RF TEST REPORT

Report No.: SET2016-17093

Product: Smartphone

FCC ID: SG7201609G551

Model No.: HM-G551-FL, L54

Applicant: Haier Telecom(Qingdao) CO., Ltd.

Address: No1.Haier Road,Hi-tech Zone Qingdao,China

Dates of Testing: 09/10/2016 — 09/21/2016

Issued by: Shenzhen Huatongwei International Inspection Co., Ltd

Lab Location: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China.

Tel：86 755 26627338 **Fax**：86 755 26627238

This test report consists of 181 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by Shenzhen Huatongwei International Inspection Co., Ltd. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to Shenzhen Huatongwei International Inspection Co., Ltd within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.

Test Report

Product .....: Smartphone

Brand Name.....: Haier

Trade Name .....: Haier

Applicant .....: Haier Telecom(Qingdao) CO., Ltd.

Applicant Address .....: No1.Haier Road,Hi-tech Zone Qingdao,China

Manufacturer .....: Haier Telecom(Qingdao) CO., Ltd.

Manufacturer Address.....: No1.Haier Road,Hi-tech Zone Qingdao,China

Test Standards .....: 47 CFR Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

47 CFR FCC Part 22(H): Cellular Radiotelephone Service

47 CFR Part 27(L) 27(H) 27(M): Miscellaneous wireless communications services

Test Result……: PASS

Tested by ……:

2016.09.22

Lu Lei，Test Engineer

Reviewed by……:

2016.09.22

Zhu Qi, Senior Egineer

Approved by……:

2016.09.22

Wu Li'an，Manager

Table of Contents

1. GENERAL INFORMATION 4

1.1 EUT Description 4

1.2 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator 5

1.3 Test Standards and Results 7

1.4 Test Configuration of Equipment Under Test 9

1.5 Measurement Results Explanation Example 10

1.6 Facilities and Accreditations 10

2. 47 CFR PART 2, PART 27H REQUIREMENTS 11

2.1 Conducted RF Output Power 11

2.2 Peak to Average Radio 19

2.3 99% Occupied Bandwidth and 26dB Bandwidth 30

2.4 Frequency Stability 47

2.5 Conducted Out of Band Emissions 52

2.6 Conducted Band Edge 96

2.7 Transmitter Radiated Power (EIRP/ERP) 154

2.8 Radiated Out of Band Emissions 162

3. LIST OF MEASURING EQUIPMENT 180

4. UNCERTAINTY OF EVALUATION 181

Change History		
Issue	Date	Reason for change
1.0	2016.09.22	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type	Smartphone
Hardware Version	V1.2_B
Software Version	L54-H03-S004
EUT supports Radios application	GSM/GPRS/EDGE/WCDMA/HSPA//LTE WLAN2.4GHz 802.11b/g/n (HT20/40) Bluetooth V3.0+EDR / Bluetooth 4.0 LE
Frequency Range	LTE Band 4 Tx: 1710.7MHz~1754.3MHz Rx: 2110.7MHz~2154.3MHz LTE Band 5 Tx: 824.7MHz~848.3MHz Rx: 869.7MHz~893.3MHz LTE Band 7 Tx: 2502.5MHz~2567.5MHz Rx: 2622.5MHz~2687.5MHz
Maximum Output Power to Antenna	LTE Band 4：22.86dBm LTE Band 5：23.29dBm LTE Band 7：21.46dBm
Bandwidth	LTE Band 4：1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz LTE Band 5：1.4MHz/3MHz/5MHz/10MHz LTE Band 7：5MHz/10MHz/15MHz/20MHz
Modulation Type	QPSK/16QAM
Antenna Type	Monopole Antenna

1.2 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	BW (MHz)	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP/EIRP(W)
Part 27	LTE Band 4	QPSK	1.4	1M09G7D	—	0.114
Part 27	LTE Band 4	16QAM	1.4	1M10W7D	—	0.094
Part 27	LTE Band 4	QPSK	3	2M74G7D	—	0.114
Part 27	LTE Band 4	16QAM	3	2M75W7D	—	0.094
Part 27	LTE Band 4	QPSK	5	4M53G7D	—	0.115
Part 27	LTE Band 4	16QAM	5	4M52W7D	—	0.095
Part 27	LTE Band 4	QPSK	10	8M95G7D	0.03	0.115
Part 27	LTE Band 4	16QAM	10	8M94W7D	0.03	0.095
Part 27	LTE Band 4	QPSK	15	13M5G7D	—	0.116
Part 27	LTE Band 4	16QAM	15	13M5W7D	—	0.096
Part 27	LTE Band 4	QPSK	20	18M4G7D	—	0.116
Part 27	LTE Band 4	16QAM	20	18M4W7D	—	0.096
Part 22	LTE Band 5	QPSK	1.4	1M10G7D	—	0.123
Part 22	LTE Band 5	16QAM	1.4	1M09W7D	—	0.097
Part 22	LTE Band 5	QPSK	3	2M73G7D	—	0.123
Part 22	LTE Band 5	16QAM	3	2M74W7D	—	0.097
Part 22	LTE Band 5	QPSK	5	4M53G7D	—	0.124
Part 22	LTE Band 5	16QAM	5	4M51W7D	—	0.098
Part 22	LTE Band 5	QPSK	10	8M94G7D	0.04	0.125
Part 22	LTE Band 5	16QAM	10	8M93W7D	0.04	0.099
Part 27	LTE Band 7	QPSK	5	4M52G7D	—	0.095
Part 27	LTE Band 7	16QAM	5	4M53W7D	—	0.071
Part 27	LTE Band 7	QPSK	10	8M96G7D	0.02	0.095
Part 27	LTE Band 7	16QAM	10	8M95W7D	0.02	0.071

Part 27	LTE Band 7	QPSK	15	13M5G7D	—	0.095
Part 27	LTE Band 7	16QAM	15	13M5W7D	—	0.072
Part 27	LTE Band 7	QPSK	20	18M4G7D	—	0.096
Part 27	LTE Band 7	16QAM	20	18M5W7D	—	0.072

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22, and Part27 for the EUT FCC ID Certification:

1.47 CFR Part 2, 22(H), 27(L), 27(H), 27(M)

2. ANSI/TIA/EIA-603-D-2010

3. FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Limit	Result
1	2.1046	Conducted RF Output Power	Reporting Only	PASS
2	27.50(d)(5)	Peak to Average Radio	＜13dB	PASS
3	27.50(h)(2)	Effective Radiated Power(Band 7)	EIRP＜2Watt	PASS PASS
	27.50(d)(4)	Effective Radiated Power(Band 4)	EIRP＜1Watt	PASS
	22.913(a)(2)	Effective Radiated Power(Band 5)	EIRP＜7Watt	PASS
4	2.1049 22.917(b) 27.53(h)(3) 27.53(m)(6)	Occupied Bandwidth	Reporting Only	PASS
5	2.1051 22.917(a) 27.53(g) 27.53(h)	Conducted Band Edge(Band 4/5)	＜ 43+10log10(P[watt])	PASS
	2.1051 27.53(m)(4)	Conducted Band Edge(Band 7)	＜5.5MHz: -13dBm ⩾5.5MHz: -25dBm	PASS

6	2.1051 22.917(a) 27.53(g) 27.53(h)	Conducted Spurious Emission (Band 4/5)	＜ 43+10log10(P[watt])	PASS
	2.1051 27.53(m)(4)	Conducted Spurious Emission (Band 7)	＜ 55+10log10(P[watt])	PASS
7	2.1053 22.917(a) 27.53(g) 27.53(h)	Radiated Spurious Emission (Band 4/5)	＜ 43+10log10(P[watt])	PASS
	2.1053 27.53(m)(4)	Radiated Spurious Emission (Band 7)	＜ 55+10log10(P[watt])	PASS
8	2.1055 22.355	Frequency Stability	＜2.5ppm	PASS
	2.1055 24.235 27.54		Within Authorized Band	

Remark：

1. All test items were verified and recorded according to the standards and without any deviation during the test.

2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

1.4 Test Configuration of Equipment Under Test

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth(MHz)						Modulation		RB#			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	4	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	5	√	√	√	√			√	√	√	√	√	√	√	√
	7			√	√	√	√	√	√	√	√	√	√	√	√
Peak-to-Average Ratio	4	√	√	√	√	√	√	√	√	√		√	√	√	√
	5	√	√	√	√			√	√	√		√	√	√	√
	7			√	√	√	√	√	√	√		√	√	√	√
26dB and 99% Bandwidth	4	√	√	√	√	√	√	√	√			√		√	
	5	√	√	√	√			√	√			√		√	
	7			√	√	√	√	√	√			√		√	
Conducted Band Edge	4	√	√	√	√	√	√	√	√	√		√	√		√
	5	√	√	√	√			√	√	√		√	√		√
	7			√	√	√	√	√	√	√		√	√		√
Conducted Spurious Emission	4	√	√	√	√	√	√	√	√	√			√	√	√
	5	√	√	√	√			√	√	√			√	√	√
	7			√	√	√	√	√	√	√			√	√	√
Frequency Stability	4	√	√	√	√	√	√	√				√		√	
	5	√	√	√	√			√				√		√	
	7			√	√	√	√	√				√		√	
ERP/EIRP	4	√	√	√	√	√	√	√	√	√			√	√	√
	5	√	√	√	√			√	√	√			√	√	√
	7			√	√	√	√	√	√	√			√	√	√
Radiated Spurious Emission	4	√	√	√	√	√	√	√		√			√	√	√
	5	√	√	√	√			√		√			√	√	√
	7			√	√	√	√	√		√			√	√	√
Note	**1. The mark “ √ ” means that this configuration is chosen for testing.** **2. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.** **3. For E.R.P/E.I.R.P. measurement, the widest bandwidth and the bandwidth with the highest conducted power of each band is chosen for testing. Besides, the lowest bandwidth of each band is also measured for reporting only.**														

1.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 7.5dB and 10dB attenuator.

Example:

Offset (dB) = RF cable loss(dB) + attenuator factor(dB).
= 7 + 10 = 17 (dB)

1.6 Facilities and Accreditations

1.6.1 Test Facilities

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories

(identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

FCC-Registration No.: 317478

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

1.6.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15℃- 35℃
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

2. 47 CFR PART 2, PART 27H REQUIREMENTS

2.1 Conducted RF Output Power

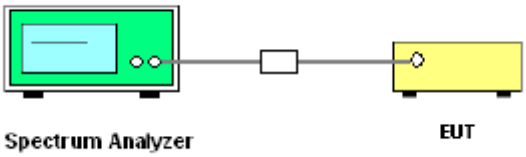
2.1.1 Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

2.1.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.1.3 Test Setup



2.1.4 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

2.1.5 Test Results

1. LTE Band 4 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20050	20175	20300
Frequency(MHz)				1720	1732.5	1745
20	QPSK	1	0	22.81	**22.86**	22.85
20		1	49	22.84	22.82	22.79
20		1	99	22.78	22.80	22.74
20		50	0	22.42	22.44	22.47
20		50	24	22.41	22.45	22.41
20		50	49	22.38	22.42	22.35
20		100	0	22.35	22.36	22.37
20	16QAM	1	0	21.82	21.91	21.84
20		1	49	21.80	21.85	21.83
20		1	99	21.84	21.80	21.77
20		50	0	21.37	21.29	21.32
20		50	24	21.29	21.27	21.30
20		50	49	21.31	21.25	21.26
20		100	0	21.34	21.25	21.21
Channel				20025	20175	20325
Frequency(MHz)				1717.5	1732.5	1747.5
15	QPSK	1	0	22.78	**22.82**	22.77
15		1	37	22.76	22.80	22.75
15		1	74	22.75	22.79	22.73
15		36	0	22.38	22.41	22.43
15		36	18	22.36	22.40	22.38
15		36	37	22.35	22.38	22.34
15		75	0	22.32	22.34	22.36
15	16QAM	1	0	21.81	21.87	21.82
15		1	37	21.78	21.82	21.79
15		1	74	21.82	21.77	21.75
15		36	0	21.35	21.27	21.30
15		36	18	21.26	21.28	21.27
15		36	37	21.26	21.25	21.26
15		75	0	21.30	21.21	21.24

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20000	20175	20350
Frequency(MHz)				1715	1732.5	1750
10	QPSK	1	0	22.72	22.75	22.75
10		1	24	22.76	**22.79**	22.74
10		1	49	22.74	22.77	22.72
10		25	0	22.36	22.39	22.40
10		25	12	22.36	22.37	22.36
10		25	24	22.34	22.38	22.31
10		50	0	22.32	22.35	22.34
10	16QAM	1	0	21.78	21.83	21.81
10		1	24	21.77	21.76	21.79
10		1	49	21.75	21.74	21.75
10		25	0	21.32	21.33	21.28
10		25	12	21.23	21.24	21.26
10		25	24	21.30	21.21	21.25
10		50	0	21.26	21.24	21.27
Channel				19975	20175	20375
Frequency(MHz)				1712.5	1732.5	1752.5
5	QPSK	1	0	22.72	22.76	22.75
5		1	12	22.74	22.72	**22.77**
5		1	24	22.75	22.70	22.74
5		12	0	22.34	22.32	22.37
5		12	6	22.33	22.35	22.34
5		12	11	22.30	22.32	22.32
5		25	0	22.32	22.30	22.31
5	16QAM	1	0	21.75	21.82	21.82
5		1	12	21.74	21.76	21.78
5		1	24	21.73	21.72	21.75
5		12	0	21.32	21.24	21.34
5		12	6	21.29	21.23	21.25
5		12	11	21.26	21.24	21.22
5		25	0	21.22	21.23	21.25

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				19965	20175	20385
Frequency(MHz)				1711.5	1732.5	1753.5
3	QPSK	1	0	22.75	22.72	22.76
3		1	7	22.73	22.74	**22.78**
3		1	14	22.70	22.71	22.73
3		8	0	22.35	22.34	22.32
3		8	4	22.30	22.34	22.33
3		8	7	22.32	22.33	22.34
3		15	0	22.32	22.32	22.31
3	16QAM	1	0	21.74	21.84	21.81
3		1	7	21.75	21.78	21.73
3		1	14	21.76	21.72	21.75
3		8	0	21.29	21.22	21.26
3		8	4	21.24	21.23	21.25
3		8	7	21.25	21.21	21.23
3		15	0	21.24	21.25	21.20
Channel				19957	20175	20393
Frequency(MHz)				1710.7	1732.5	1754.3
1.4	QPSK	1	0	22.78	22.75	22.79
1.4		1	2	22.76	22.77	**22.80**
1.4		1	5	22.72	22.73	22.75
1.4		3	0	22.30	22.32	22.34
1.4		3	1	22.28	22.25	22.31
1.4		3	2	22.31	22.30	22.28
1.4		6	0	22.27	22.26	22.29
1.4	16QAM	1	0	21.74	21.79	21.77
1.4		1	2	21.73	21.74	21.72
1.4		1	5	21.70	21.75	21.71
1.4		3	0	21.30	21.29	21.32
1.4		3	1	21.25	21.26	21.24
1.4		3	2	21.27	21.25	21.24
1.4		6	0	21.23	21.20	21.22

2. LTE Band 5 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20450	20525	20600
Frequency(MHz)				829	836.5	844
10	QPSK	1	0	23.27	**23.29**	23.25
10		1	24	23.25	23.22	23.23
10		1	49	23.22	23.24	23.20
10		25	0	22.81	22.89	22.84
10		25	12	22.78	22.76	22.80
10		25	24	22.77	22.74	22.75
10		50	0	22.75	22.72	22.78
10	16QAM	1	0	22.23	22.25	22.24
10		1	24	22.21	22.22	22.25
10		1	49	22.18	22.19	22.20
10		25	0	21.55	21.53	21.50
10		25	12	21.58	21.50	21.52
10		25	24	21.52	21.48	21.44
10		50	0	21.50	21.44	21.50
Channel				20425	20525	20625
Frequency(MHz)				826.5	836.5	846.5
5	QPSK	1	0	23.24	**23.25**	23.21
5		1	12	23.23	23.22	23.22
5		1	24	23.18	23.19	23.20
5		12	0	22.84	22.86	22.82
5		12	6	22.75	22.83	22.81
5		12	11	22.74	22.78	22.75
5		25	0	22.71	22.74	22.72
5	16QAM	1	0	22.29	22.21	22.22
5		1	12	22.22	22.19	22.20
5		1	24	22.20	22.17	22.18
5		12	0	21.57	21.53	21.54
5		12	6	21.48	21.50	21.52
5		12	11	21.45	21.48	21.51
5		25	0	21.47	21.44	21.43

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20415	20525	20635
Frequency(MHz)				825.5	836.5	847.5
3	QPSK	1	0	23.25	**23.26**	23.24
3		1	7	23.24	23.22	23.21
3		1	14	23.23	23.20	23.17
3		8	0	22.77	22.81	22.76
3		8	4	22.80	22.75	22.78
3		8	7	22.78	22.72	22.75
3		15	0	22.70	22.74	22.71
3	16QAM	1	0	22.28	22.22	22.25
3		1	7	22.25	22.18	22.23
3		1	14	22.22	22.20	22.16
3		8	0	21.53	21.55	21.50
3		8	4	21.44	21.48	21.45
3		8	7	21.43	21.49	21.47
3		15	0	21.42	21.46	21.48
Channel				20407	20525	20643
Frequency(MHz)				824.7	836.5	848.3
1.4	QPSK	1	0	23.18	**23.22**	23.20
1.4		1	2	23.16	23.18	23.21
1.4		1	5	23.19	23.20	23.17
1.4		3	0	22.81	22.78	22.72
1.4		3	1	22.77	22.73	22.78
1.4		3	2	22.76	22.77	22.71
1.4		6	0	22.75	22.74	22.73
1.4	16QAM	1	0	22.22	22.27	22.29
1.4		1	2	22.23	22.24	22.21
1.4		1	5	22.24	22.22	22.26
1.4		3	0	21.55	21.54	21.55
1.4		3	1	21.59	21.53	21.45
1.4		3	2	21.50	21.48	21.47
1.4		6	0	21.48	21.42	21.45

3. LTE Band 7 Conducted Power Test Verdict:

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20850	21100	21350
Frequency(MHz)				2510	2535	2560
20	QPSK	1	0	21.42	**21.46**	21.44
20		1	49	21.38	21.37	21.33
20		1	99	21.41	21.42	21.35
20		50	0	20.72	20.74	20.77
20		50	24	20.77	20.75	20.71
20		50	49	20.68	20.69	20.65
20		100	0	20.65	20.60	20.63
20	16QAM	1	0	20.20	20.21	20.15
20		1	49	20.24	20.22	20.23
20		1	99	20.18	20.17	20.18
20		50	0	19.77	19.75	19.72
20		50	24	19.69	19.67	19.70
20		50	49	19.64	19.61	19.66
20		100	0	19.70	19.65	19.71
Channel				20825	21100	21375
Frequency(MHz)				2507.5	2535	2562.5
15	QPSK	1	0	21.40	**21.42**	21.41
15		1	37	21.37	21.35	21.38
15		1	74	21.36	21.38	21.37
15		36	0	20.75	20.73	20.76
15		36	18	20.72	20.71	20.72
15		36	37	20.65	20.67	20.66
15		75	0	20.64	20.63	20.65
15	16QAM	1	0	20.22	20.25	20.19
15		1	37	20.24	20.22	20.15
15		1	74	20.17	20.15	20.14
15		36	0	19.75	19.74	19.79
15		36	18	19.69	19.68	19.72
15		36	37	19.65	19.66	19.64
15		75	0	19.71	19.65	19.67

BW(MHz)	Modulation	RB Size	RB Offset	Power(dBm) Low Ch./Freq.	Power(dBm) Middle Ch./Freq.	Power(dBm) High Ch./Freq.
Channel				20800	21100	21400
Frequency(MHz)				2505	2535	2565
10	QPSK	1	0	21.37	**21.40**	21.38
10		1	24	21.31	21.30	21.33
10		1	49	21.30	21.33	21.31
10		25	0	20.74	20.70	20.75
10		25	12	20.72	20.74	20.72
10		25	24	20.65	20.67	20.68
10		50	0	20.63	20.62	20.65
10	16QAM	1	0	20.13	20.20	20.15
10		1	24	20.20	20.12	20.21
10		1	49	20.15	20.10	20.15
10		25	0	19.70	19.64	19.63
10		25	12	19.61	19.65	19.64
10		25	24	19.55	19.50	19.55
10		50	0	19.50	19.55	19.53
Channel				20775	21100	21425
Frequency(MHz)				2502.5	2535	2567.5
5	QPSK	1	0	21.38	**21.39**	21.35
5		1	12	21.36	21.38	21.36
5		1	24	21.34	21.36	21.35
5		12	0	20.75	20.75	20.72
5		12	6	20.74	20.75	20.70
5		12	11	20.63	20.65	20.60
5		25	0	20.62	20.60	20.62
5	16QAM	1	0	20.20	20.24	20.23
5		1	12	20.25	20.22	20.20
5		1	24	20.19	20.14	20.18
5		12	0	19.74	19.70	19.72
5		12	6	19.65	19.61	19.70
5		12	11	19.65	19.66	19.60
5		25	0	19.59	19.60	19.67

2.2 Peak to Average Radio

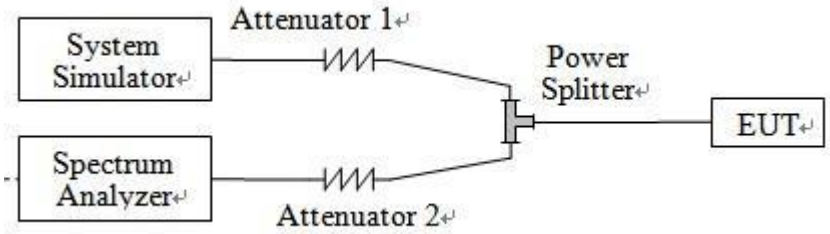
2.2.1 Definition

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

2.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

2.2.3 Test Description



2.2.4 Test Procedures

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

2.2.5 Test Results of Peak-to-Average Ratio

1. Test Result of LTE Band 4 Peak-to-Average Ratio:

BW (MHz)	Modulation	Channel	Frequency (MHz)	RB Size	RB Offset	Peak to Average radio		Limit	Verdict
						dB	Refer to Plot	dB	
20	16QAM	20050	1720	1	0	5.17	Plot A1 to A6	13	PASS
				100	0	6.23			
	16QAM	20175	1732.5	1	0	5.40			PASS
				100	0	5.87			
	16QAM	20300	1745	1	0	4.07			PASS
				100	0	6.02			

