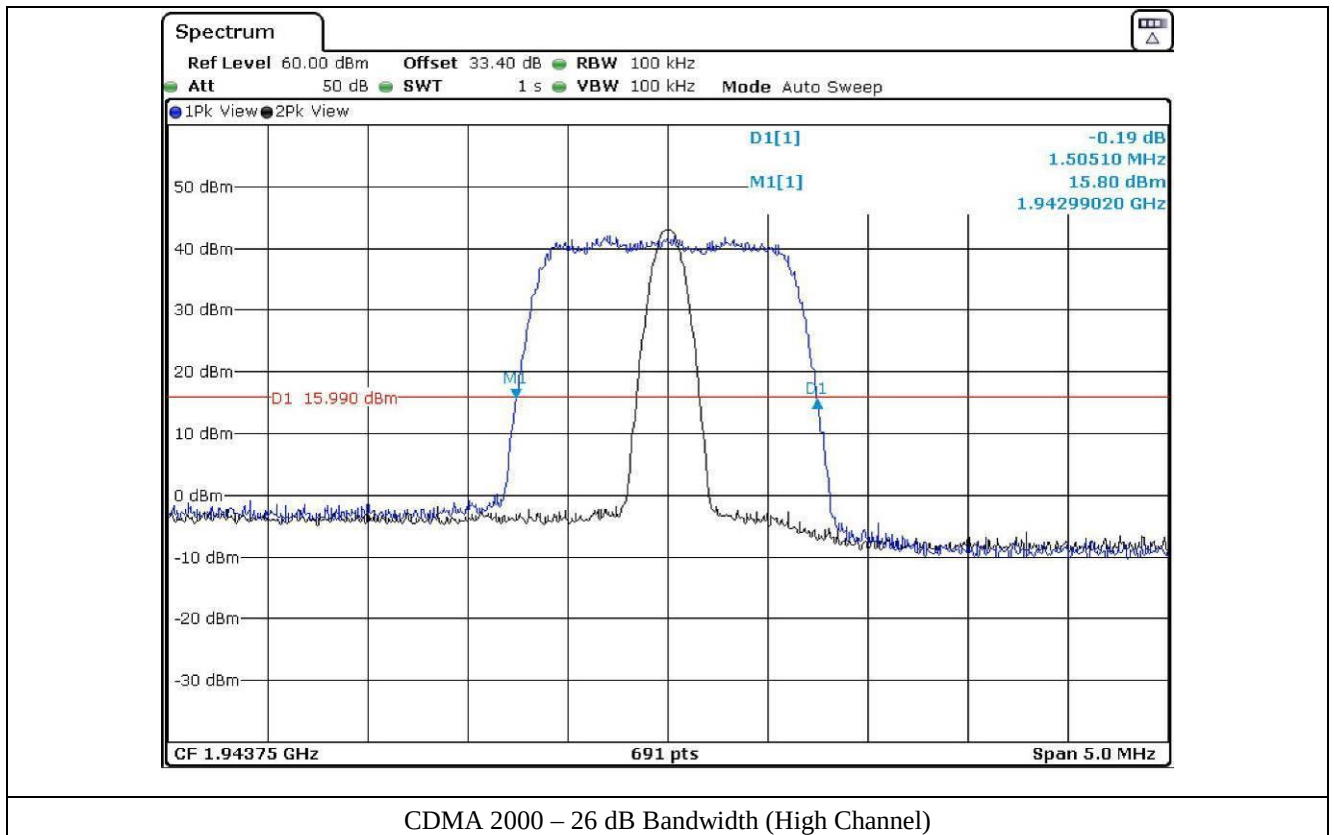
Tested by: hyung-kwon, Oh / Project Engineer

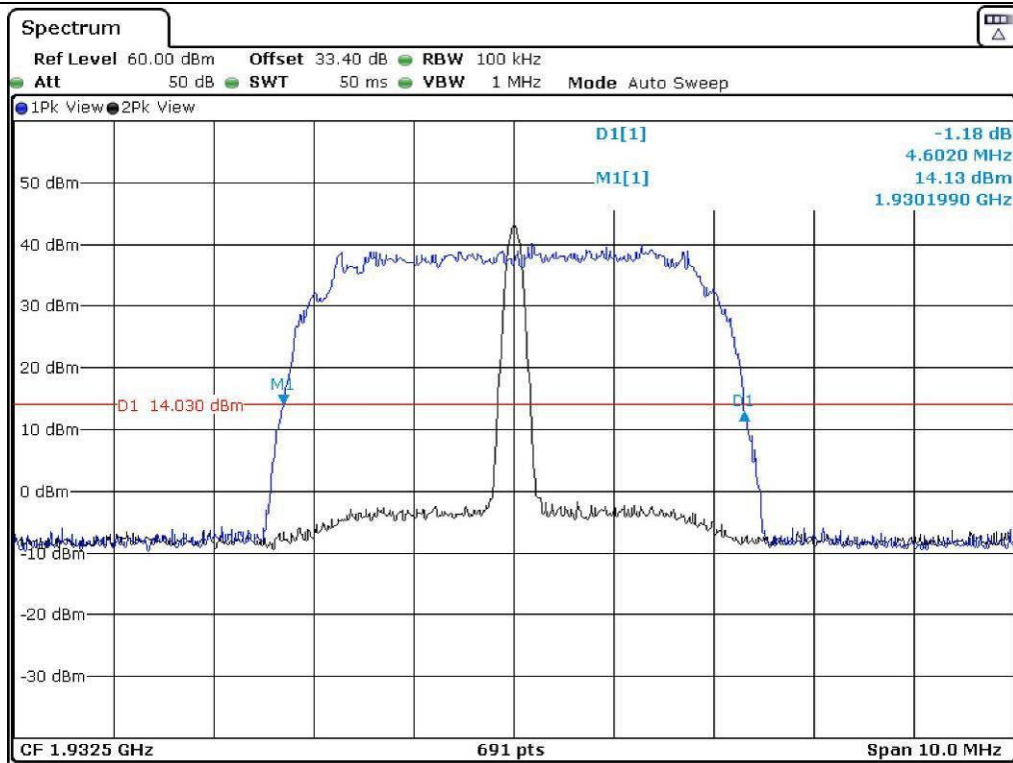


CDMA 2000 – 26 dB Bandwidth (Low Channel)