2. Test Result of LTE Band 5 Peak-to-Average Ratio:

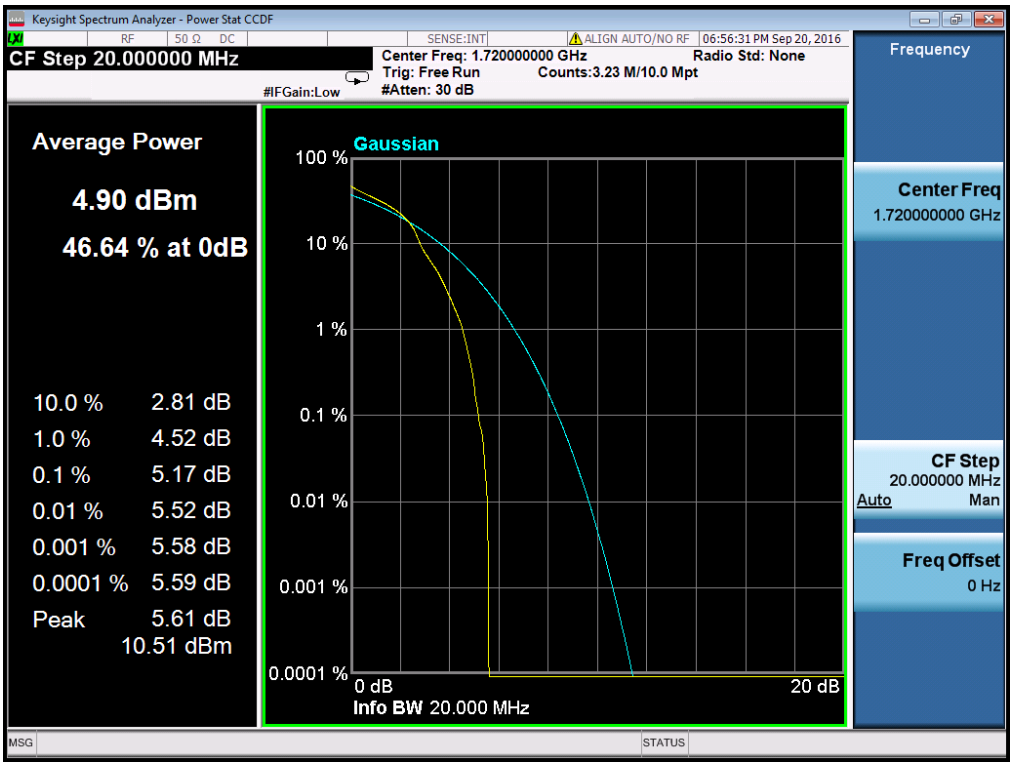
BW (MHz)	Modulation	Channel	Frequency (MHz)	RB Size	RB Offset	Peak to Average radio		Limit	Verdict
						dB	Refer to Plot	dB	
10	16QAM	20450	829	1	0	5.16	Plot B1 to B6	13	PASS
				50	0	5.66			
	16QAM	20525	836.5	1	0	5.13			PASS
				50	0	5.49			
	16QAM	20600	844	1	0	5.14			PASS
				50	0	5.71			

3. Test Result of LTE Band 7 Peak-to-Average Ratio:

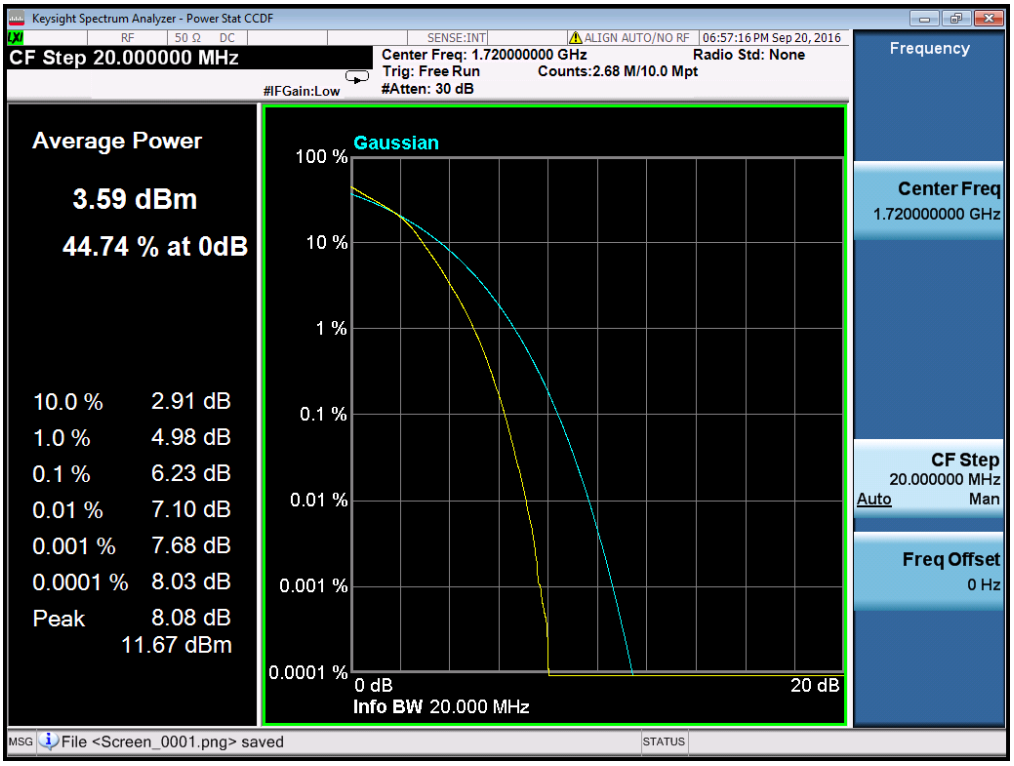
BW (MHz)	Modulation	Channel	Frequency (MHz)	RB Size	RB Offset	Peak to Average radio		Limit	Verdict
						dB	Refer to Plot	dB	
20	16QAM	20850	2510	1	0	5.46	Plot C1 to C6	13	PASS
				100	0	6.49			
	16QAM	21100	2535	1	0	6.15			PASS
				100	0	6.52			
	16QAM	21350	2560	1	0	5.38			PASS
				100	0	6.33			

Note: both QPSK/16QAM modulation modes were tested, only provide worst-case mode (16QAM) test plots here.

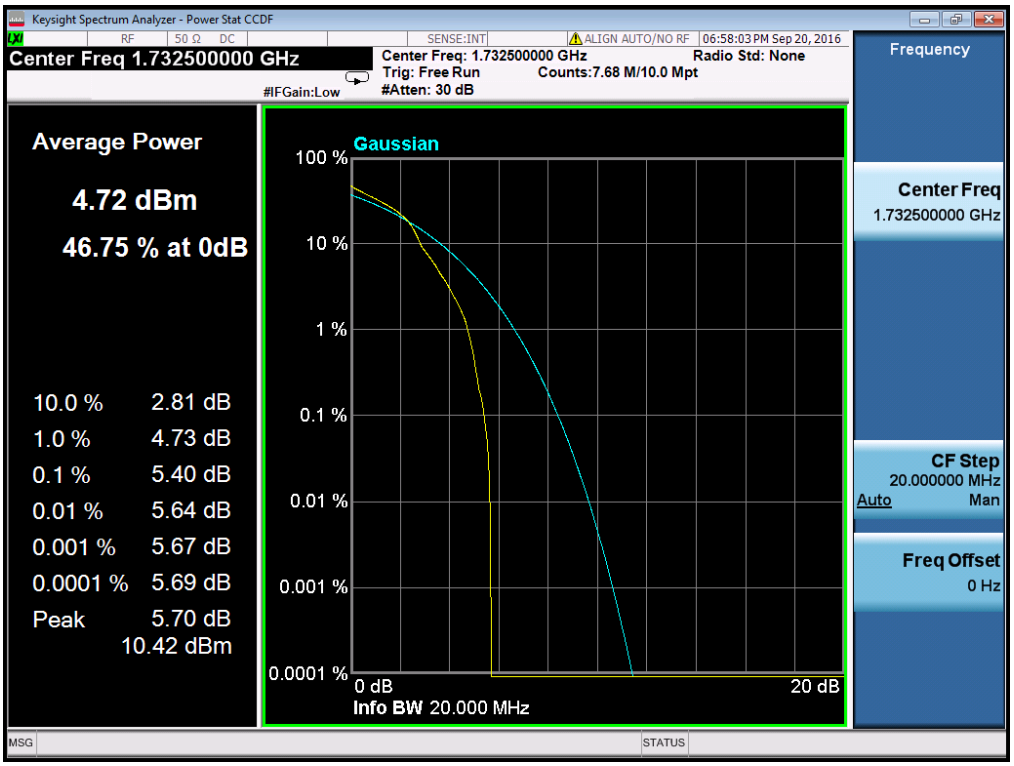
2.2.6 Test Results (Plots) of Peak-to-Average Ratio



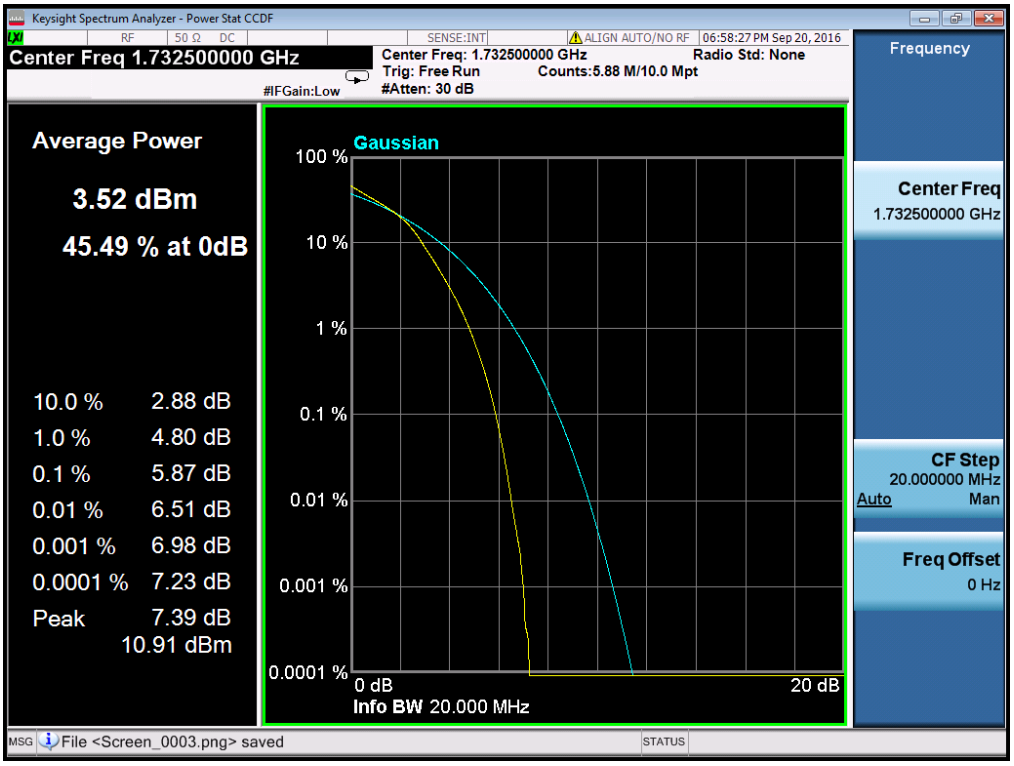
(Plot A1: Band 4/20MHz/16QAM in L Ch 1RB Size)



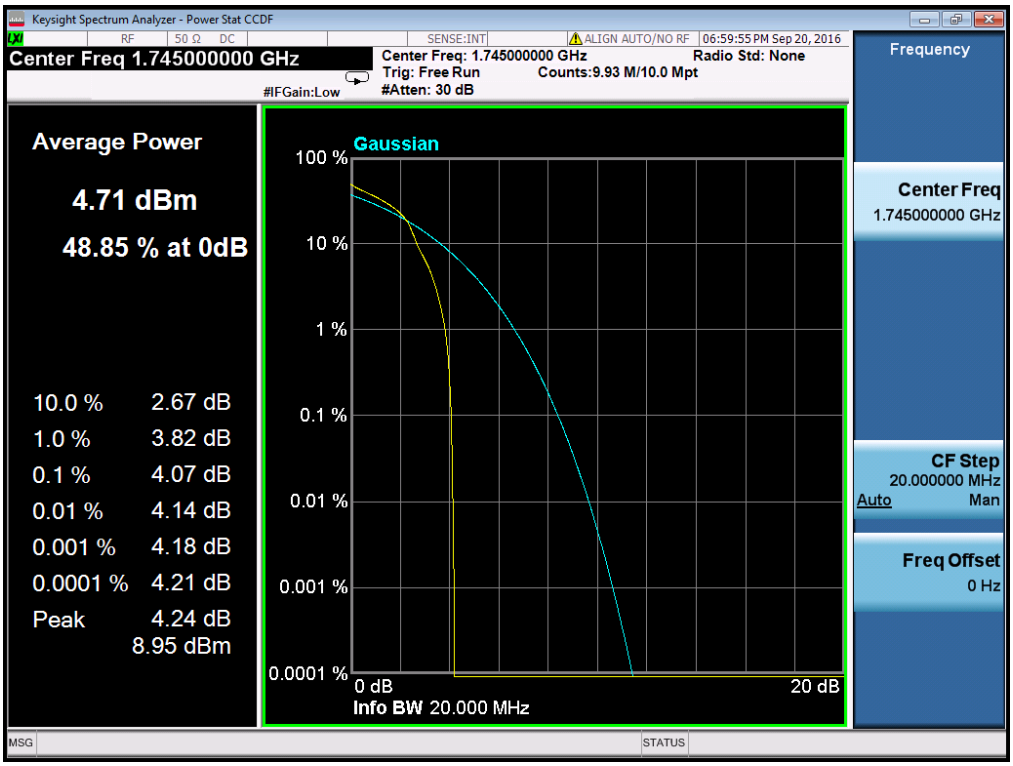
(Plot A2: Band 4/20MHz/16QAM in L Ch 100RB Size)



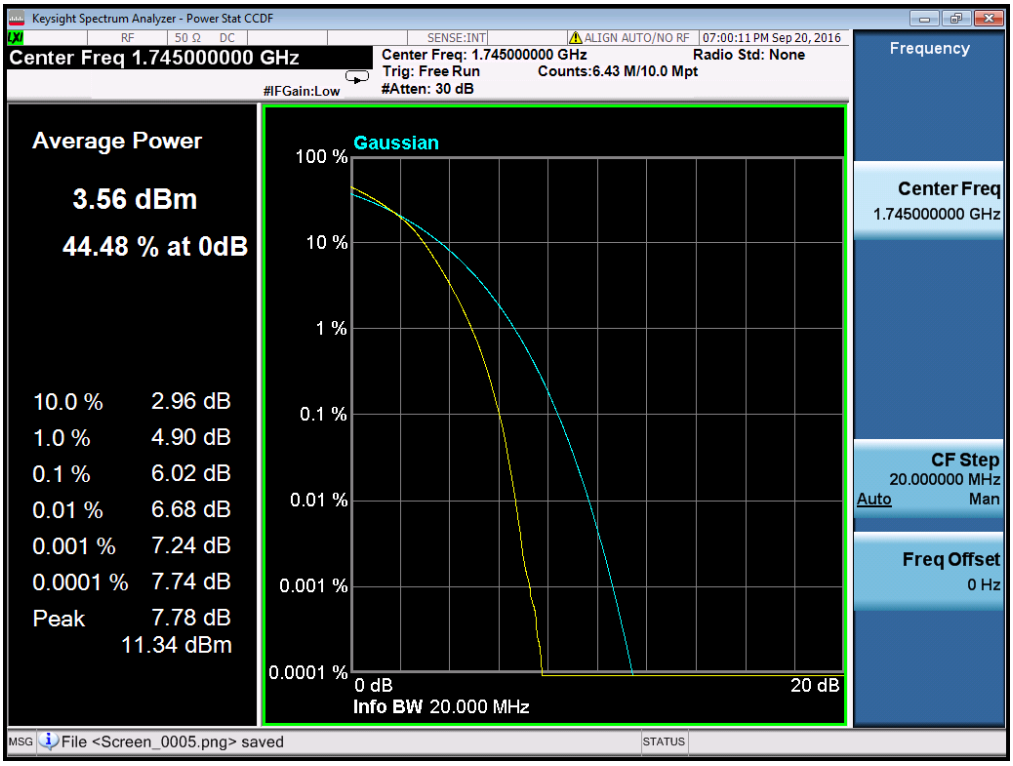
(Plot A3: Band 4/20MHz/16QAM in M Ch 1RB Size)



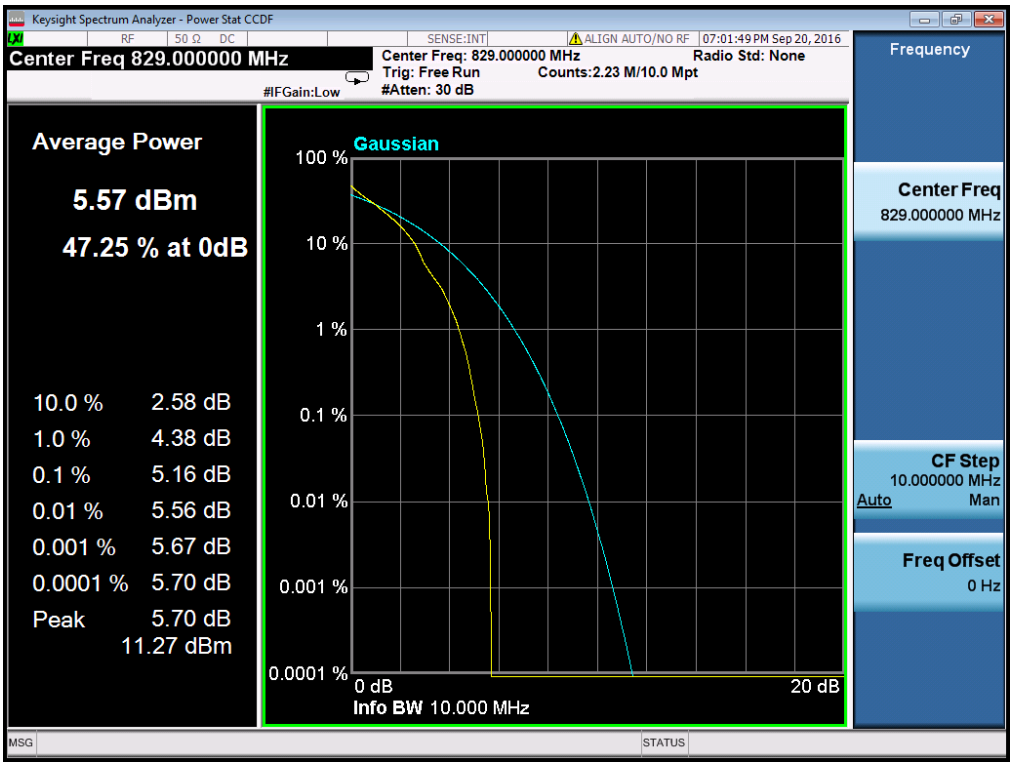
(Plot A4: Band 4/20MHz/16QAM in M Ch 100RB Size)



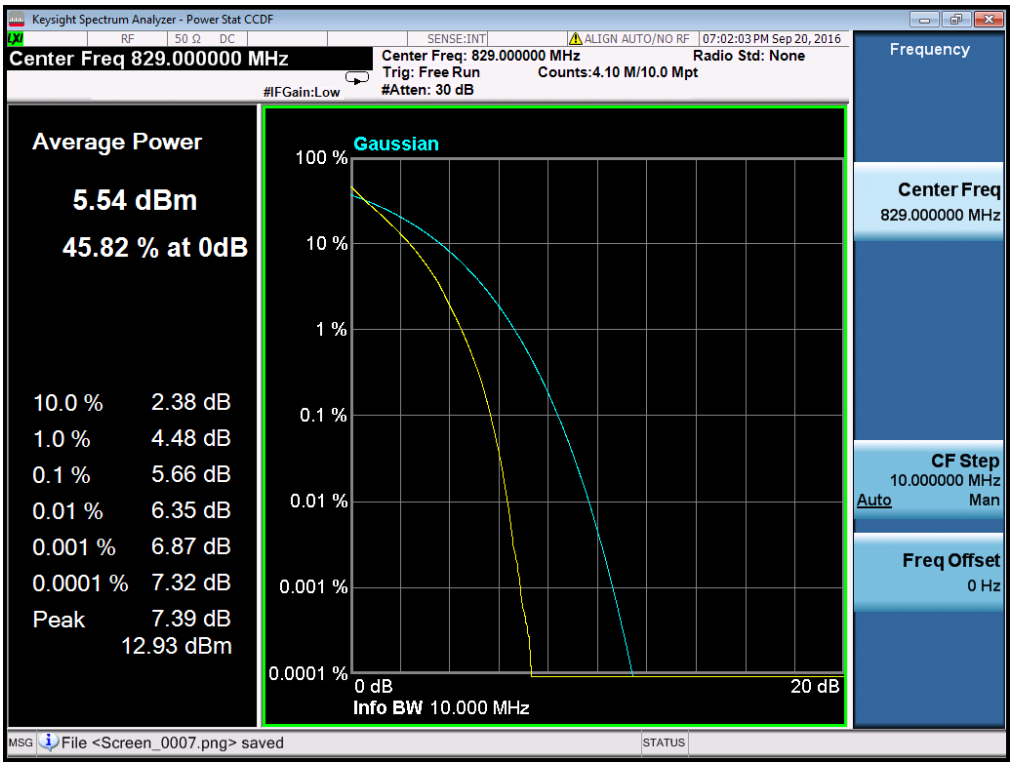
(Plot A5: Band 4/20MHz/16QAM in H Ch 1RB Size)



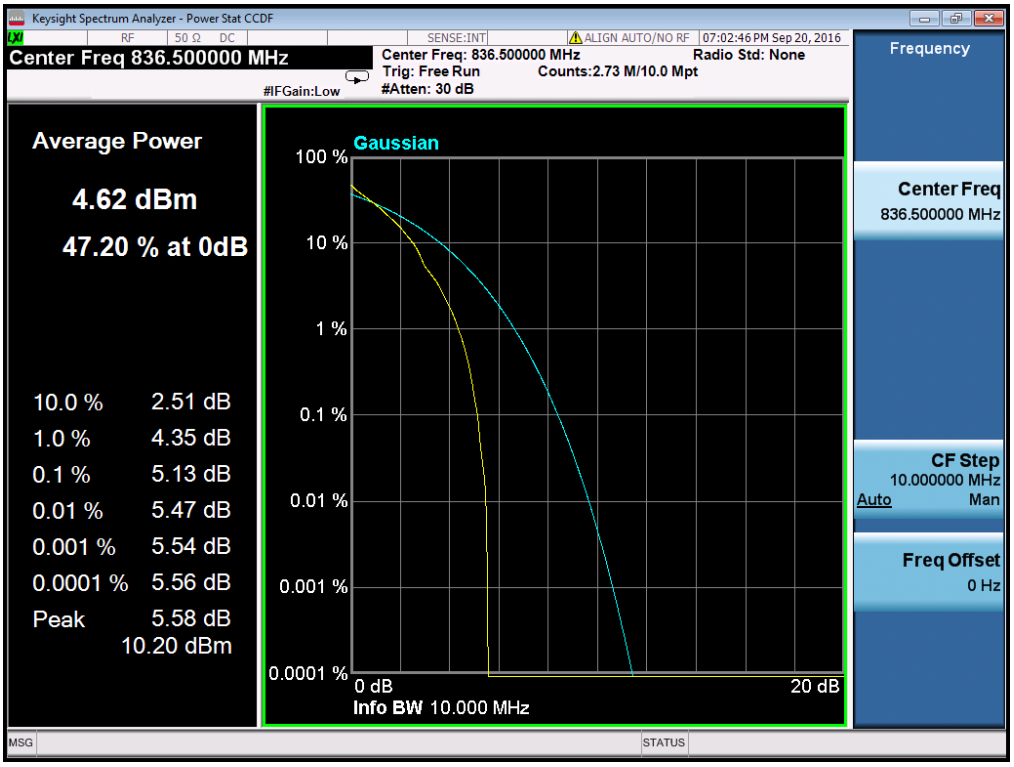
(Plot A6: Band 4/20MHz/16QAM in H Ch 100RB Size)



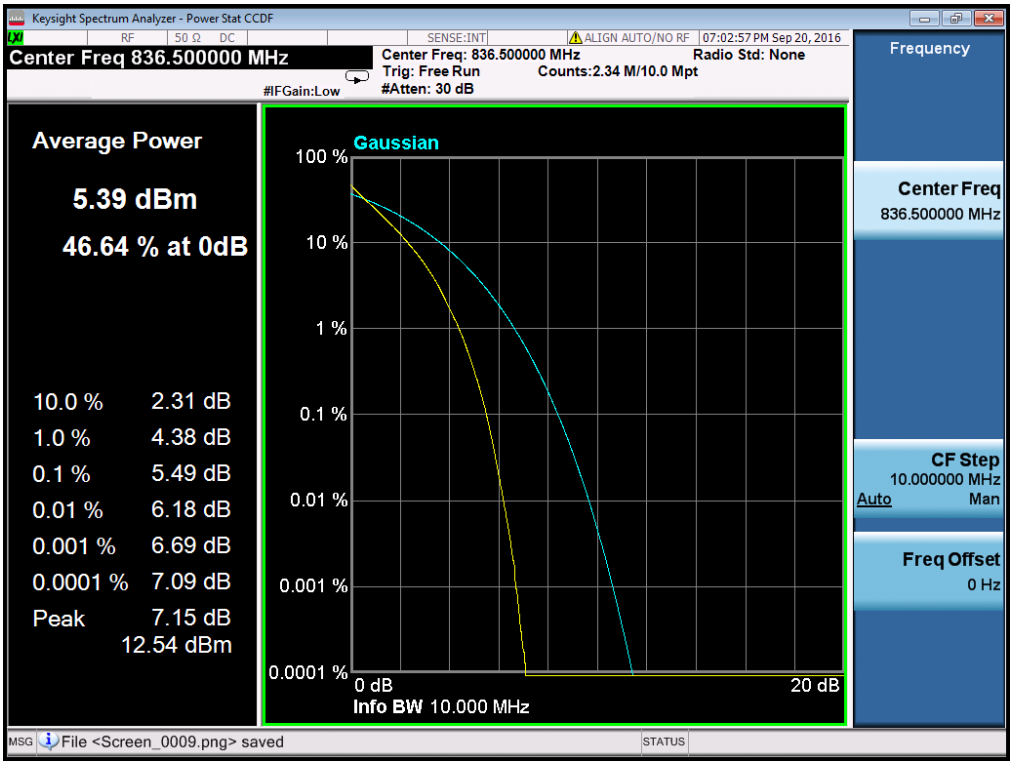
(Plot B1: Band 5/10MHz/16QAM in L Ch 1RB Size)



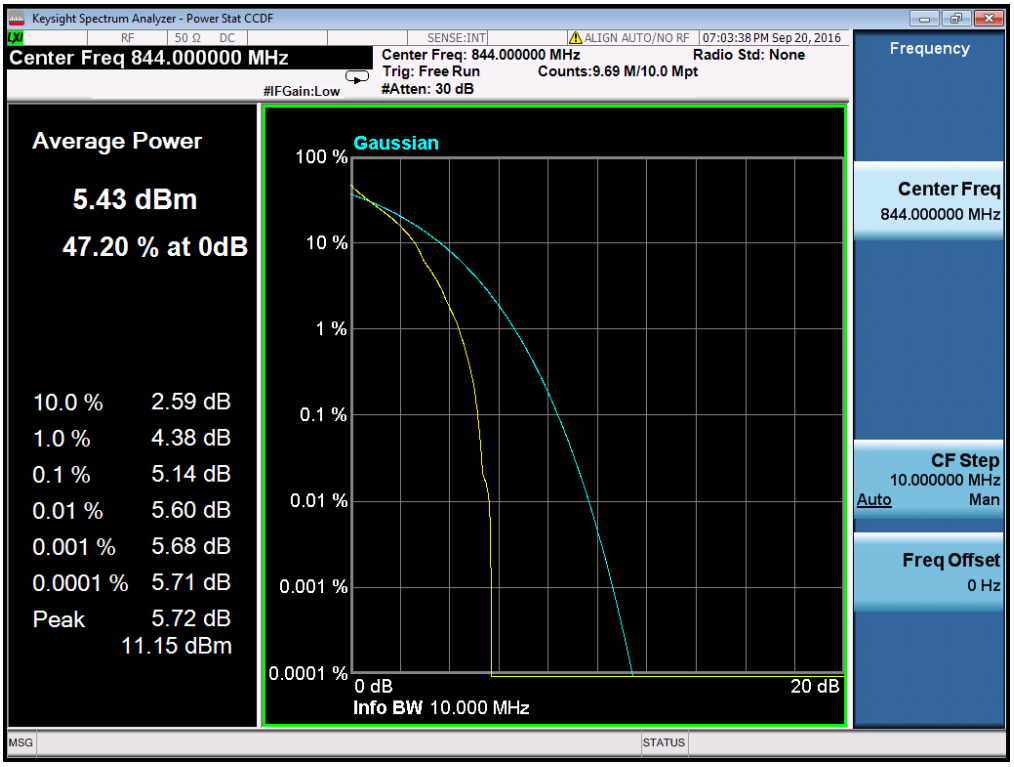
(Plot B2: Band 5/10MHz/16QAM in L Ch 50RB Size)



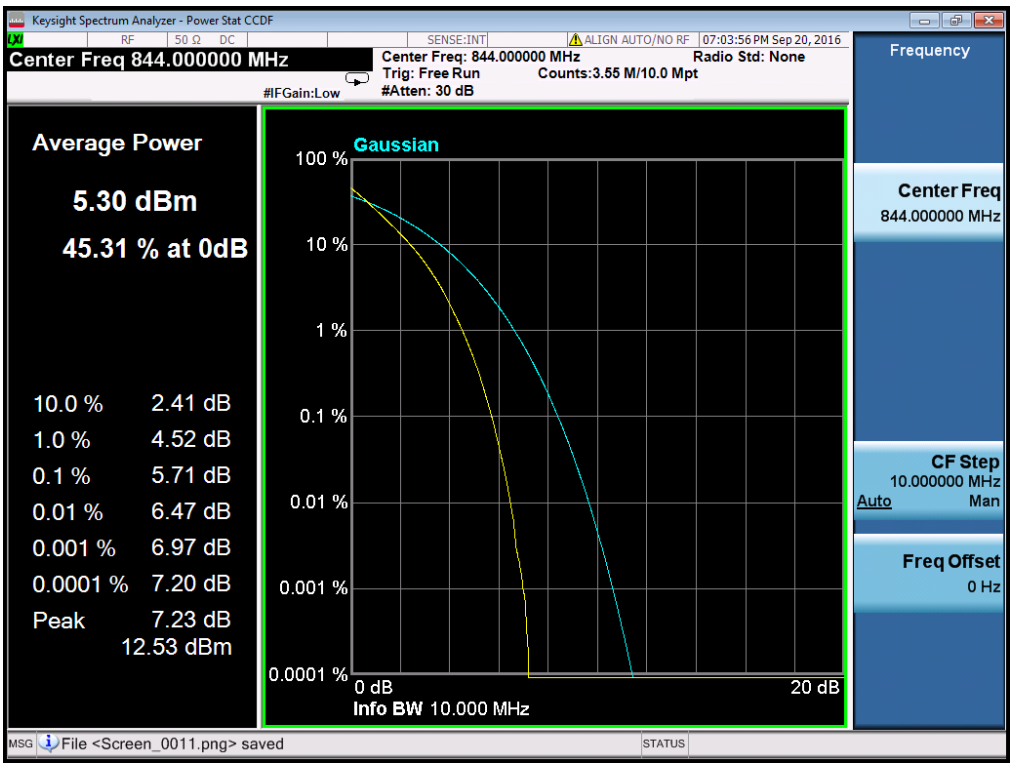
(Plot B3: Band 5/10MHz/16QAM in M Ch 1RB Size)



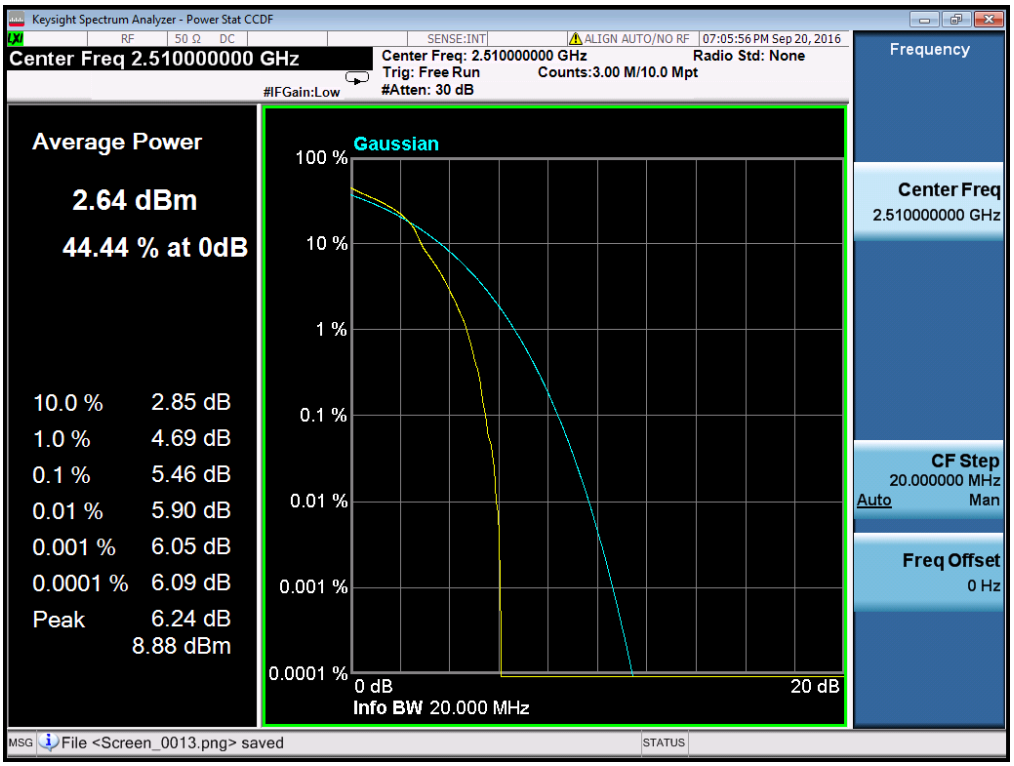
(Plot B4: Band 5/10MHz/16QAM in M Ch 50RB Size)



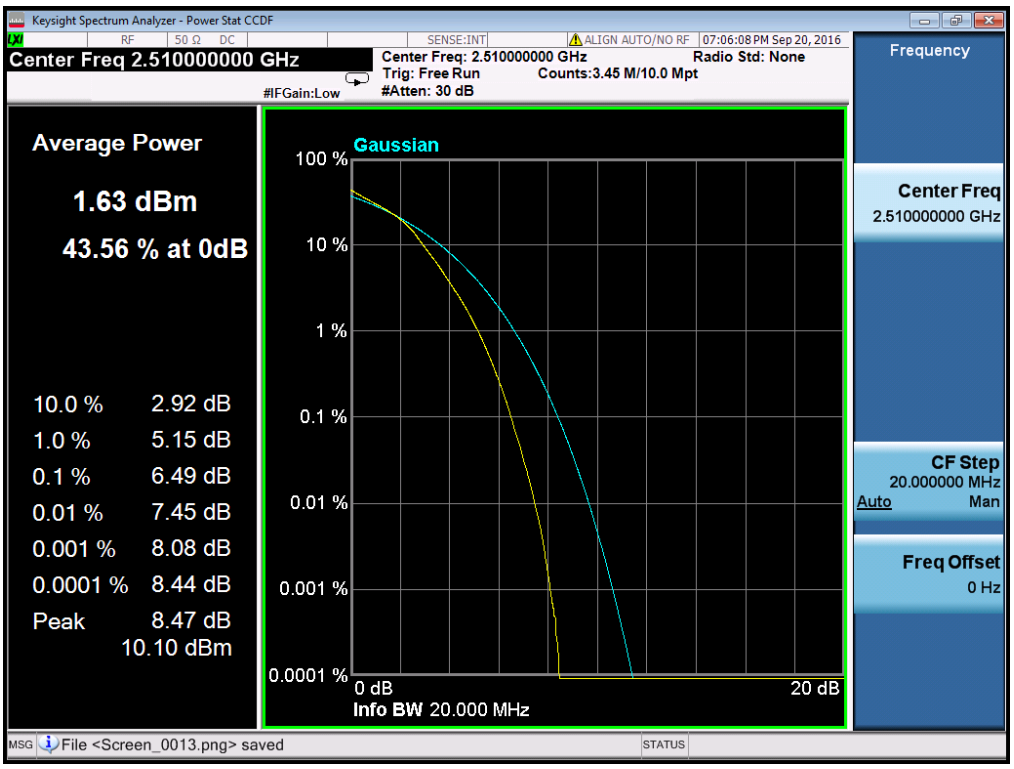
(Plot B5: Band 5/10MHz/16QAM in H Ch 1RB Size)



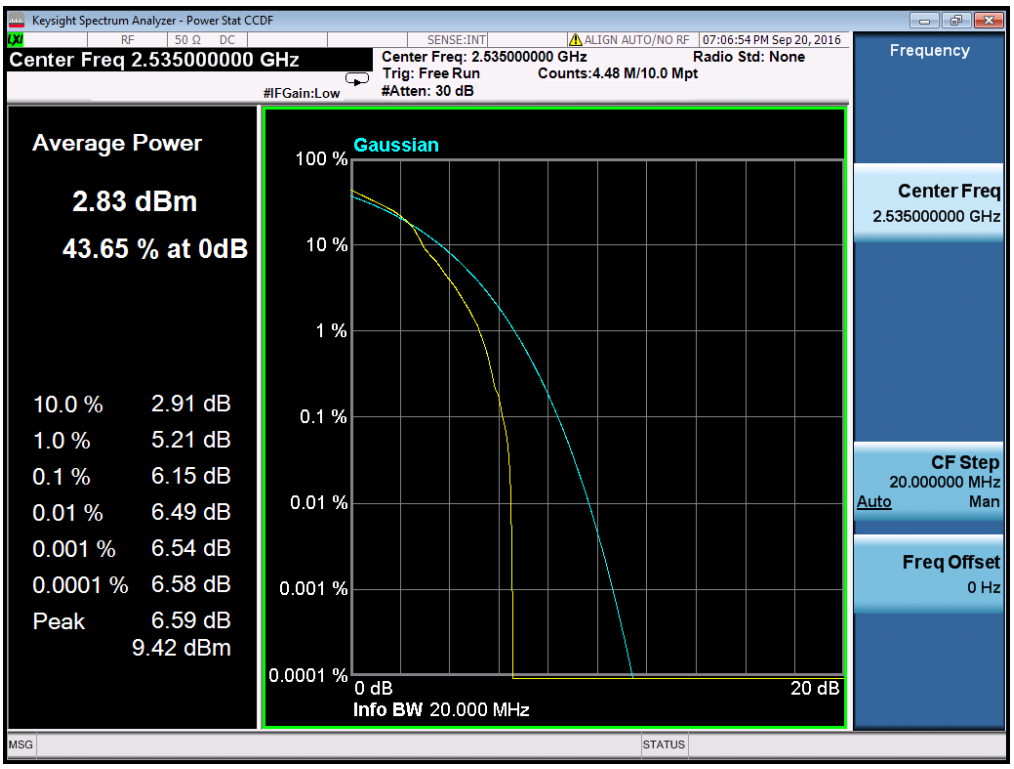
(Plot B6: Band 5/10MHz/16QAM in H Ch 50RB Size)



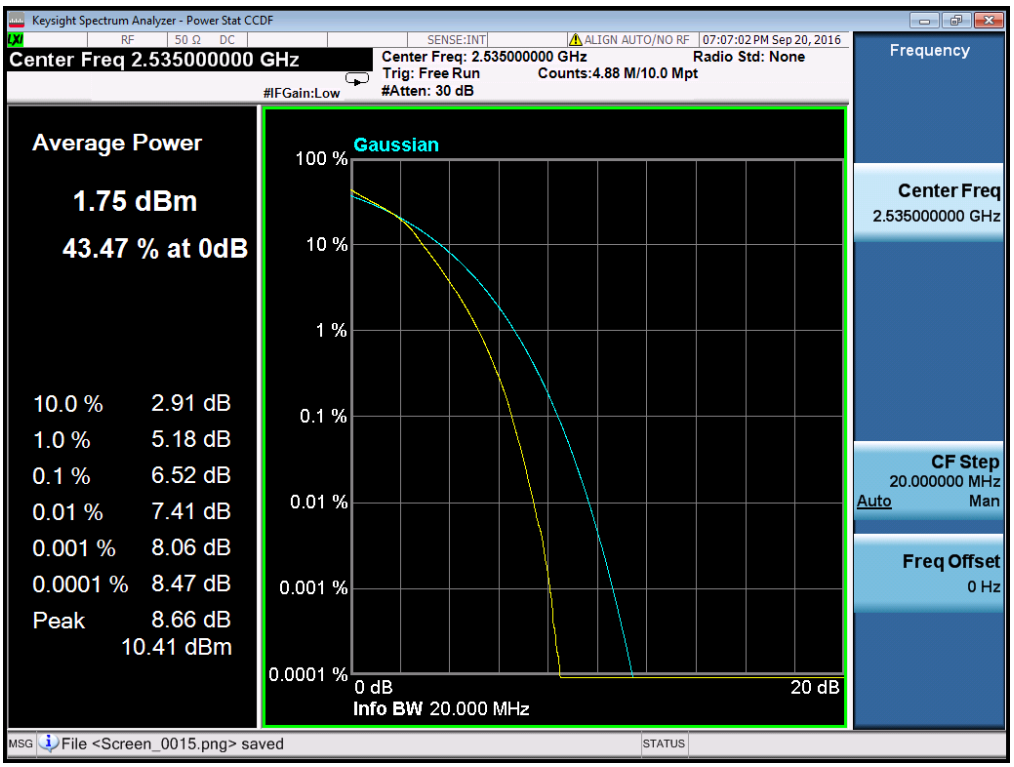
(Plot C1: Band 7/20MHz/16QAM in L Ch 1RB Size)