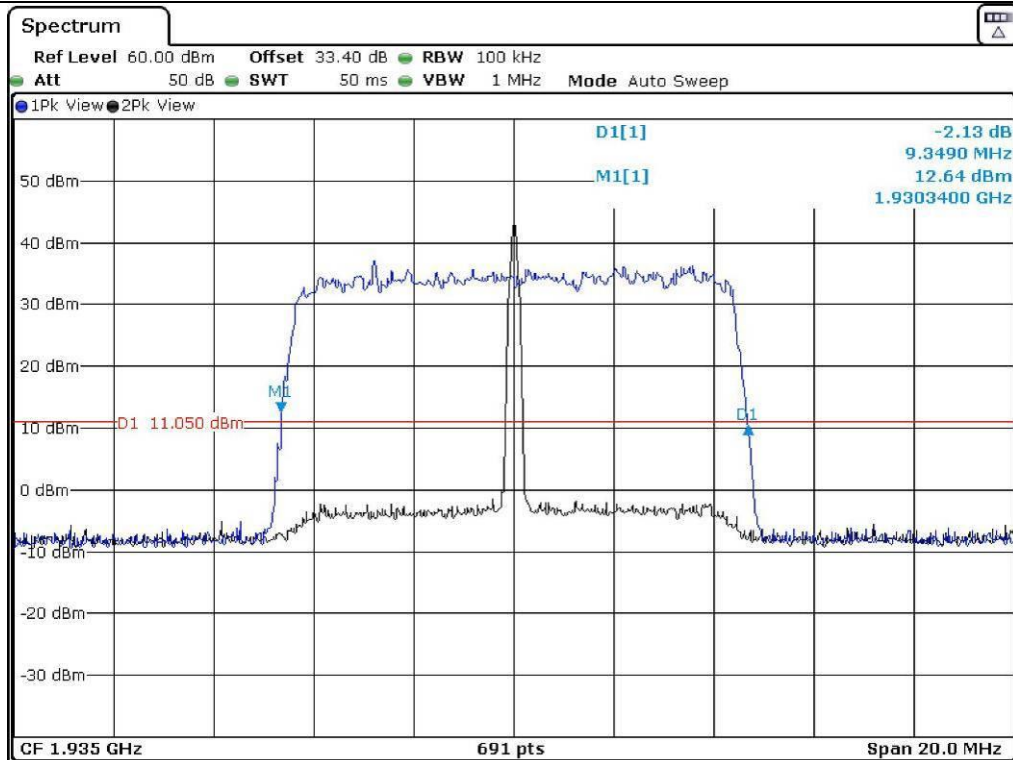


CDMA 2000 – 26 dB Bandwidth (Middle Channel)