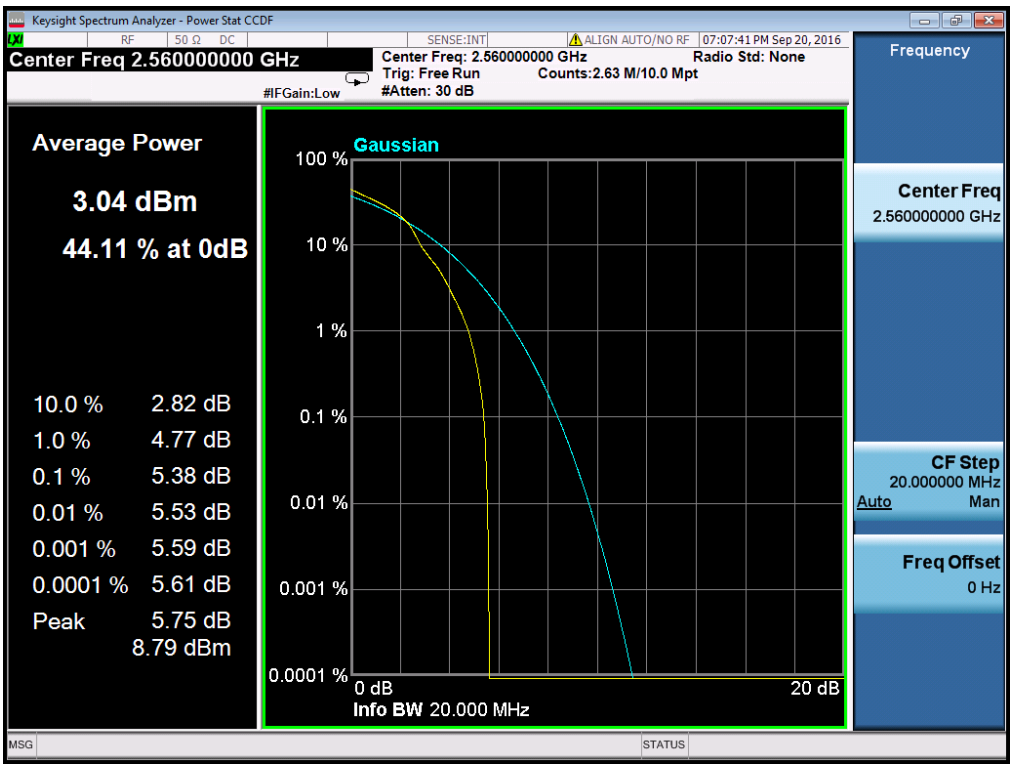
(Plot C2: Band 7/20MHz/16QAM in L Ch 100RB Size)



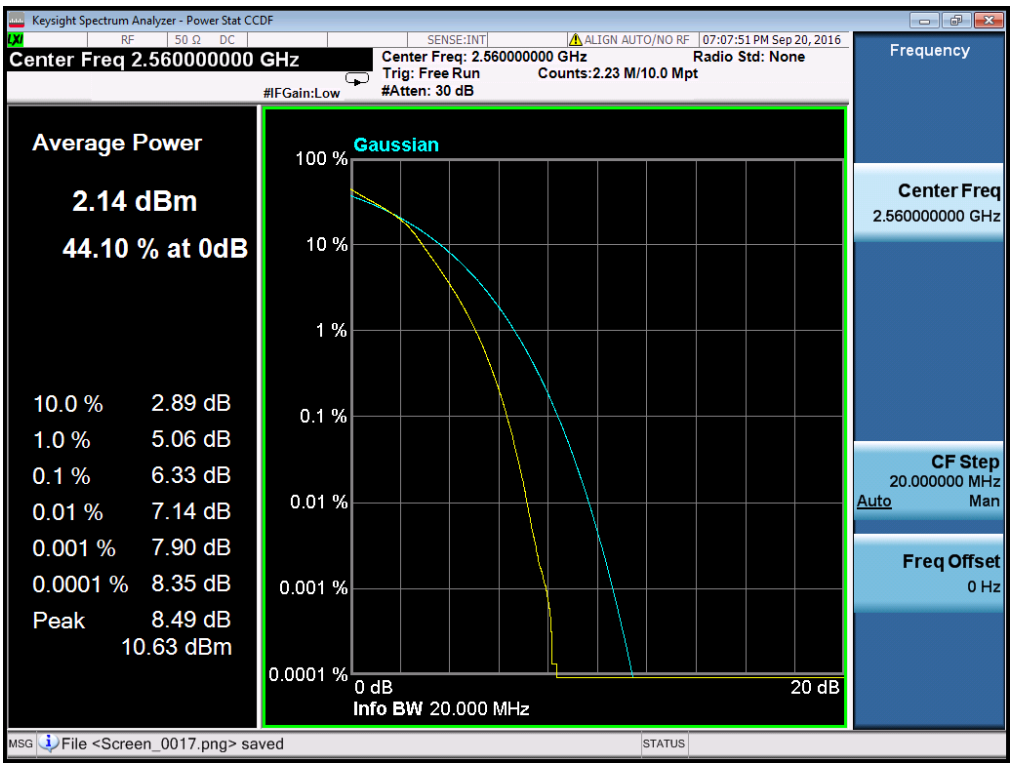
(Plot C3: Band 7/20MHz/16QAM in M Ch 1RB Size)



(Plot C4: Band 7/20MHz/16QAM in M Ch 100RB Size)



(Plot C5: Band 7/20MHz/16QAM in H Ch 1RB Size)



(Plot C6: Band 7/20MHz/16QAM in H Ch 100RB Size)

2.3 99% Occupied Bandwidth and 26dB Bandwidth

2.3.1 Definition

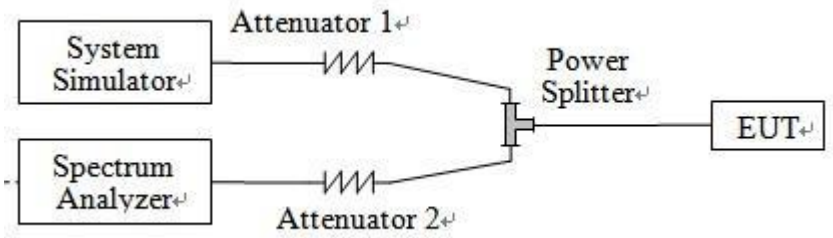
According to FCC section 2.1049, the occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

2.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

2.3.3 Test Setup



2.3.4 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The 26dB and 99% occupied bandwidth (BW) of the middle channel for the highest RF power with full RB sizes were measured.

2.3.5 Test Result of 99% Occupied Bandwidth and 26dB Bandwidth

LTE Band 4					
BW (MHz)	Channel	Frequency (MHz)	Mode	99% Occupied Bandwidth(MHz)	26dBBandwidth (MHz)
1.4	20175	1732.5	QPSK	1.09	1.28
			16QAM	1.10	1.26
3	20175	1732.5	QPSK	2.74	3.04
			16QAM	2.75	3.02
5	20175	1732.5	QPSK	4.53	5.09
			16QAM	4.52	5.02
10	20175	1732.5	QPSK	8.95	9.80
			16QAM	8.94	9.61
15	20175	1732.5	QPSK	13.48	14.88
			16QAM	13.48	14.81
20	20175	1732.5	QPSK	18.36	20.39
			16QAM	18.44	20.62

LTE Band 5					
BW (MHz)	Channel	Frequency (MHz)	Mode	99% Occupied Bandwidth(MHz)	26dBBandwidth (MHz)
1.4	20525	836.5	QPSK	1.10	1.28
			16QAM	1.09	1.26
3	20525	836.5	QPSK	2.73	3.04
			16QAM	2.74	3.03
5	20525	836.5	QPSK	4.53	5.09
			16QAM	4.51	5.04
10	20525	836.5	QPSK	8.94	9.73
			16QAM	8.93	9.68

LTE Band 7					
BW (MHz)	Channel	Frequency (MHz)	Mode	99% Occupied Bandwidth(MHz)	26dBBandwidth (MHz)
5	21100	2535	QPSK	4.52	5.02
			16QAM	4.53	5.07
10	21100	2535	QPSK	8.96	9.76
			16QAM	8.95	9.65
15	21100	2535	QPSK	13.52	14.90
			16QAM	13.49	14.84
20	21100	2535	QPSK	18.43	20.52
			16QAM	18.48	20.65

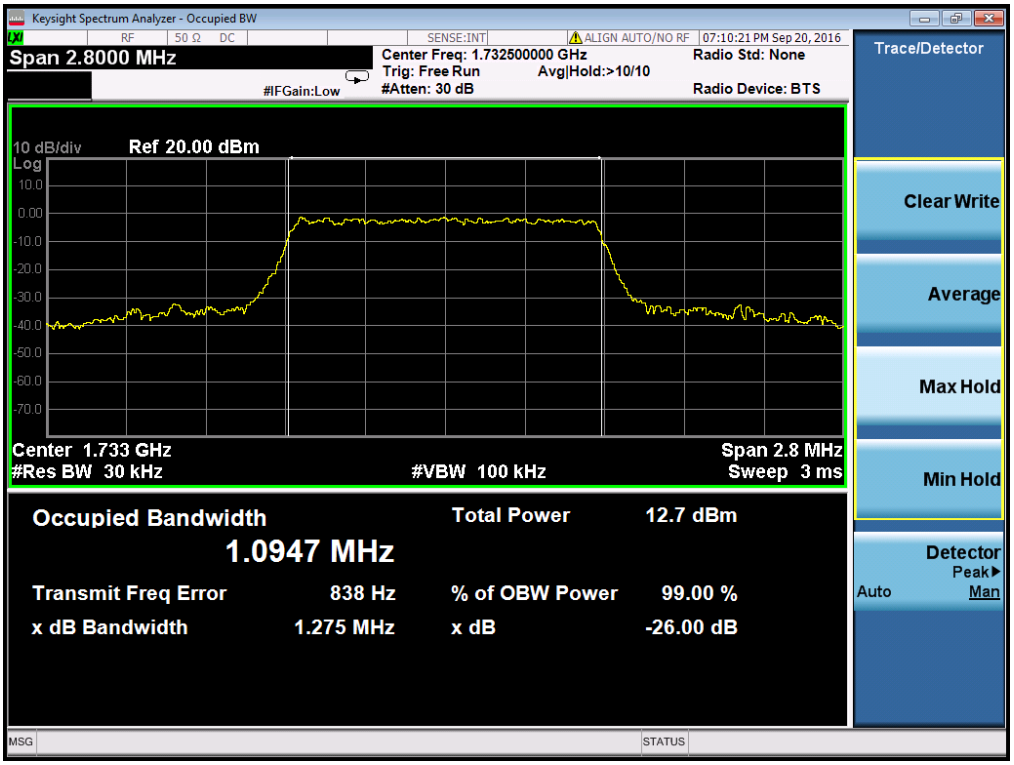
Note: The maximum RB configurations of the 99% Occupied Bandwidth and 26dB Bandwidth summary as below:

BW1.4MHz RB setting: RB Size 6,RB Offset 0 BW3MHz RB setting: RB Size 15,RB Offset 0

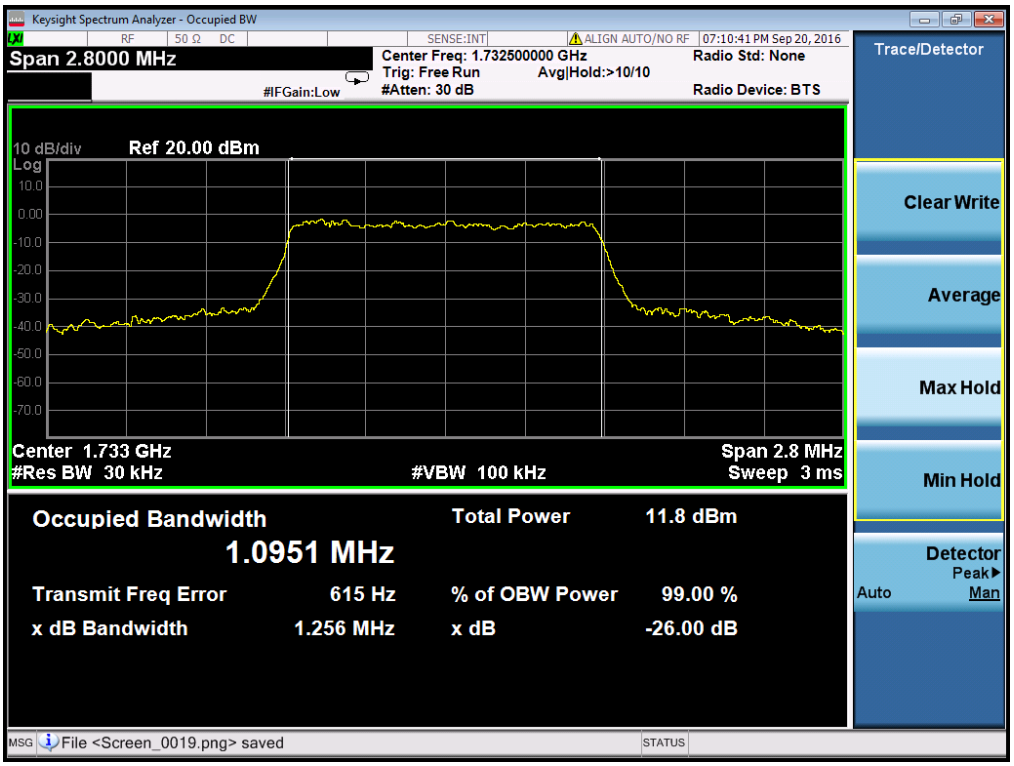
BW5MHz RB setting: RB Size 25,RB Offset 0 BW10MHz RB setting: RB Size 50,RB Offset 0

BW15MHz RB setting: RB Size 75,RB Offset 0 BW20MHz RB setting: RB Size 100,RB Offset 0

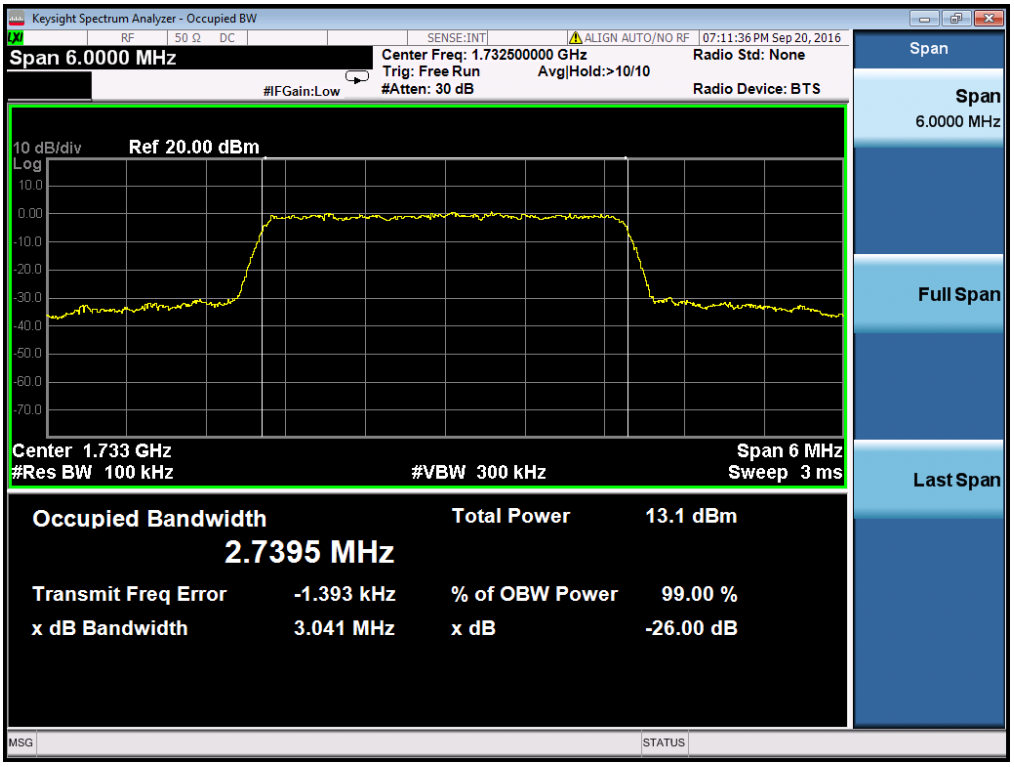
2.3.6 Test Result (Plots) of 99% Occupied Bandwidth and 26dB Bandwidth



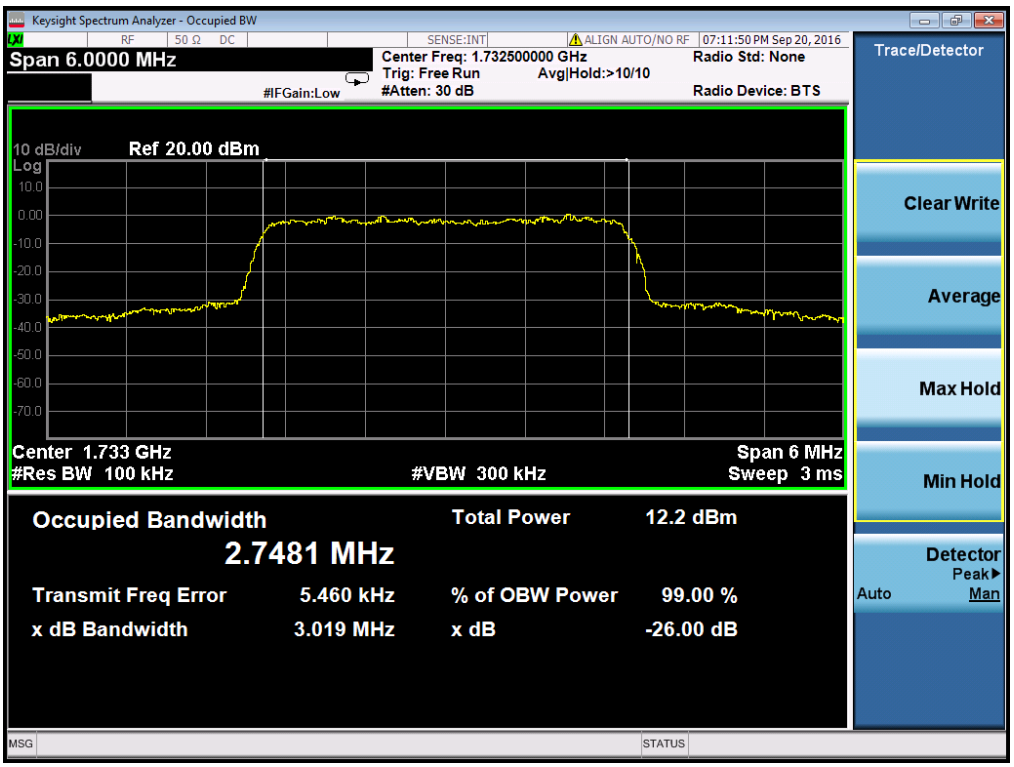
Occupied Bandwidth LTE Band 4/1.4MHz/QPSK