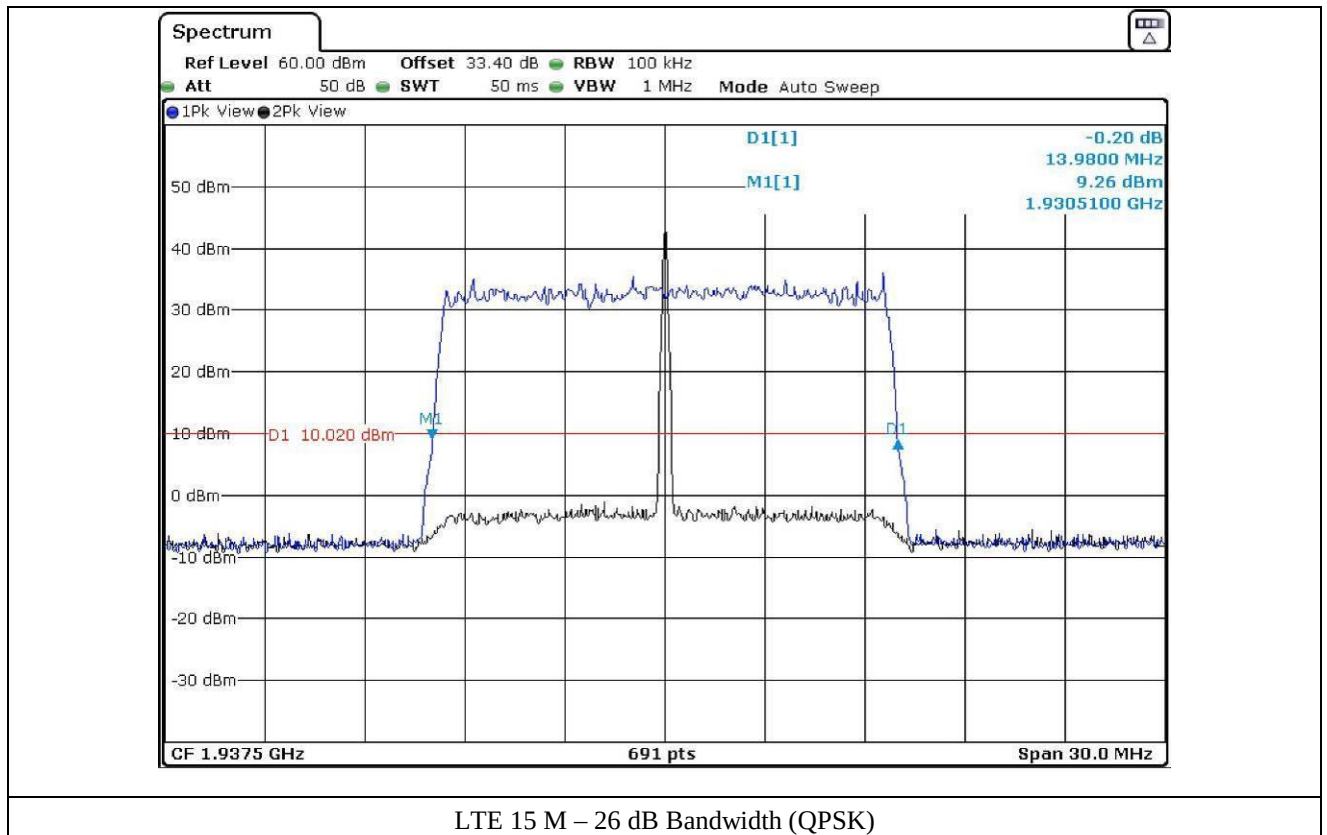


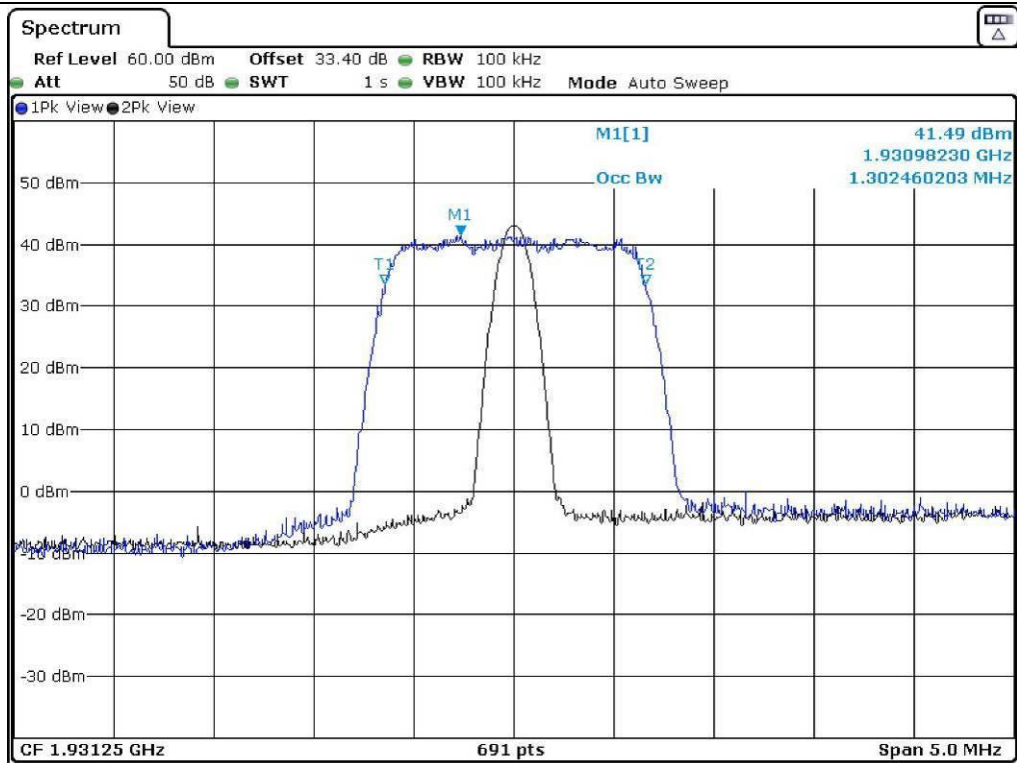


LTE 5 M – 26 dB Bandwidth (QPSK)