Occupied Bandwidth LTE Band 4/1.4MHz/16QAM

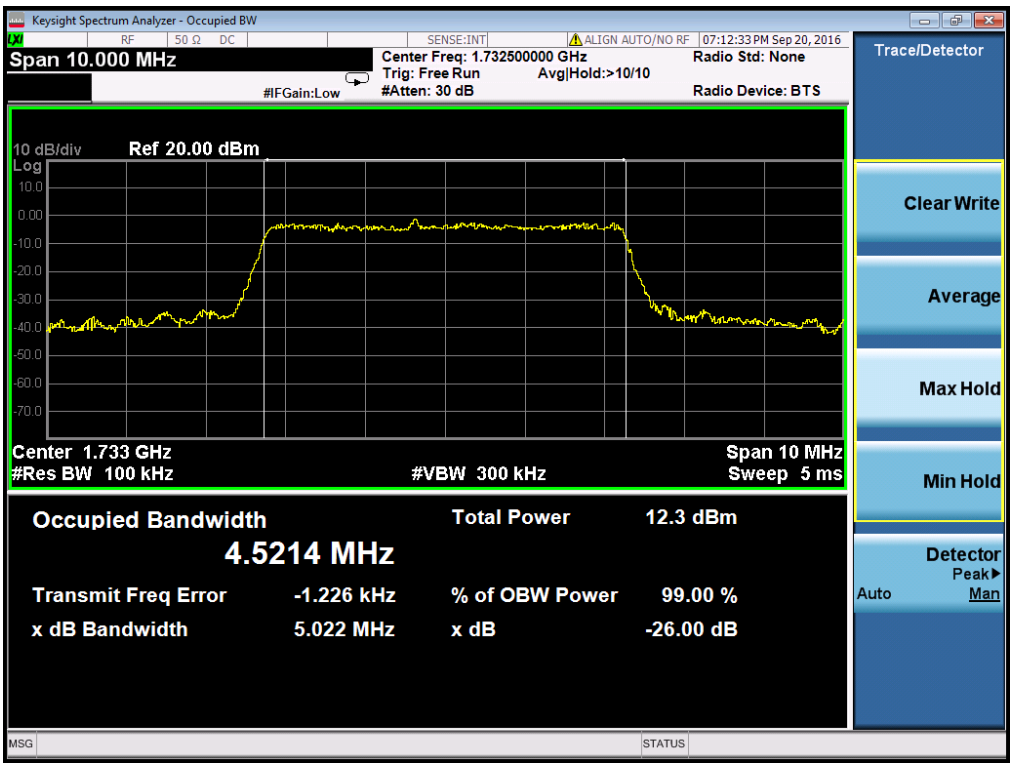


Occupied Bandwidth LTE Band 4/3MHz/QPSK

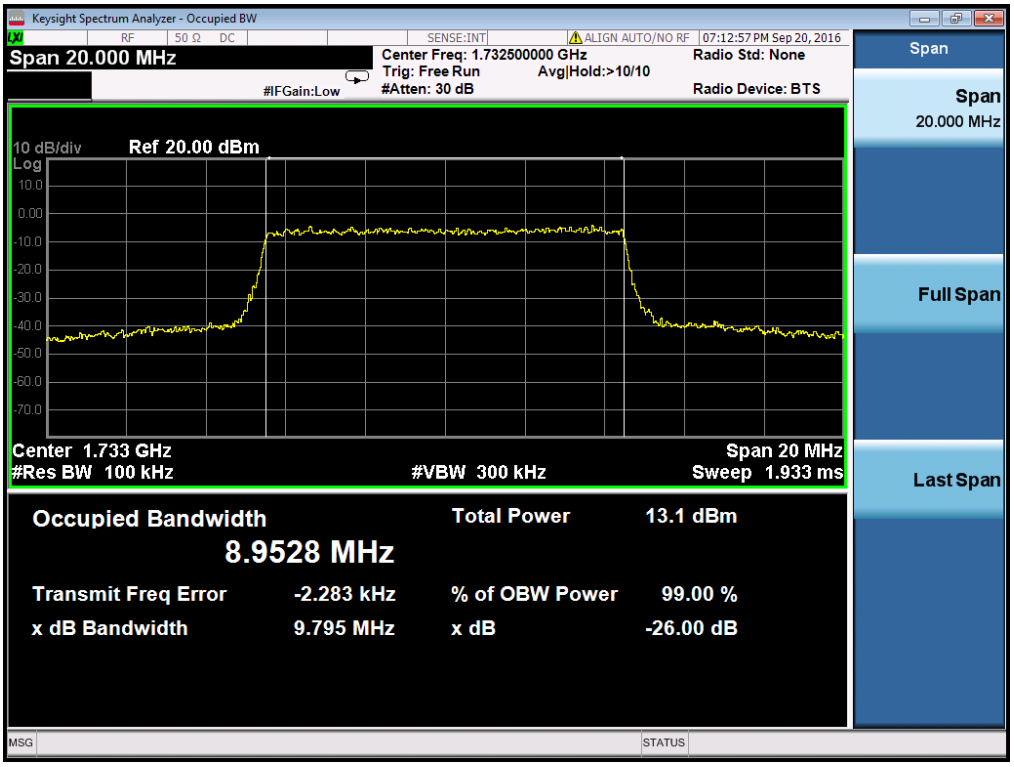


Occupied Bandwidth LTE Band 4/3MHz/16QAM

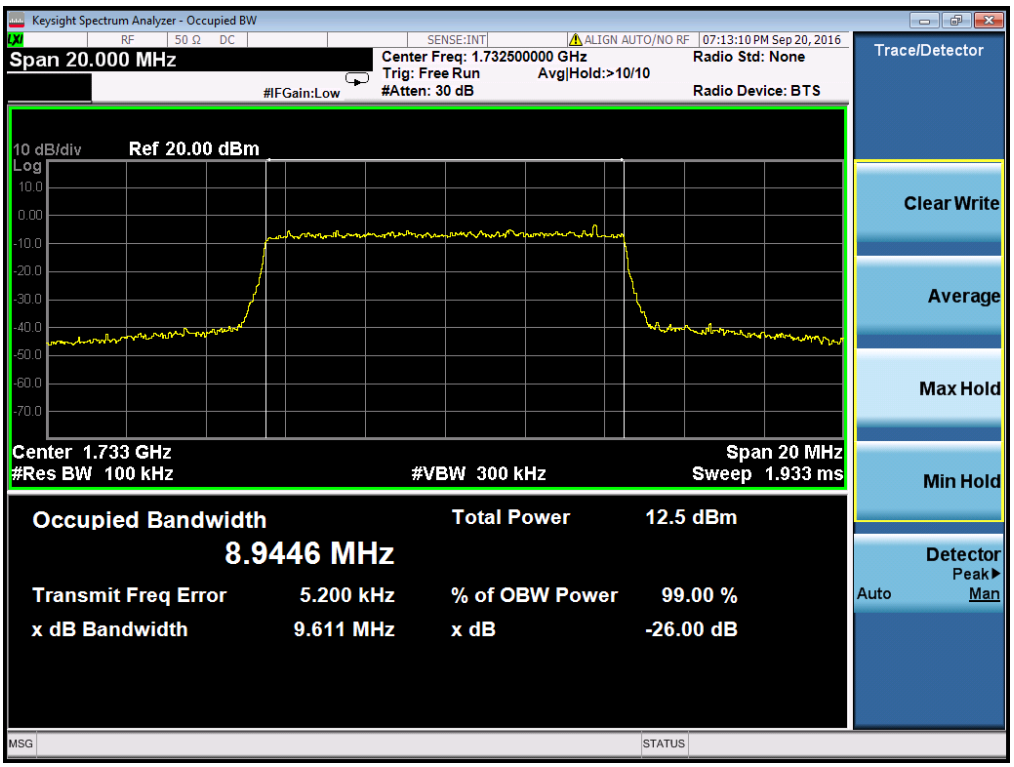
Occupied Bandwidth LTE Band 4/5MHz/QPSK



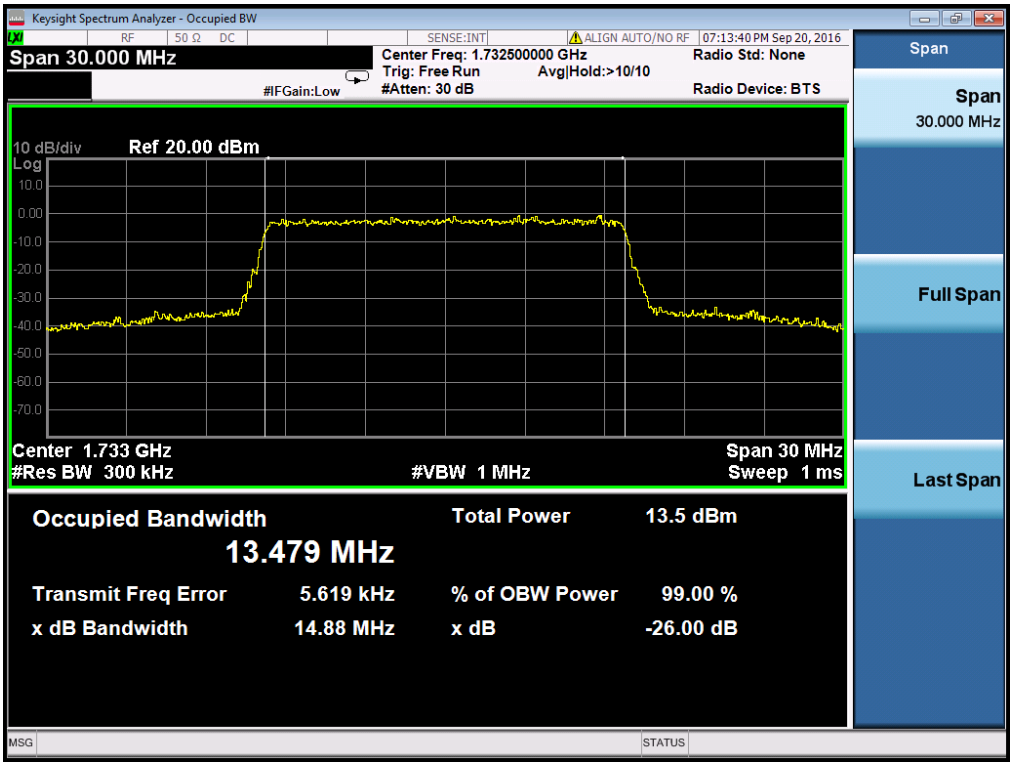
Occupied Bandwidth LTE Band 4/5MHz/16QAM



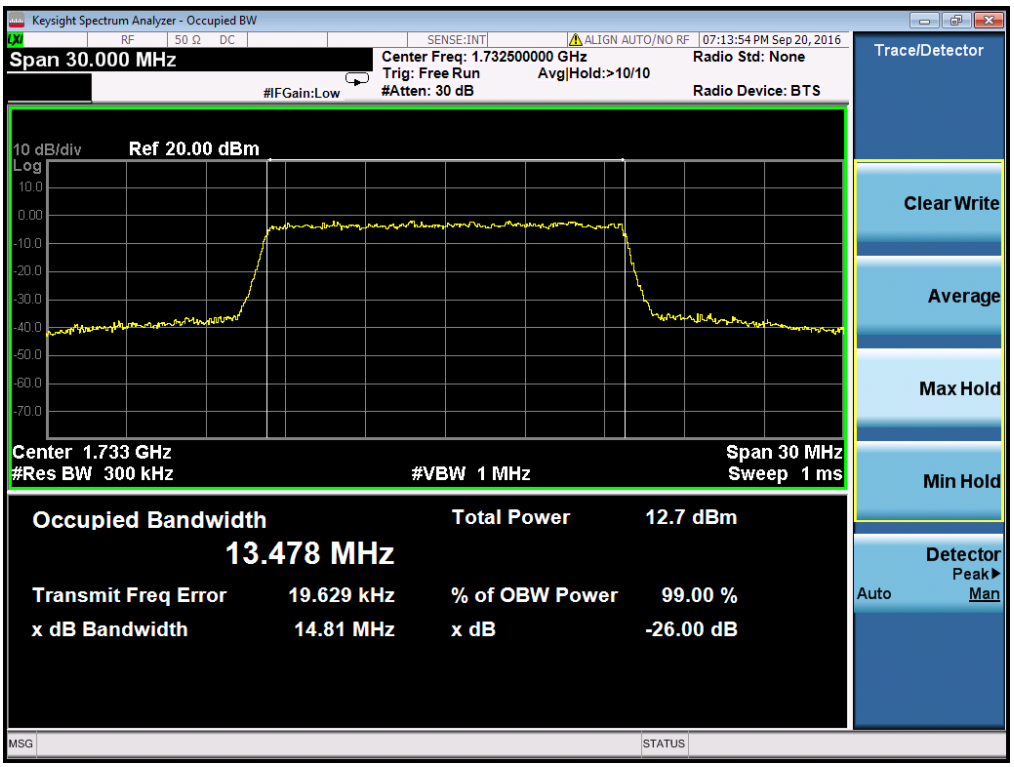
Occupied Bandwidth LTE Band 4/10MHz/QPSK



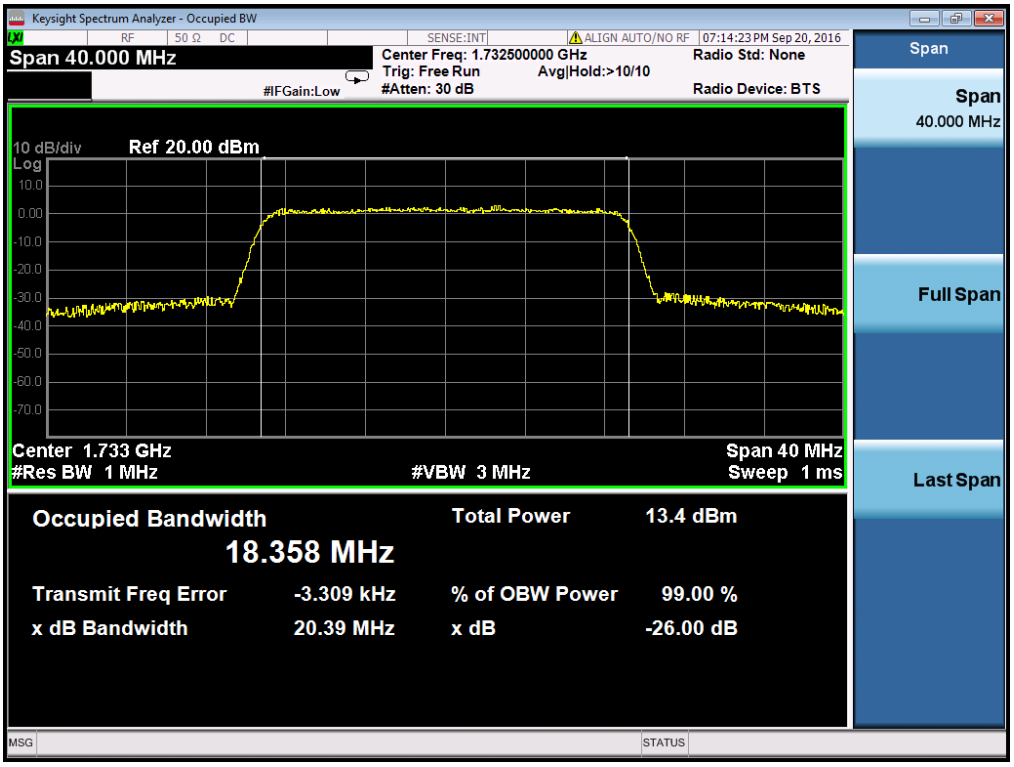
Occupied Bandwidth LTE Band 4/10MHz/16QAM



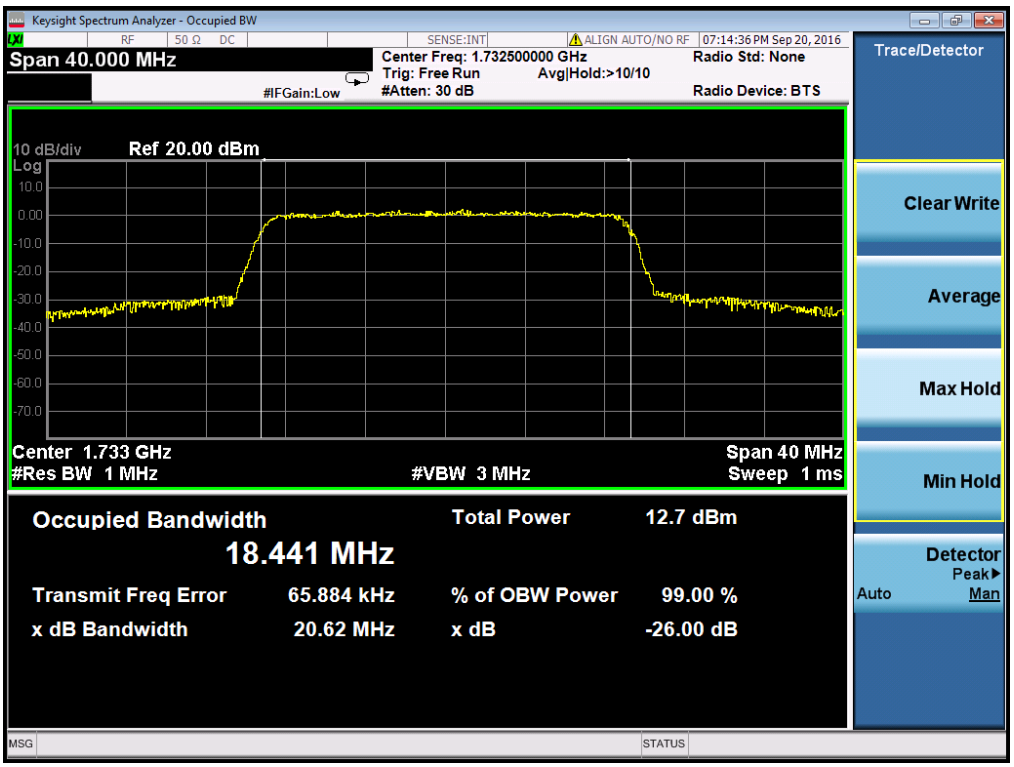
Occupied Bandwidth LTE Band 4/15MHz/QPSK



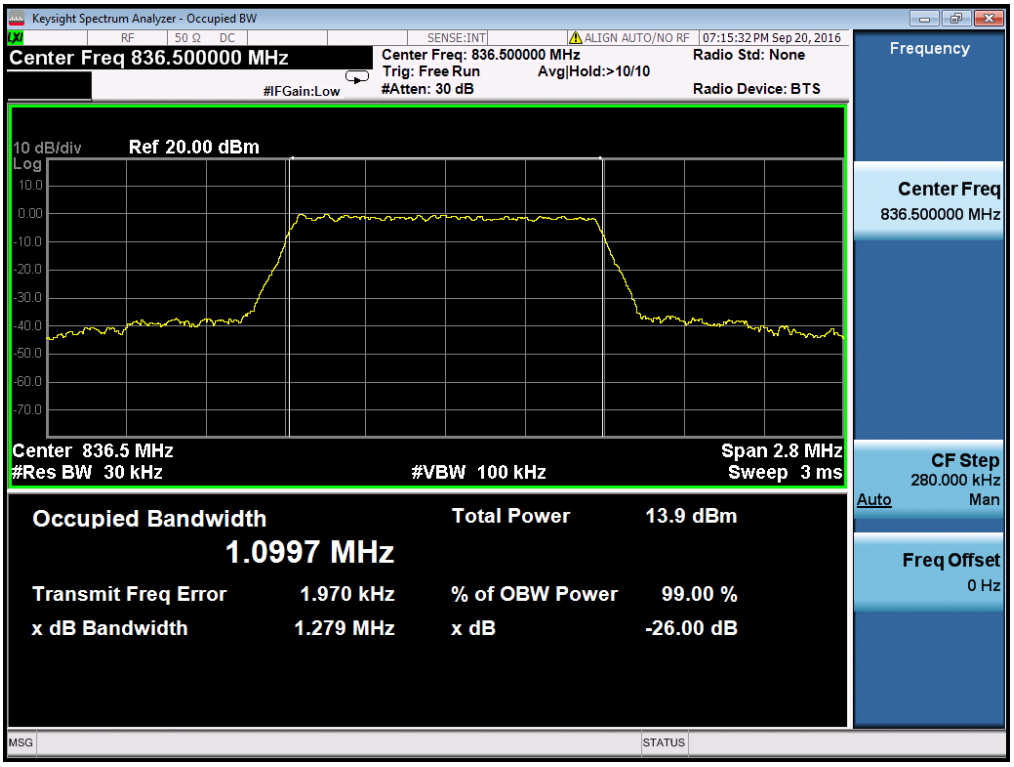
Occupied Bandwidth LTE Band 4/15MHz/16QAM



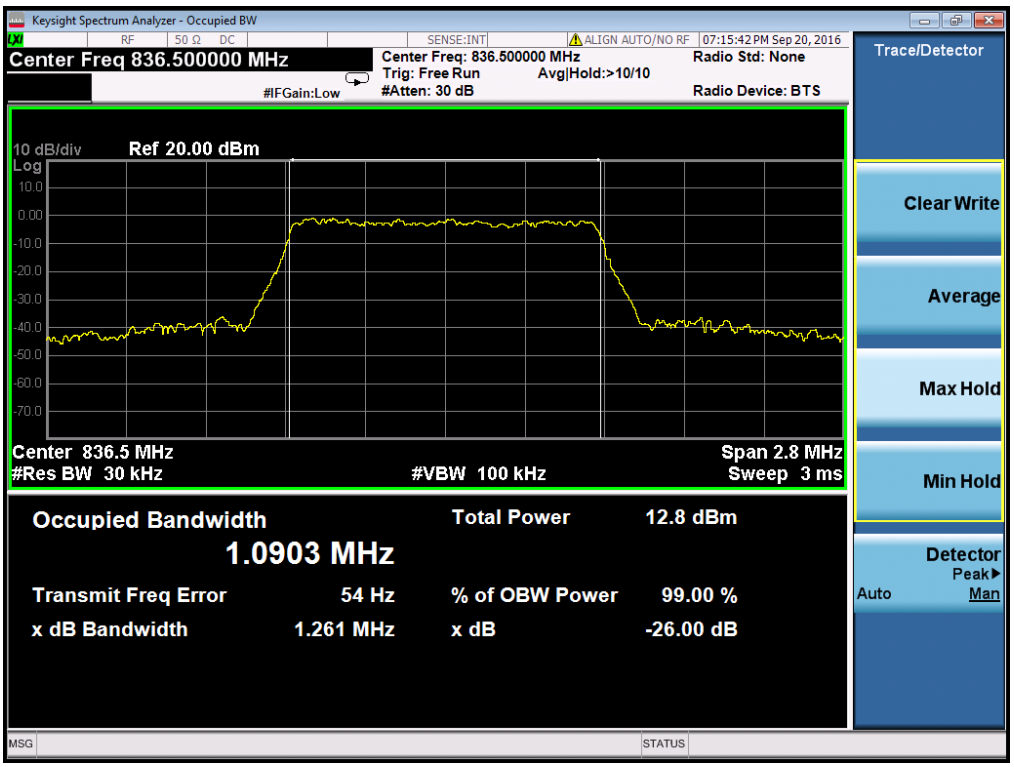
Occupied Bandwidth LTE Band 4/20MHz/QPSK



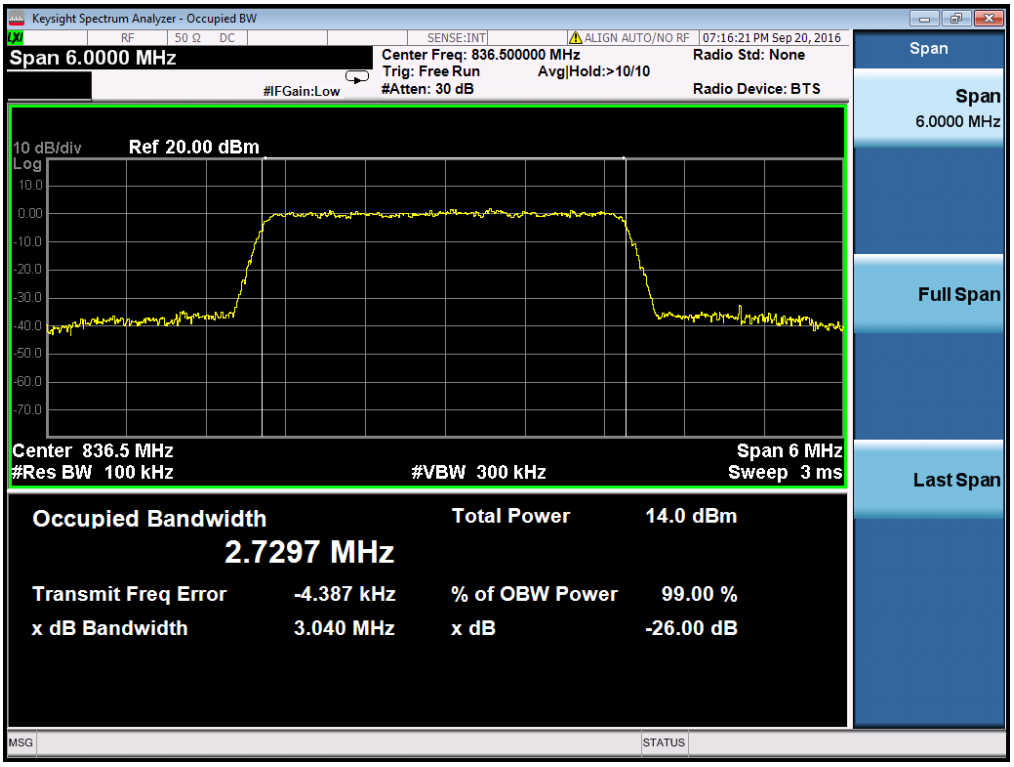
Occupied Bandwidth LTE Band 4/20MHz/16QAM



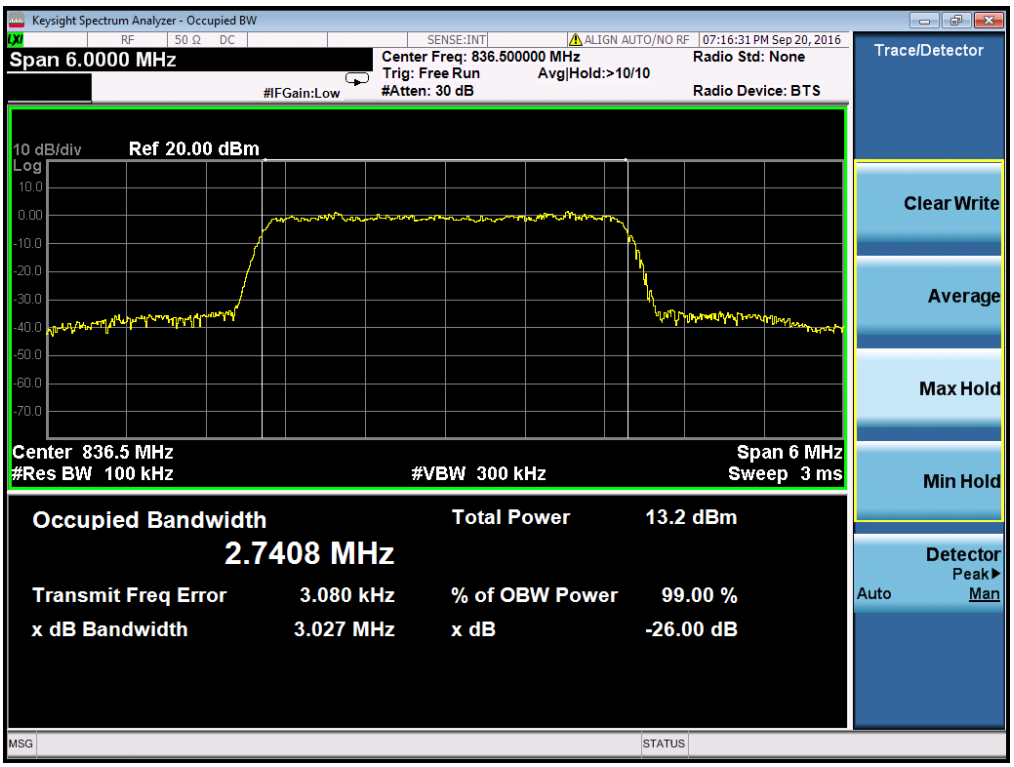
Occupied Bandwidth LTE Band 5/1.4MHz/QPSK



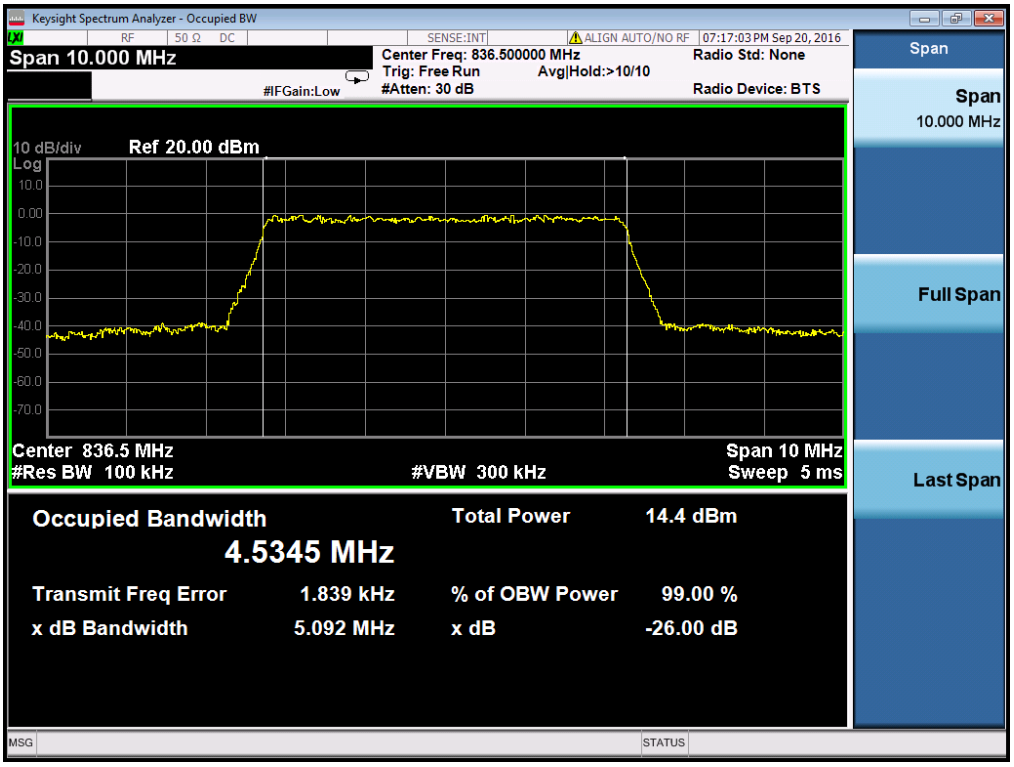
Occupied Bandwidth LTE Band 5/1.4MHz/16QAM



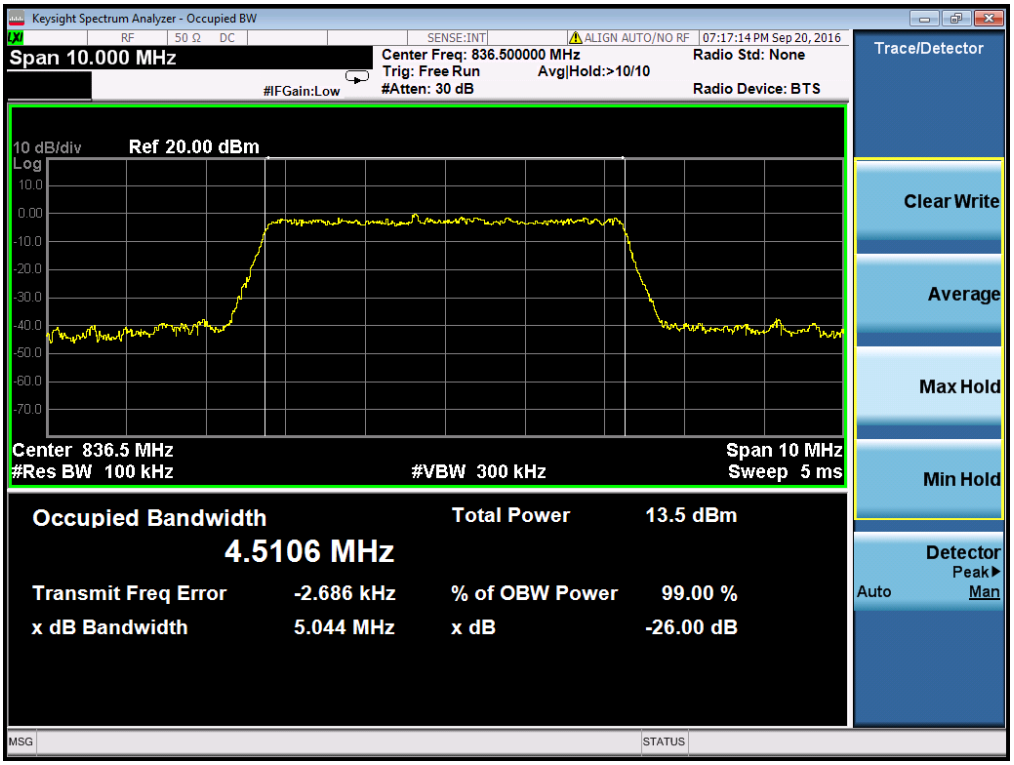
Occupied Bandwidth LTE Band 5/3MHz/QPSK



Occupied Bandwidth LTE Band 5/3MHz/16QAM

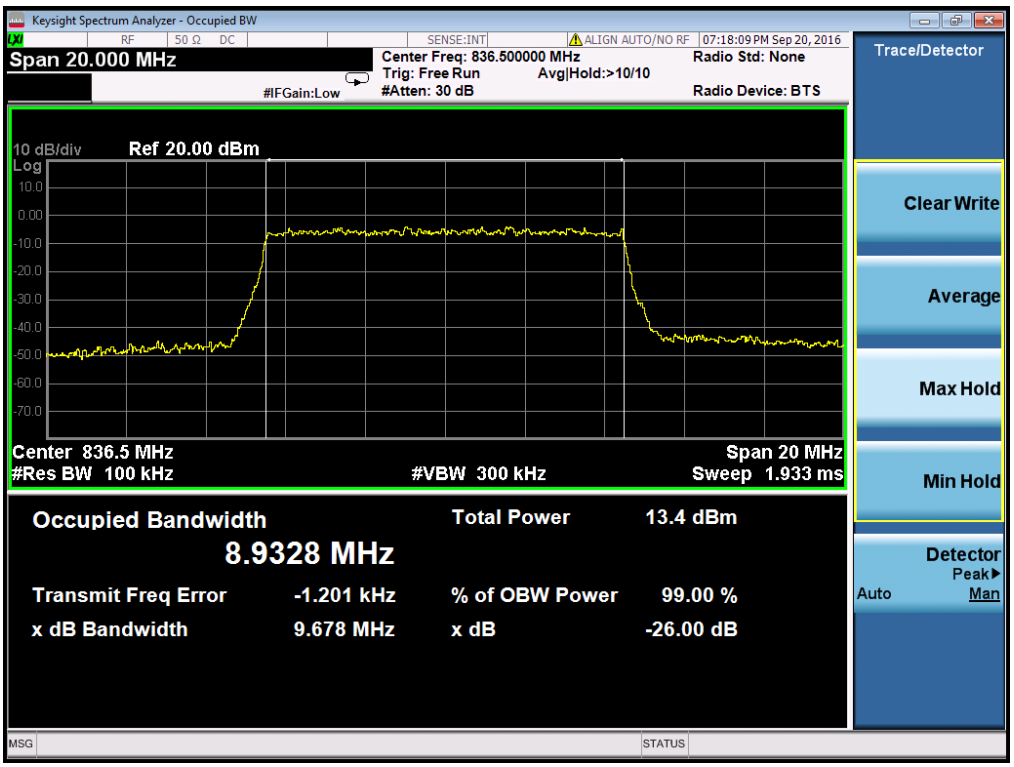


Occupied Bandwidth LTE Band 5/5MHz/QPSK

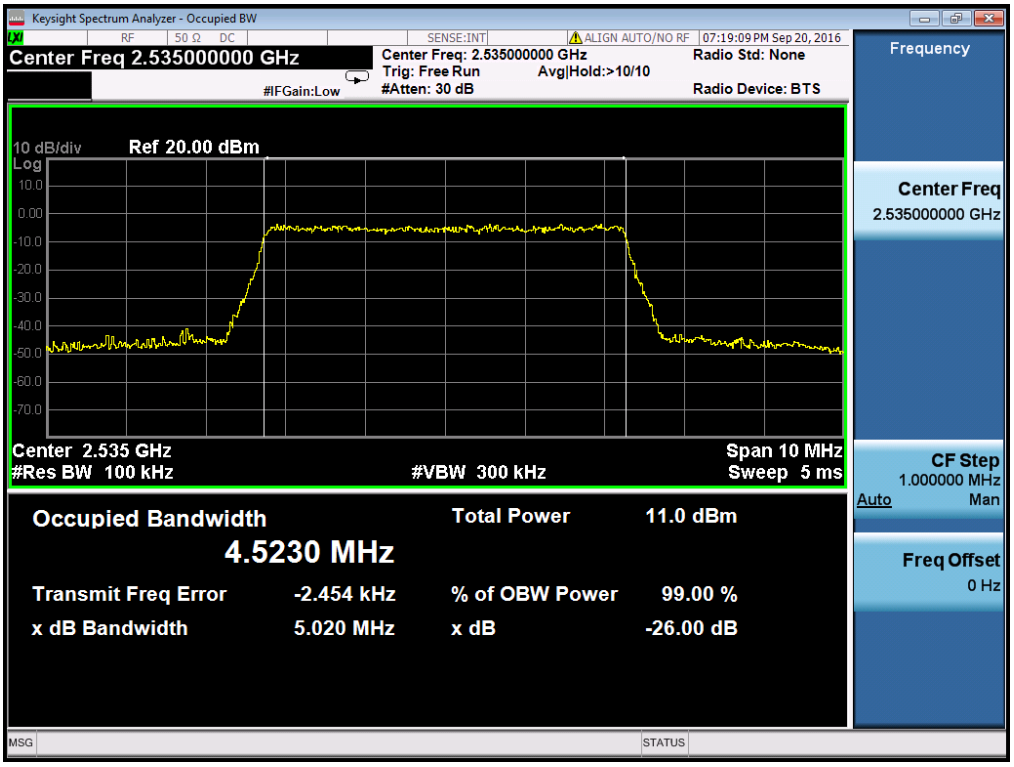


Occupied Bandwidth LTE Band 5/5MHz/16QAM

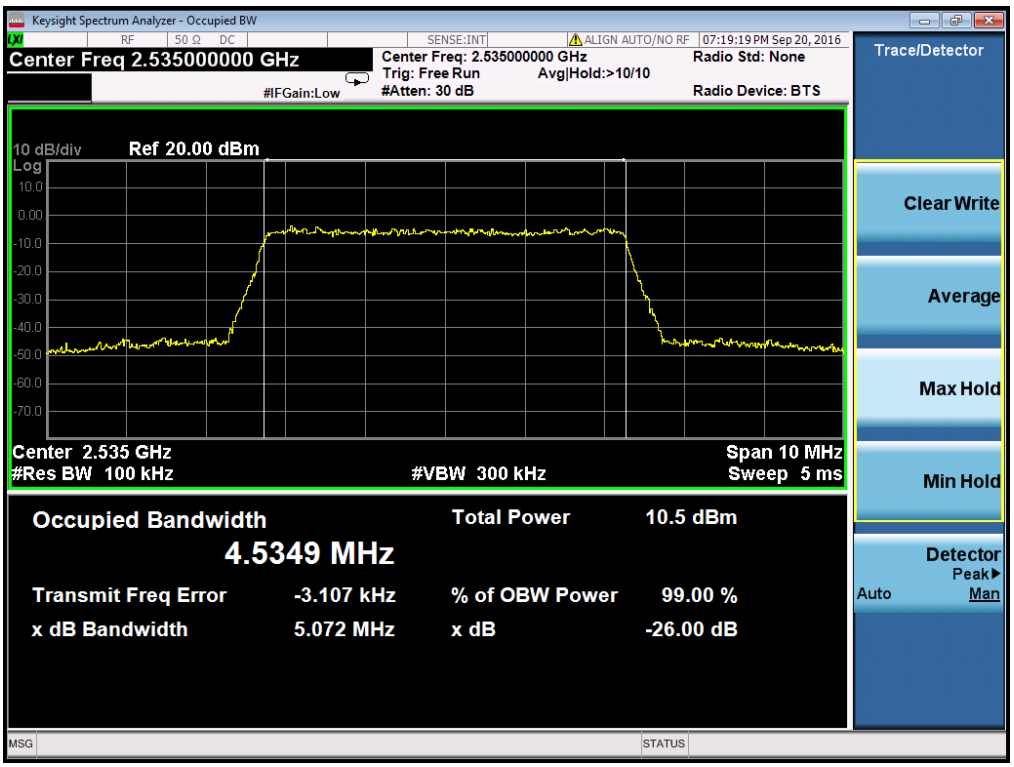
Occupied Bandwidth LTE Band 5/10MHz/QPSK



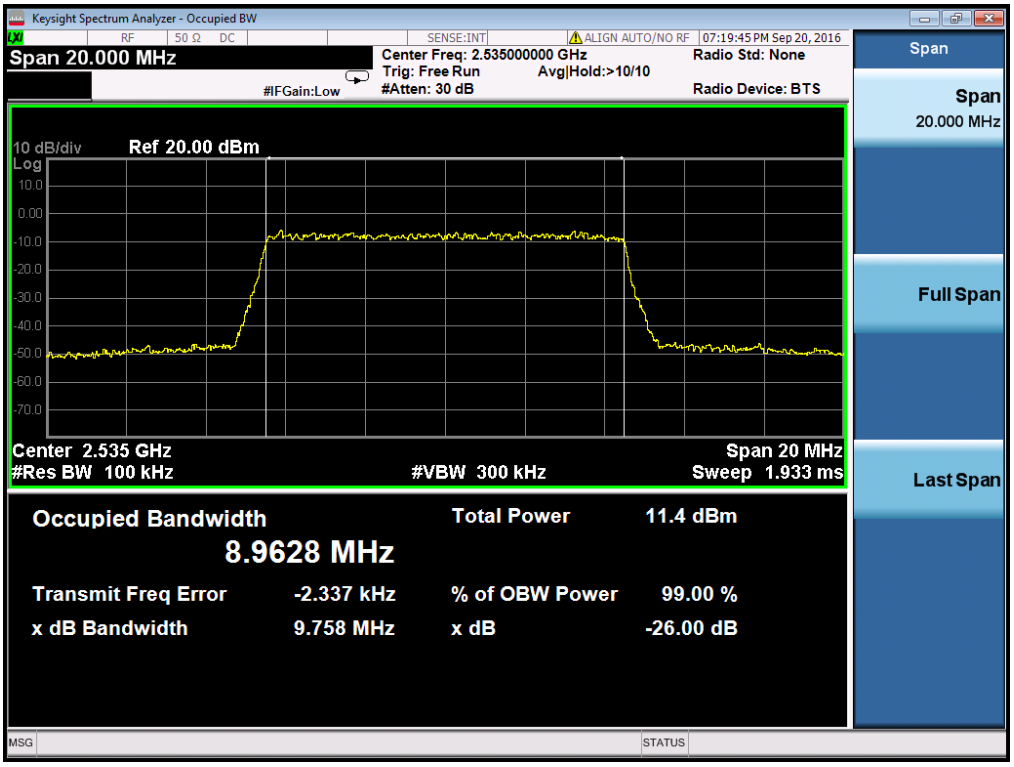
Occupied Bandwidth LTE Band 5/10MHz/16QAM



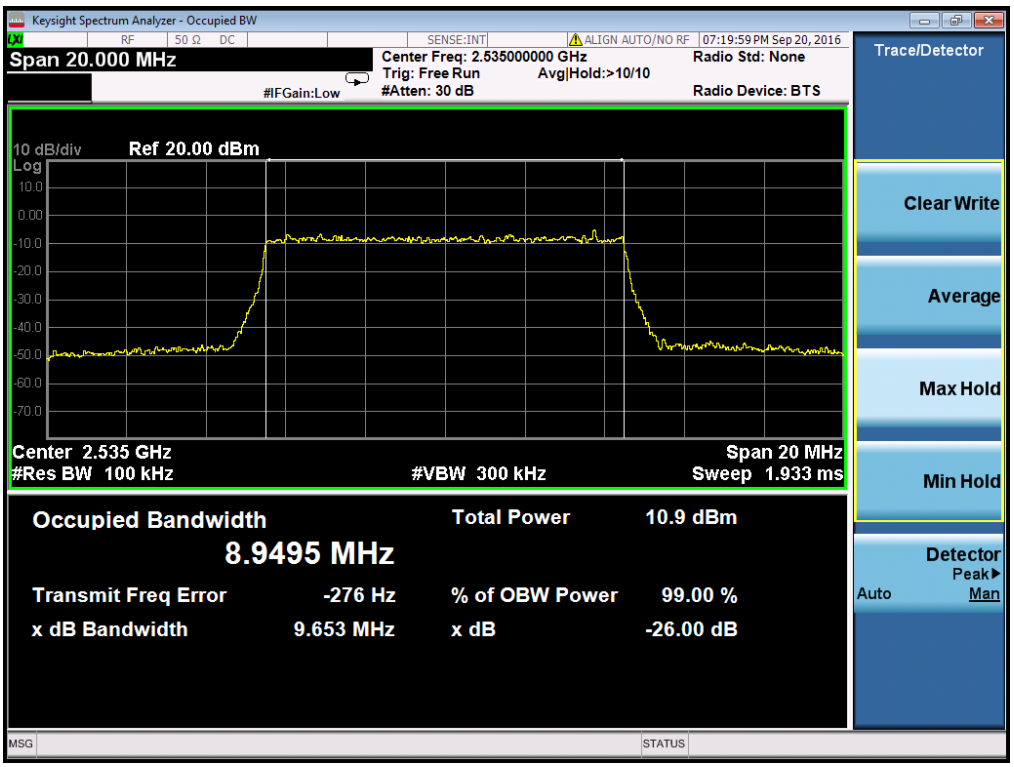
Occupied Bandwidth LTE Band 7/5MHz/QPSK



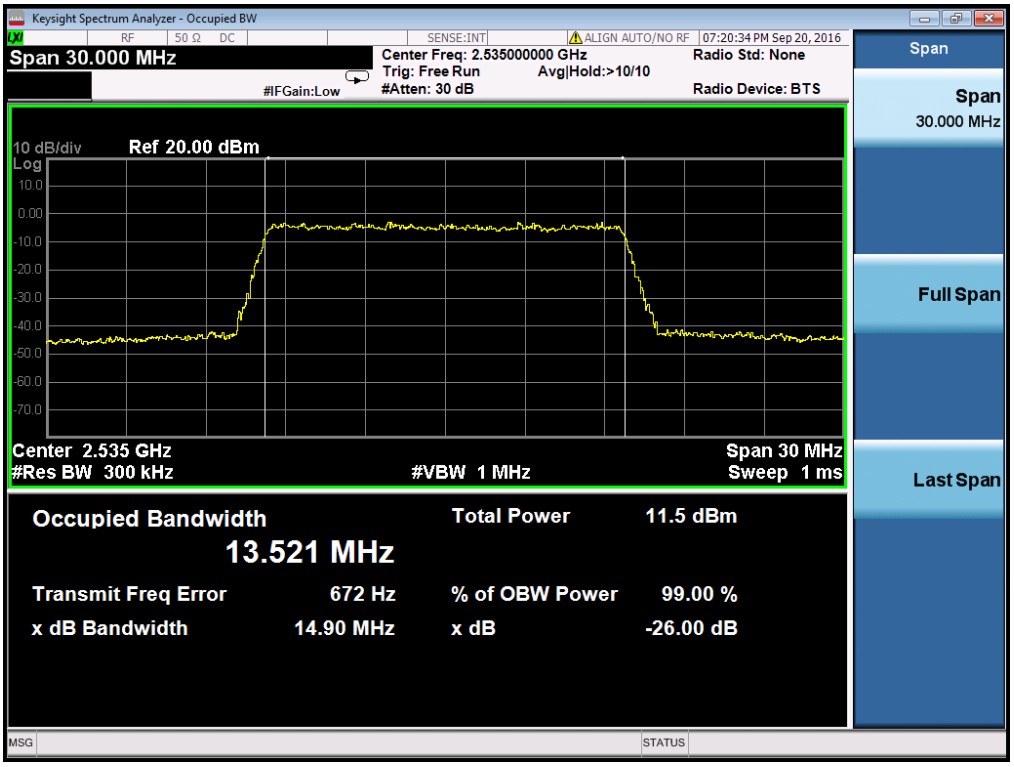
Occupied Bandwidth LTE Band 7/5MHz/16QAM