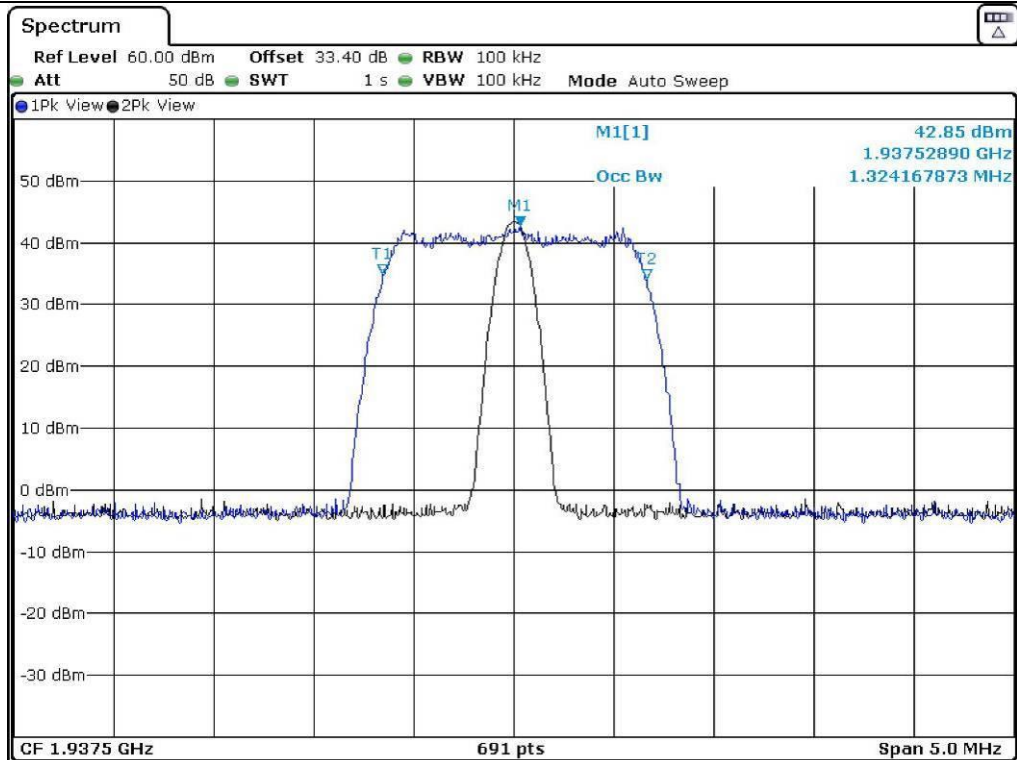


LTE 10 M – 26 dB Bandwidth (QPSK)

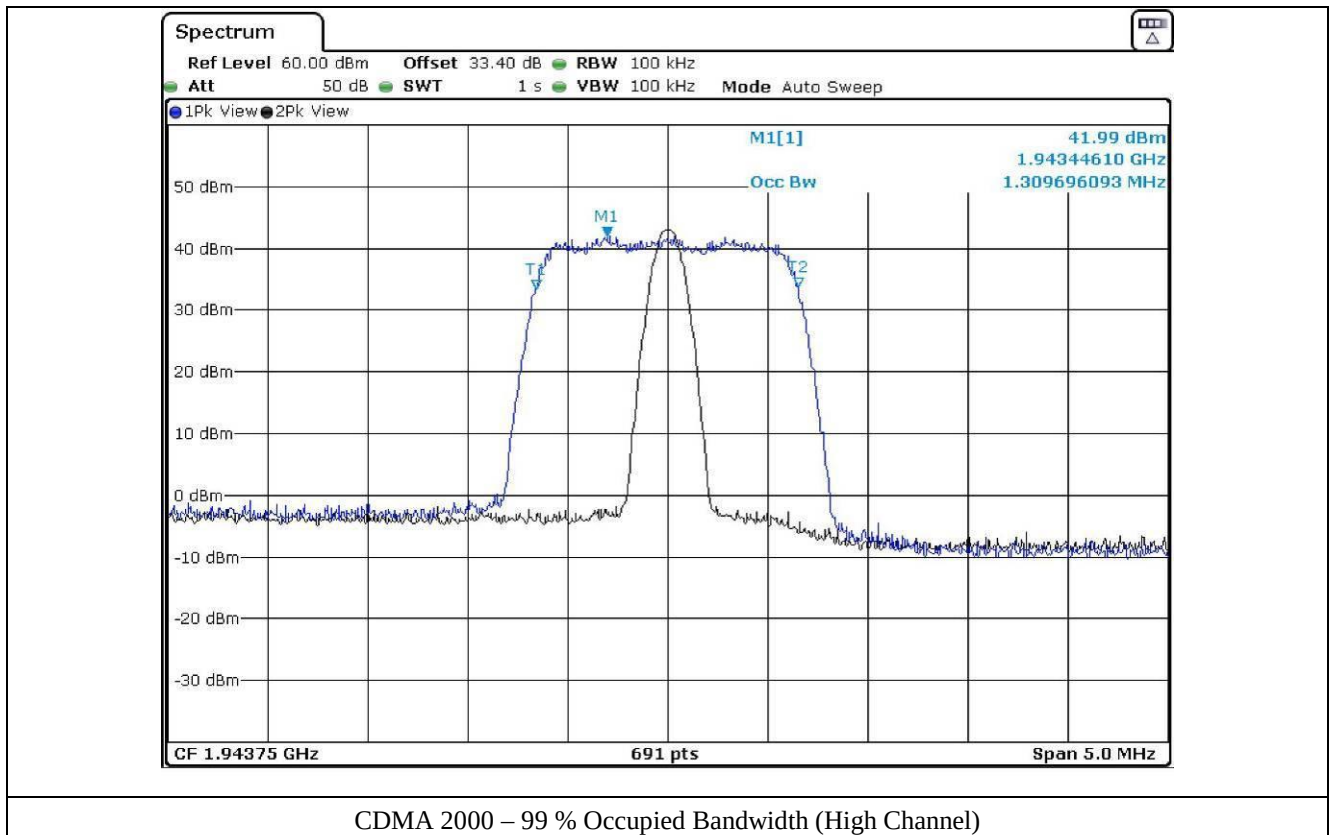


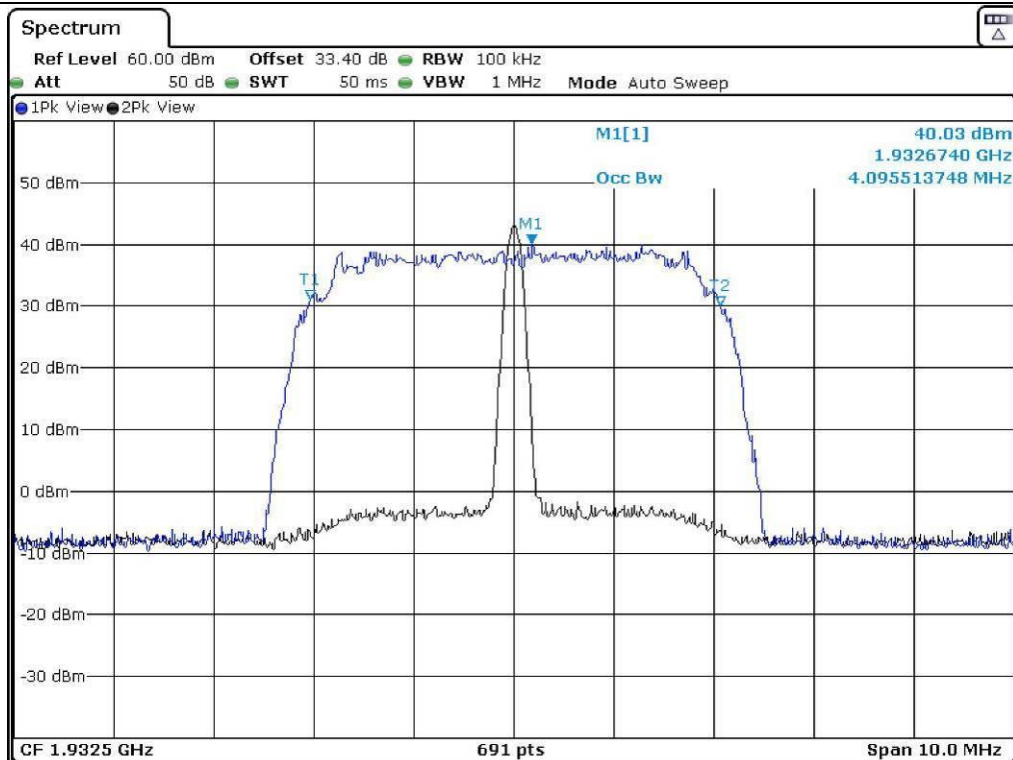


CDMA 2000 – 99 % Occupied Bandwidth (Low Channel)

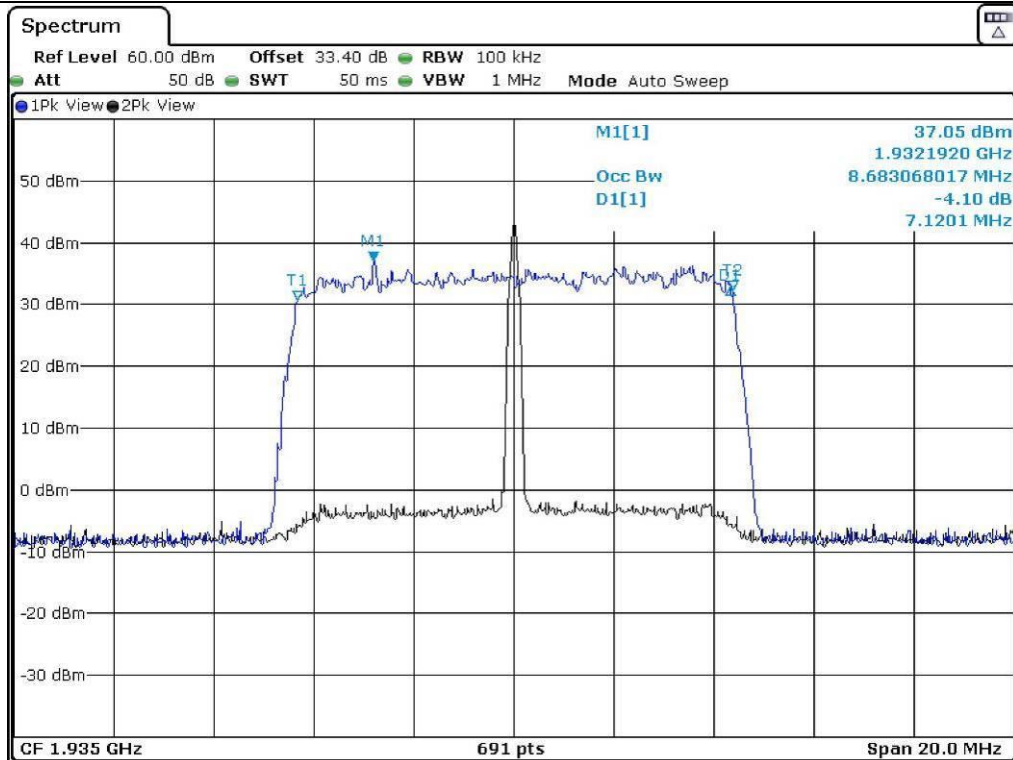


CDMA 2000 – 99 % Occupied Bandwidth (Middle Channel)