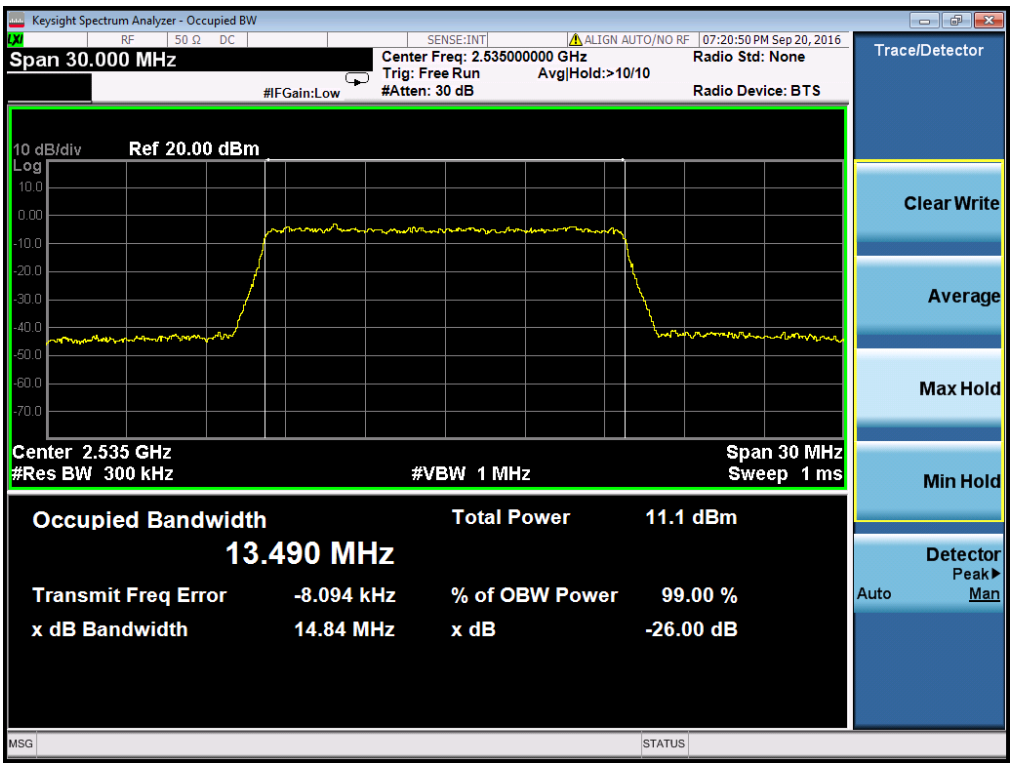
Occupied Bandwidth LTE Band 7/10MHz/QPSK



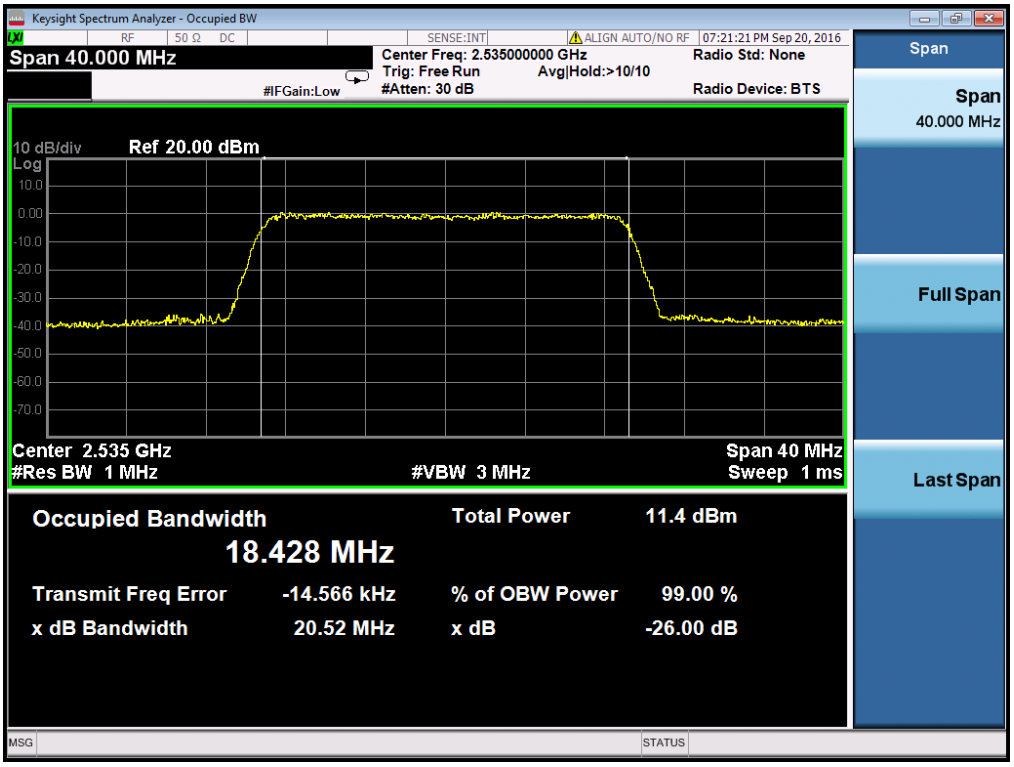
Occupied Bandwidth LTE Band 7/10MHz/16QAM



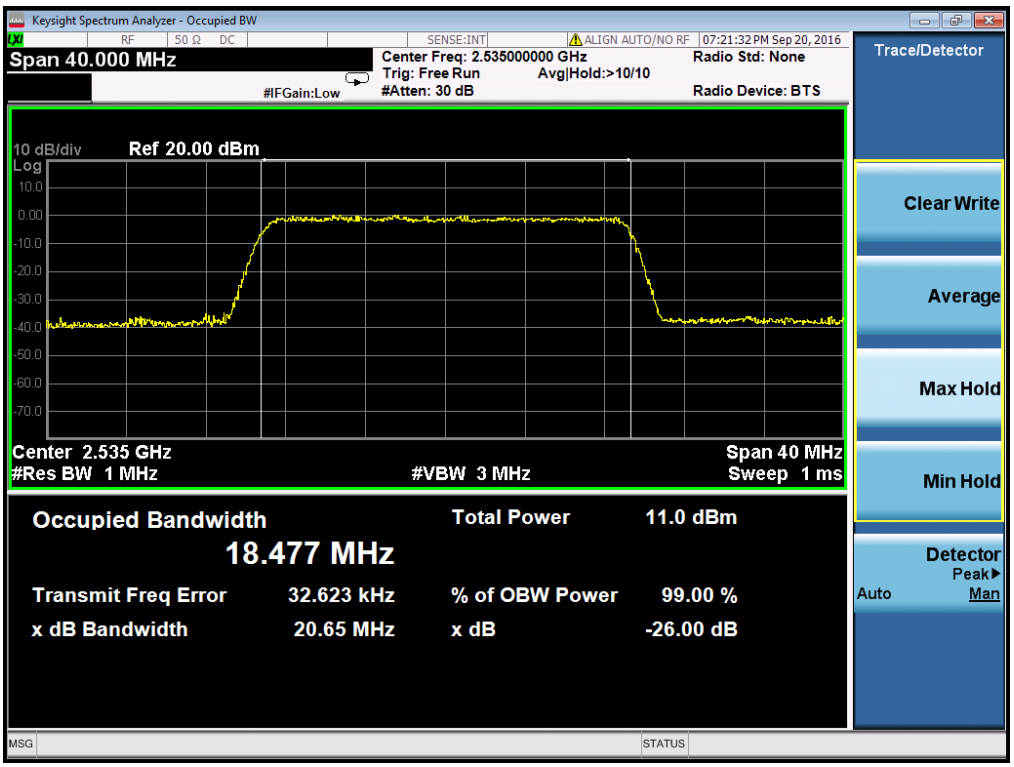
Occupied Bandwidth LTE Band 7/15MHz/QPSK



Occupied Bandwidth LTE Band 7/15MHz/16QAM



Occupied Bandwidth LTE Band 7/20MHz/QPSK



Occupied Bandwidth LTE Band 7/20MHz/16QAM

2.4 Frequency Stability

2.4.1 Requirement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency. According to FCC section 2.1055, the test conditions are:

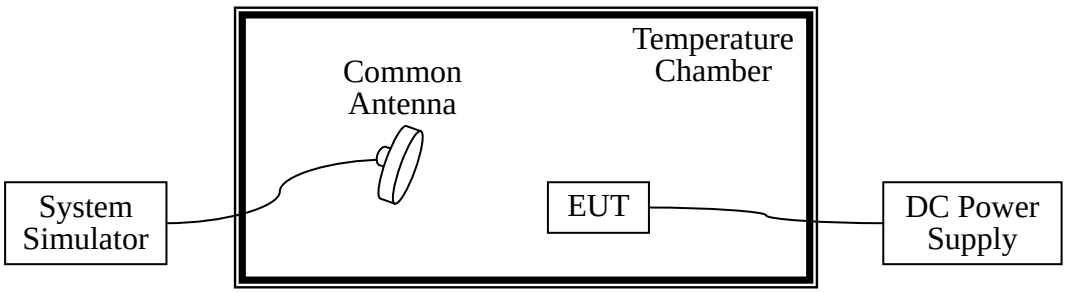
(a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.

(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.4.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3 Test Setup



2.4.4 Test Procedures

1. The EUT was set up in the thermal chamber and connected with the system simulator.

2. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized

before testing. Power was applied and the maximum change in frequency was recorded within one minute.

3. With power OFF, the temperature was raised in 10°C step up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.
4. The nominal, highest and lowest extreme voltages were tested, which are specified by the applicant; the normal temperature here used is 25°C.
5. The variation in frequency was measured for the worst case.

2.4.5 Test Result of Frequency Stability

1. LTE Band 4, QPSK ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 1732.5MHz		
Power (VDC)	Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Results
3.7	-30	52	0.03	Pass
	-20	22	0.01	
	-10	15	0.01	
	0	39	0.02	
	+10	16	0.01	
	+20	29	0.02	
	+30	20	0.01	
	+40	54	0.03	
	+55	29	0.02	
4.2	+25	37	0.02	
3.5	+25	51	0.03	

2. LTE Band 4, 16QAM ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 1732.5MHz		
Power (VDC)	Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Results
3.7	-30	32	0.02	Pass
	-20	57	0.03	
	-10	17	0.01	
	0	24	0.02	
	+10	36	0.02	
	+20	18	0.01	
	+30	36	0.02	
	+40	56	0.03	
	+55	33	0.02	
4.2	+25	59	0.03	
3.5	+25	36	0.02	

3. LTE Band 5, QPSK ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 836.5MHz		
Power (VDC)	Temperature (°C)	Frequency Error	Frequency Error	Limit
		Hz	ppm	ppm
3.7	-30	28	0.03	2.5
	-20	9	0.01	
	-10	17	0.02	
	0	39	0.04	
	+10	21	0.02	
	+20	10	0.01	
	+30	23	0.02	
	+40	42	0.04	
	+55	29	0.03	
4.2	+25	17	0.02	
3.5	+25	35	0.04	

4. LTE Band 5, 16QAM ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 836.5MHz		
Power (VDC)	Temperature (°C)	Frequency Error	Frequency Error	Limit
		Hz	ppm	ppm
3.7	-30	11	0.01	2.5
	-20	34	0.04	
	-10	26	0.03	
	0	18	0.02	
	+10	17	0.02	
	+20	19	0.02	
	+30	20	0.02	
	+40	26	0.03	
	+55	30	0.03	
4.2	+25	37	0.04	
3.5	+25	36	0.04	

5. LTE Band 7, QPSK ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 2535MHz		
Power (VDC)	Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Results
3.7	-30	49	0.02	Pass
	-20	53	0.02	
	-10	24	0.01	
	0	57	0.02	
	+10	25	0.01	
	+20	31	0.01	
	+30	33	0.01	
	+40	29	0.01	
	+55	22	0.01	
4.2	+25	57	0.02	
3.5	+25	55	0.02	

6. LTE Band 7,16QAM ,BW 10MHz

Test Conditions		Frequency Deviation BW 10MHz Middle Channel 2535MHz		
Power (VDC)	Temperature (°C)	Frequency Error Hz	Frequency Error ppm	Results
3.7	-30	21	0.01	Pass
	-20	52	0.02	
	-10	27	0.01	
	0	20	0.01	
	+10	26	0.01	
	+20	53	0.02	
	+30	57	0.02	
	+40	27	0.01	
	+55	25	0.01	
4.2	+25	20	0.01	
3.5	+25	59	0.02	

2.5 Conducted Out of Band Emissions

2.5.1 Requirement

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. This calculated to be -13dBm.

For Band 7:

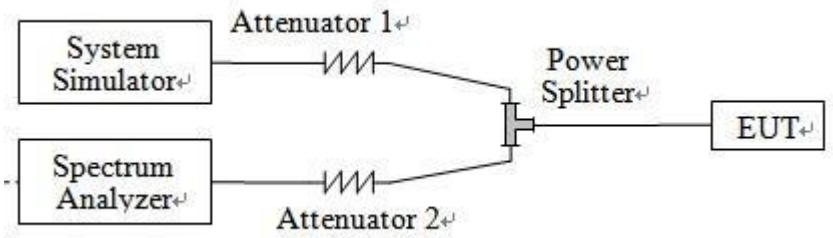
The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power(P) by a factor of at least 55+10 log(P) dB. This calculated to be -25dBm.

It is measured by means of a calibrated spectrum analyzer and scanned from 30MHz up to a frequency including its 10th harmonic.

2.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

2.5.3 Test Setup



2.5.4 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. The middle channel for the highest RF power within the transmitting frequency was

measured.

4. The conducted spurious emission for the whole frequency range was taken.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)

   = P(W)- [43 + 10log(P)] (dB)

   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

   = -13dBm.
8. For Band 7

   The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

   = P(W)- [55 + 10log(P)] (dB)

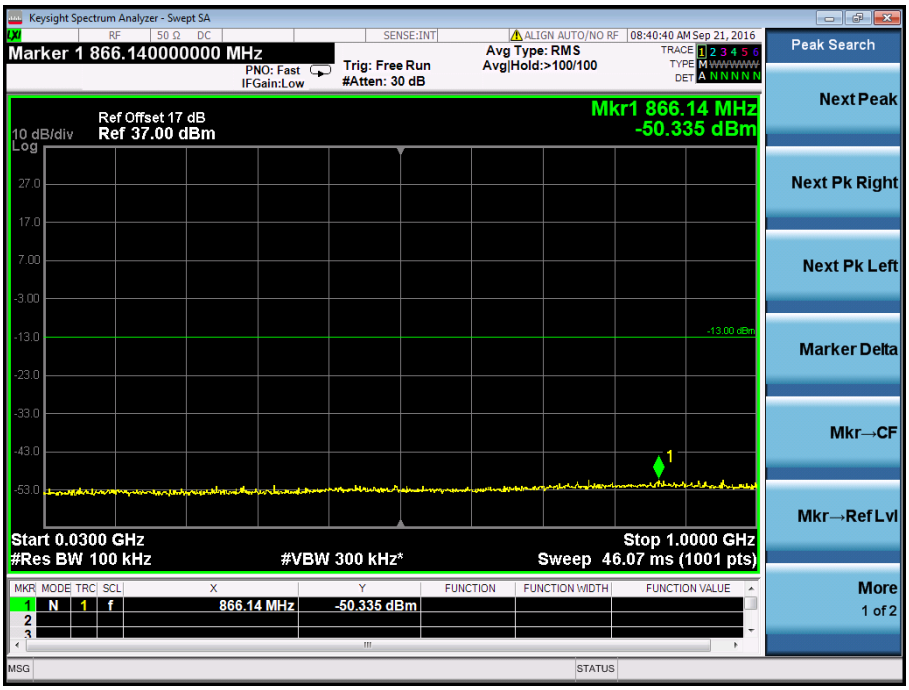
   = [30 + 10log(P)] (dBm) - [55 + 10log(P)] (dB)

   = -25dBm.

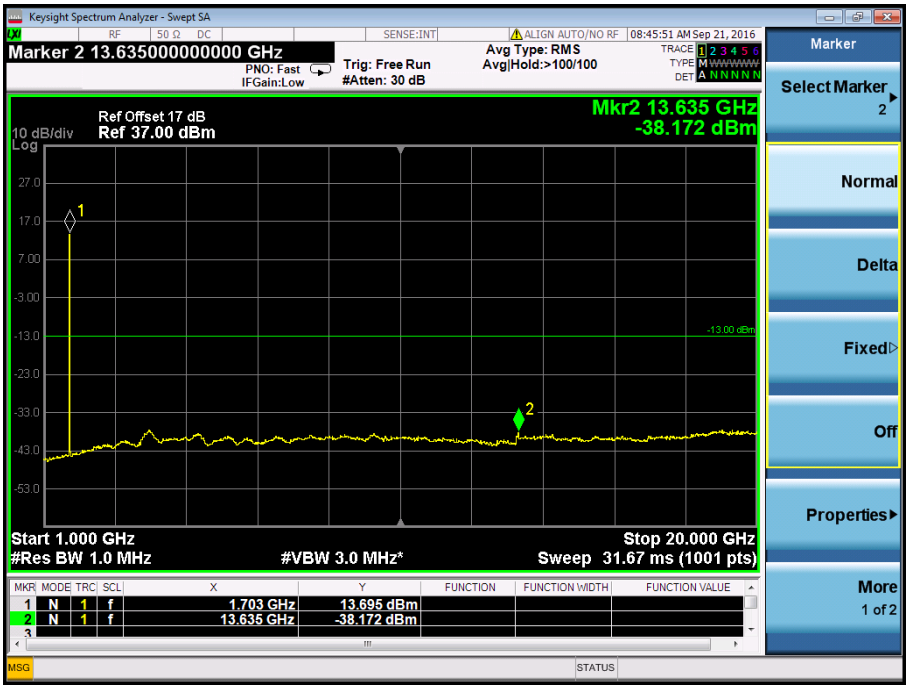
2.5.5 Test Result of Conducted Spurious Emission

Note: For 9 KHz to 30MHz: the amplitude of spurious emissions is attenuated by more than 20dB below the permissible value, so we not provide the test result here