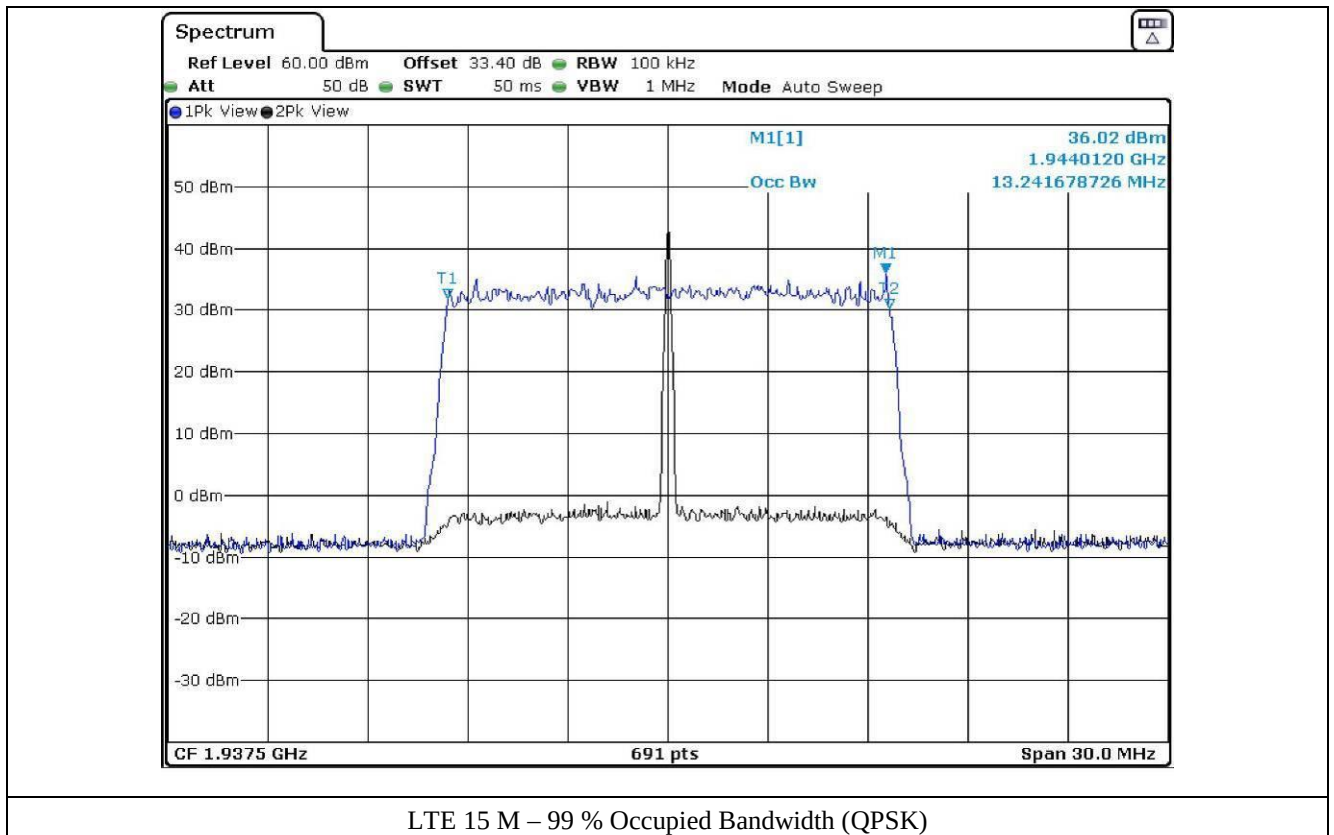


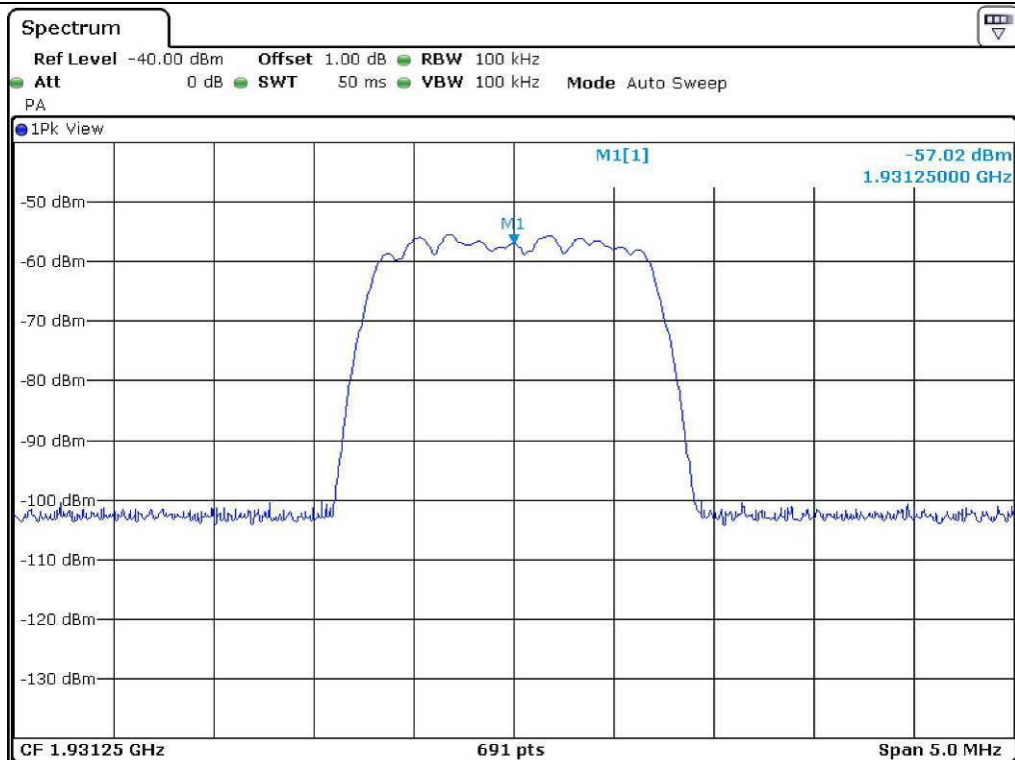


LTE 5 M – 99 % Occupied Bandwidth (QPSK)

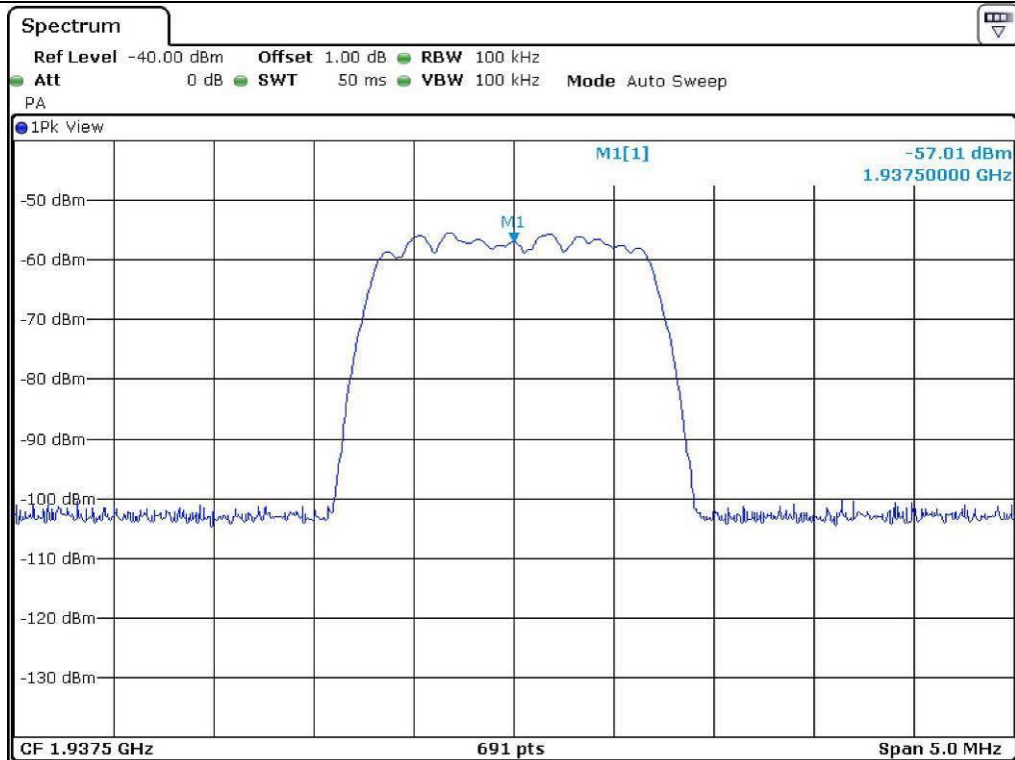


LTE 10 M – 99 % Occupied Bandwidth (QPSK)

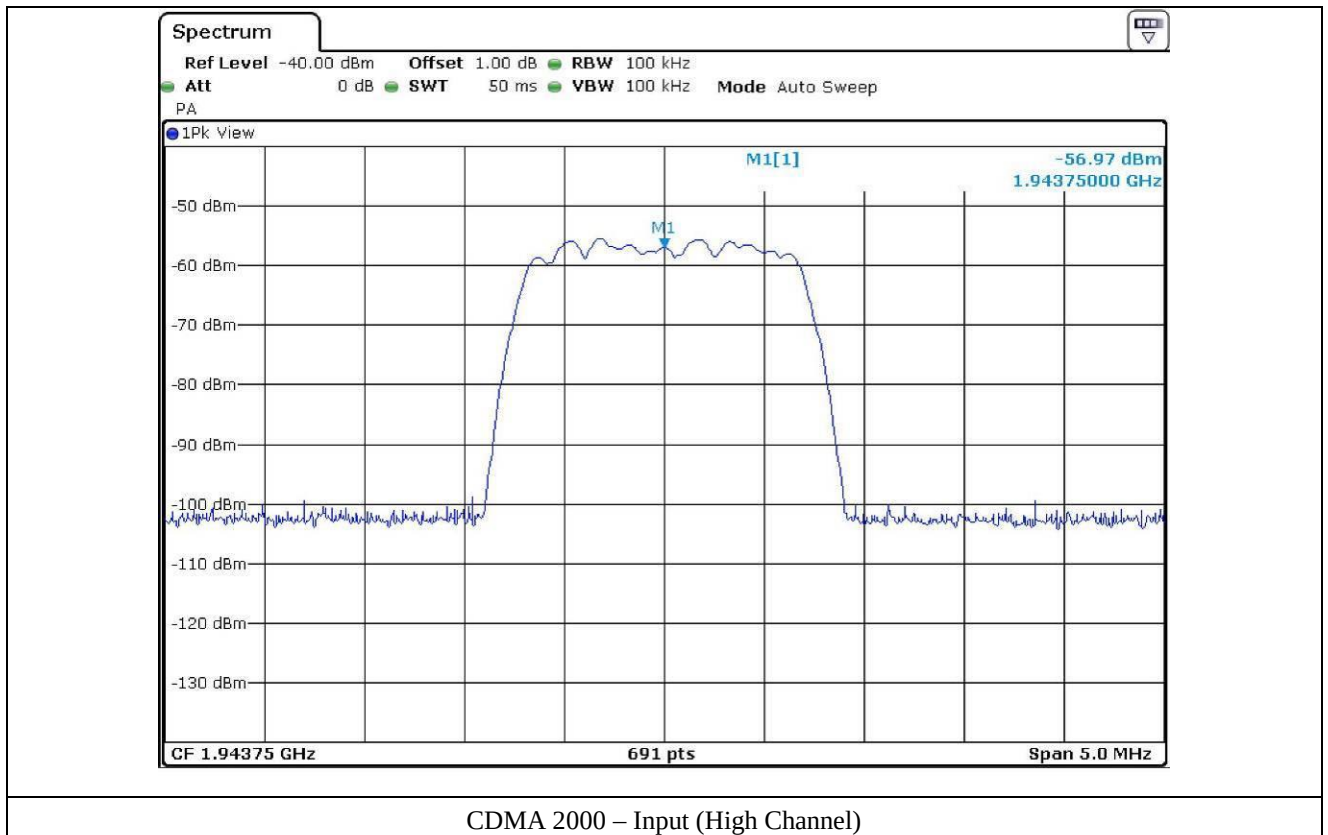


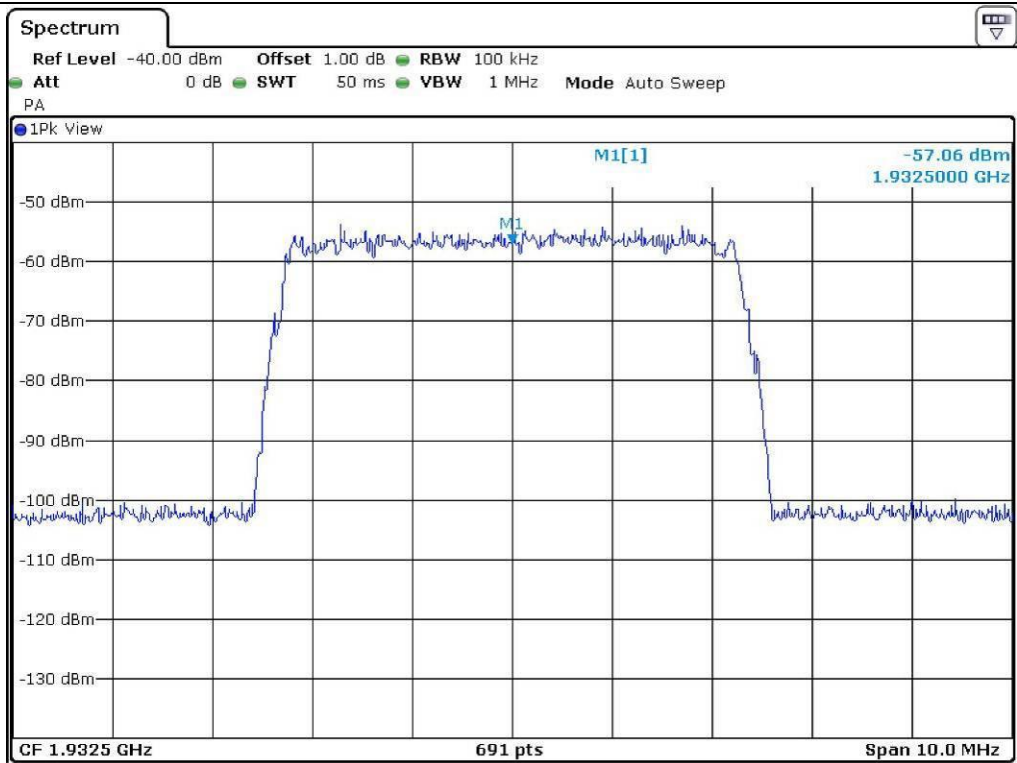


CDMA 2000 – Input (Low Channel)

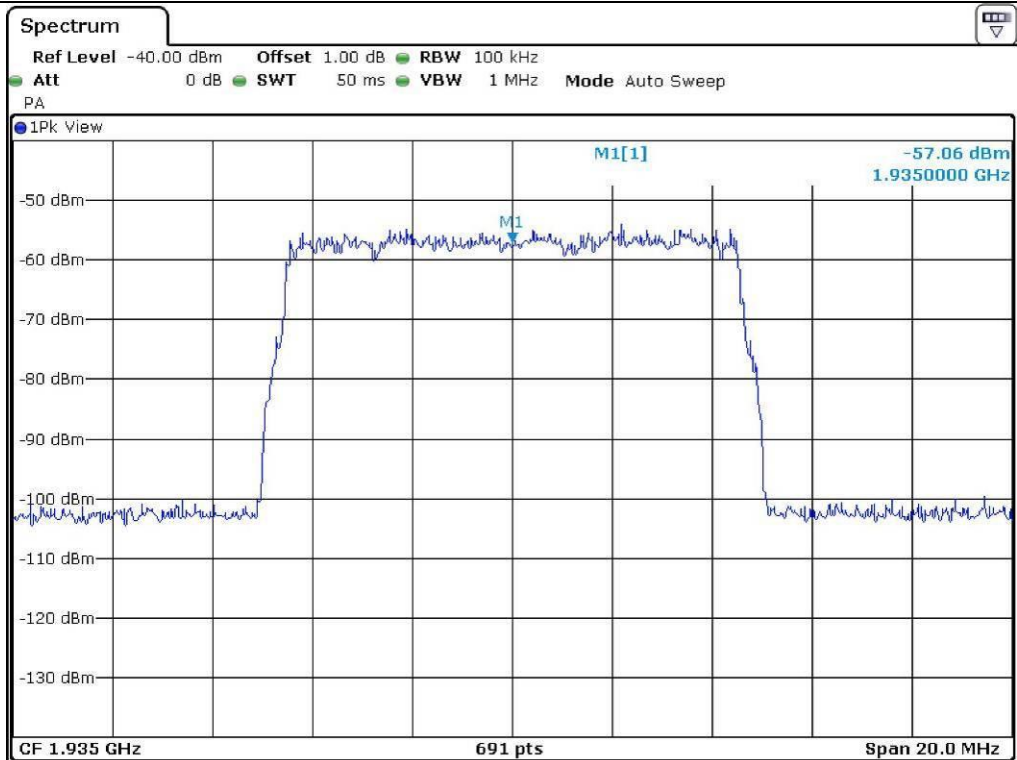


CDMA 2000 – Input (Middle Channel)





LTE 5 M – Input (QPSK)



LTE 10 M – Input (QPSK)