Band	LTE Band 4	Channel	Low
Bandwidth	1.4MHz	Modulation	QPSK

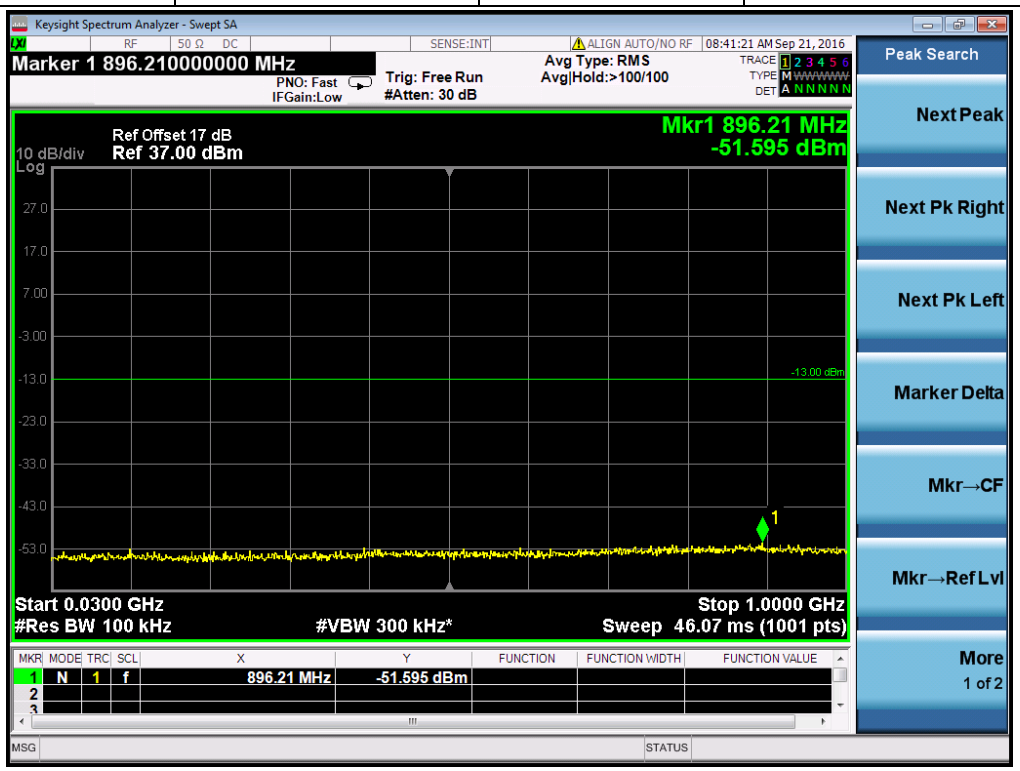


RB Size 1, RB Offset 0 30MHz to 1GHz

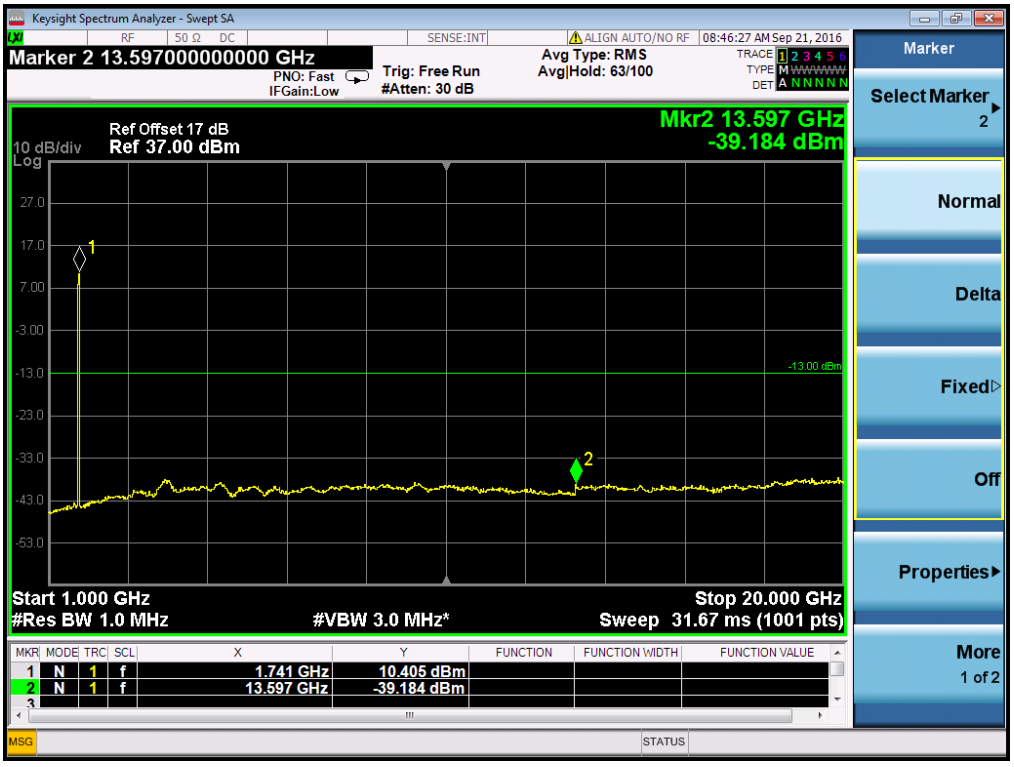


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Middle
Bandwidth	1.4MHz	Modulation	QPSK

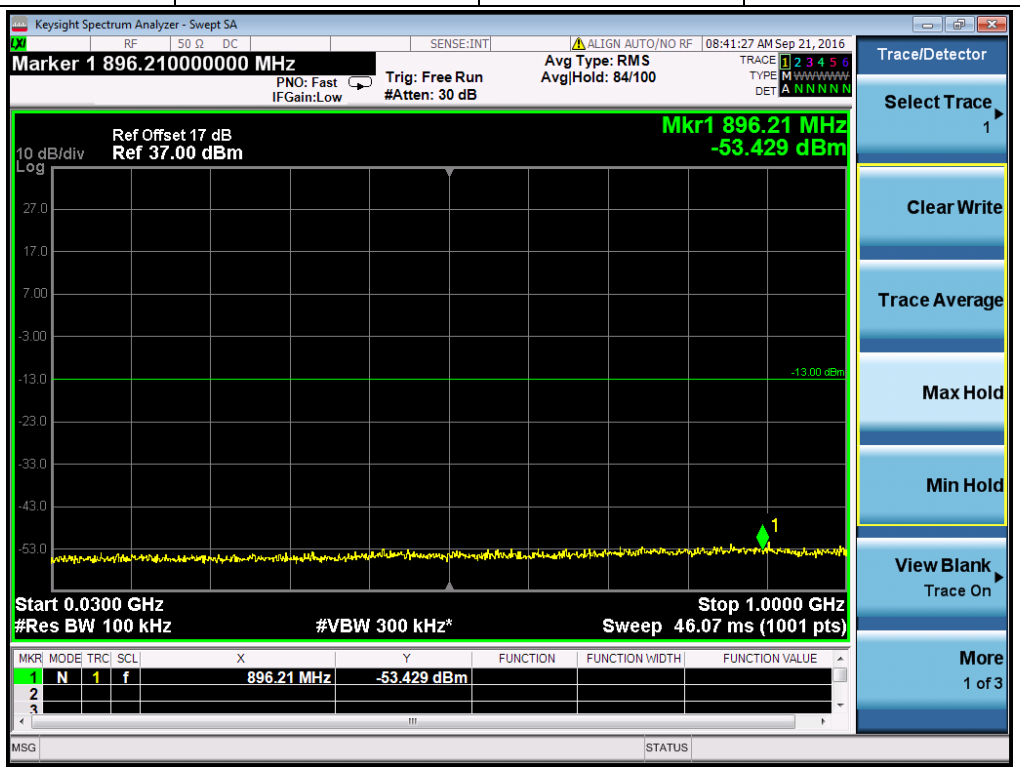


RB Size 1, RB Offset 0 30MHz to 1GHz

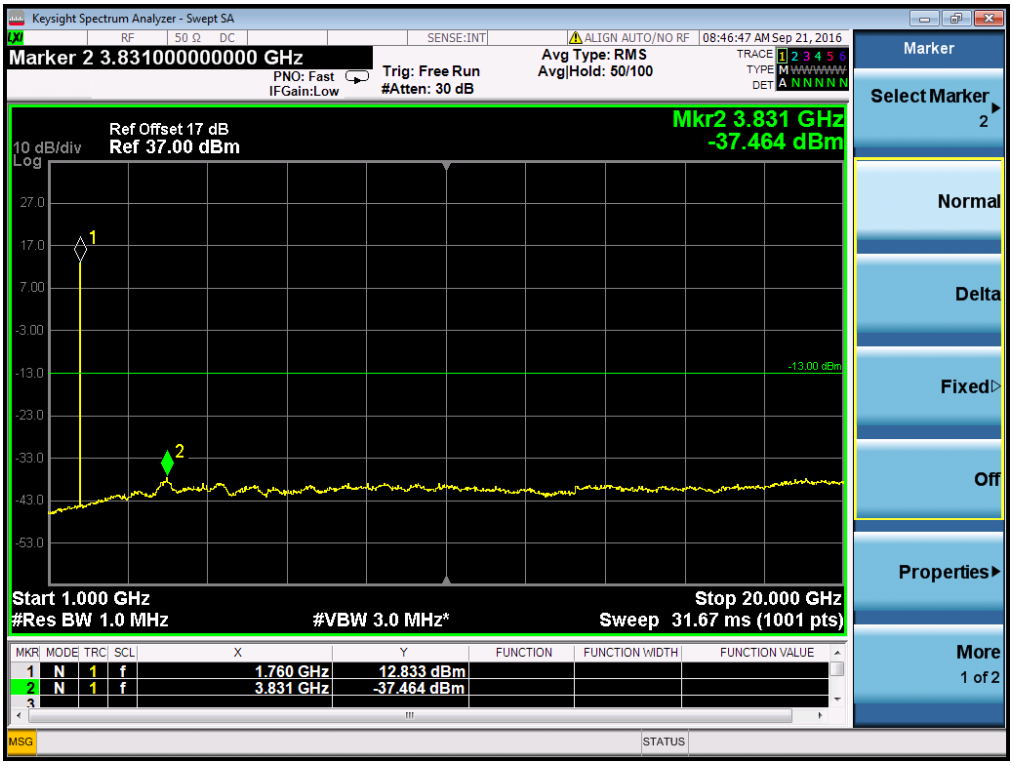


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	1.4MHz	Modulation	QPSK

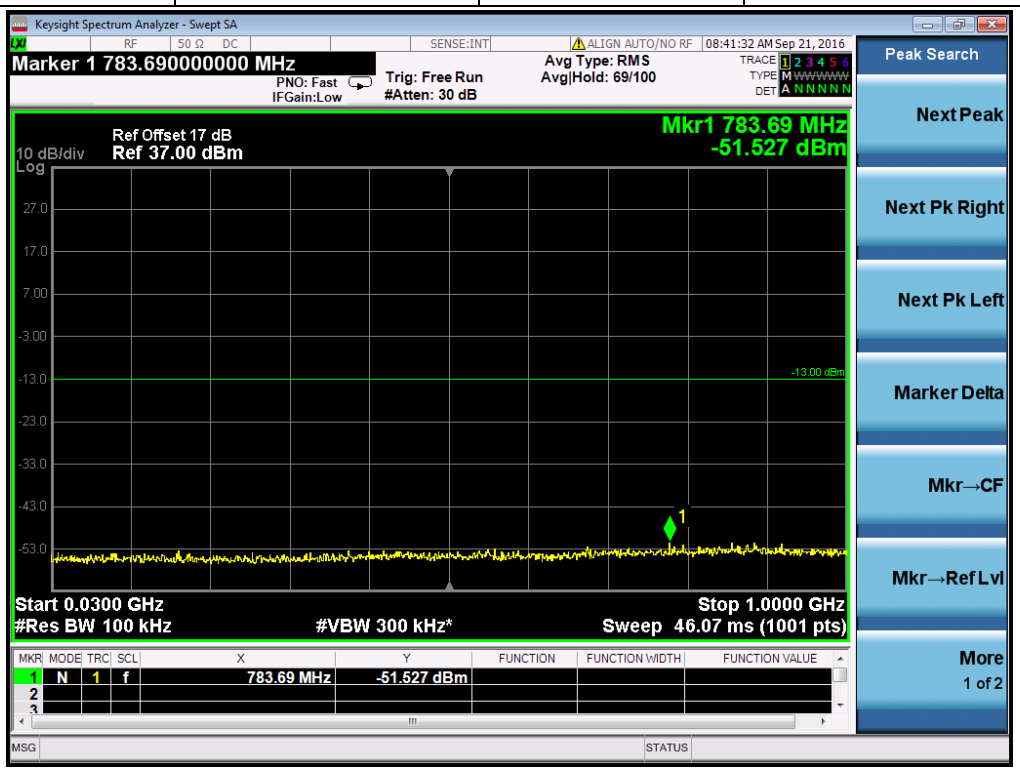


RB Size 1, RB Offset 0 30MHz to 1GHz

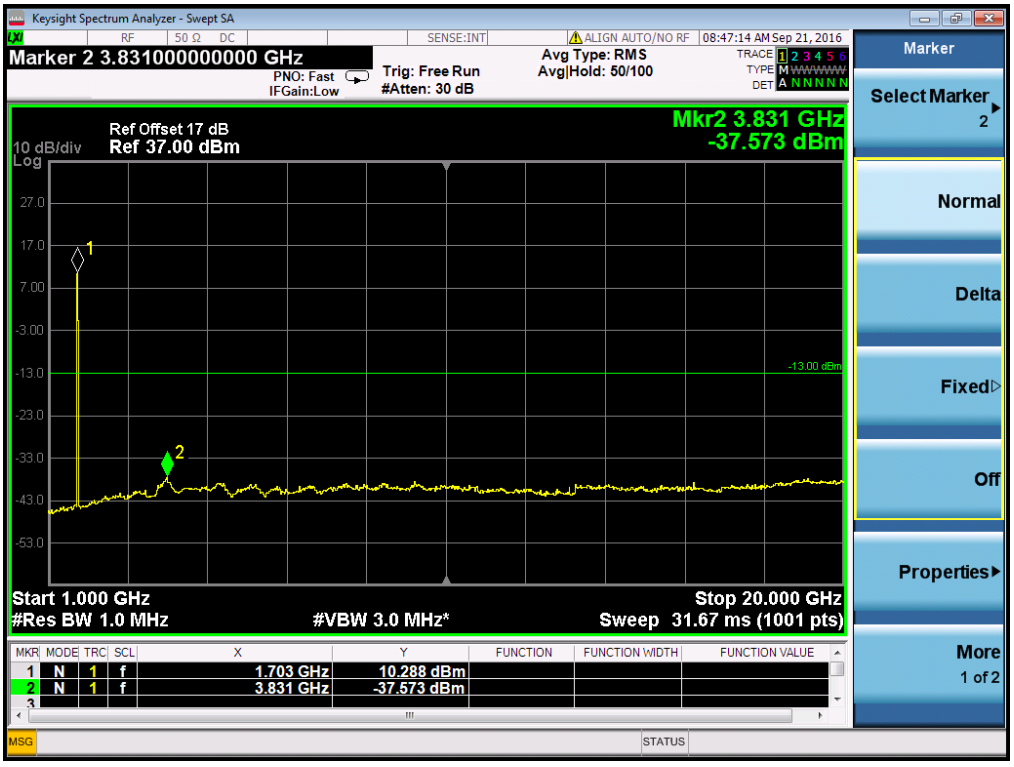


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Low
Bandwidth	3MHz	Modulation	QPSK

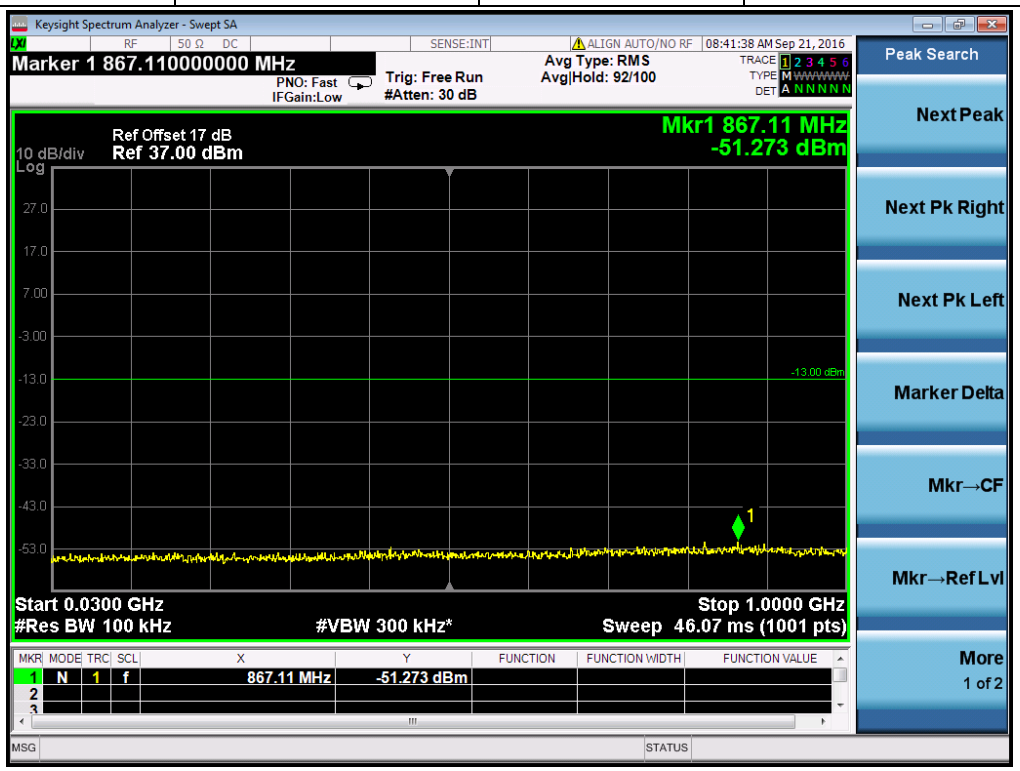


RB Size 1, RB Offset 0 30MHz to 1GHz

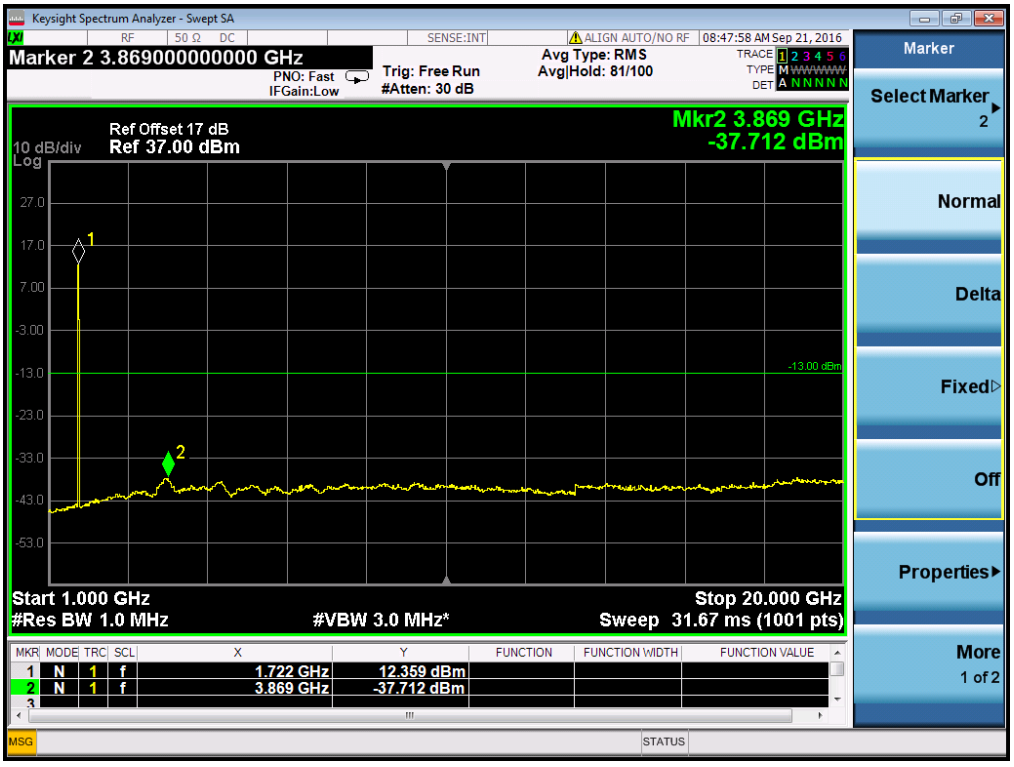


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Middle
Bandwidth	3MHz	Modulation	QPSK

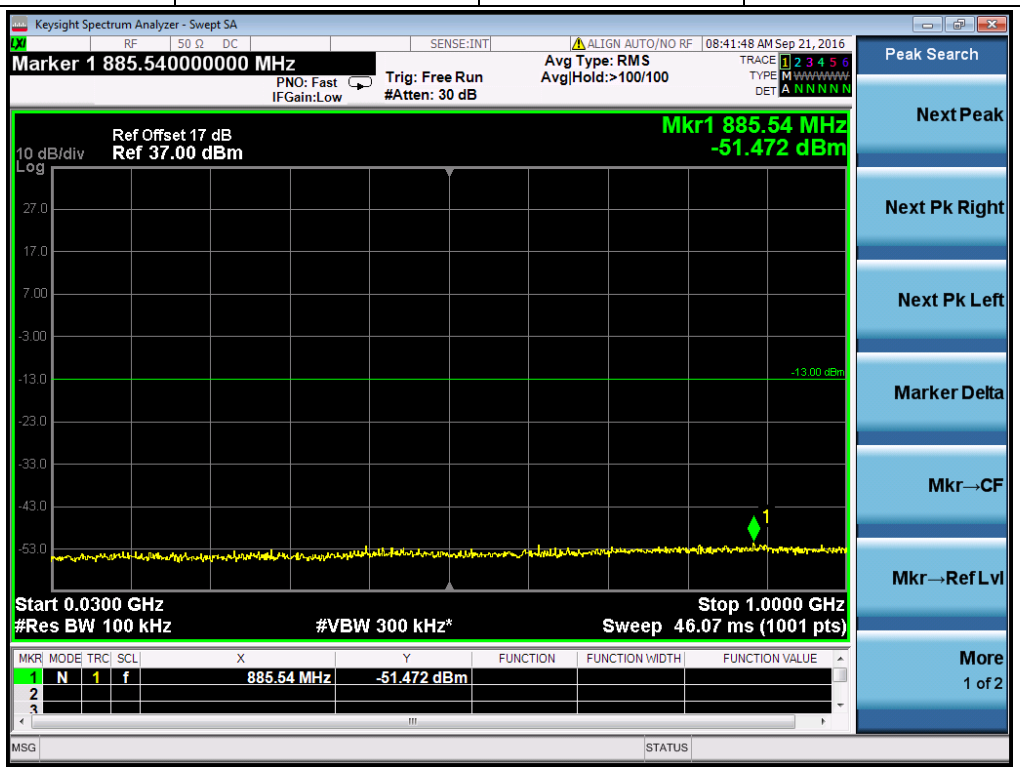


RB Size 1, RB Offset 0 30MHz to 1GHz

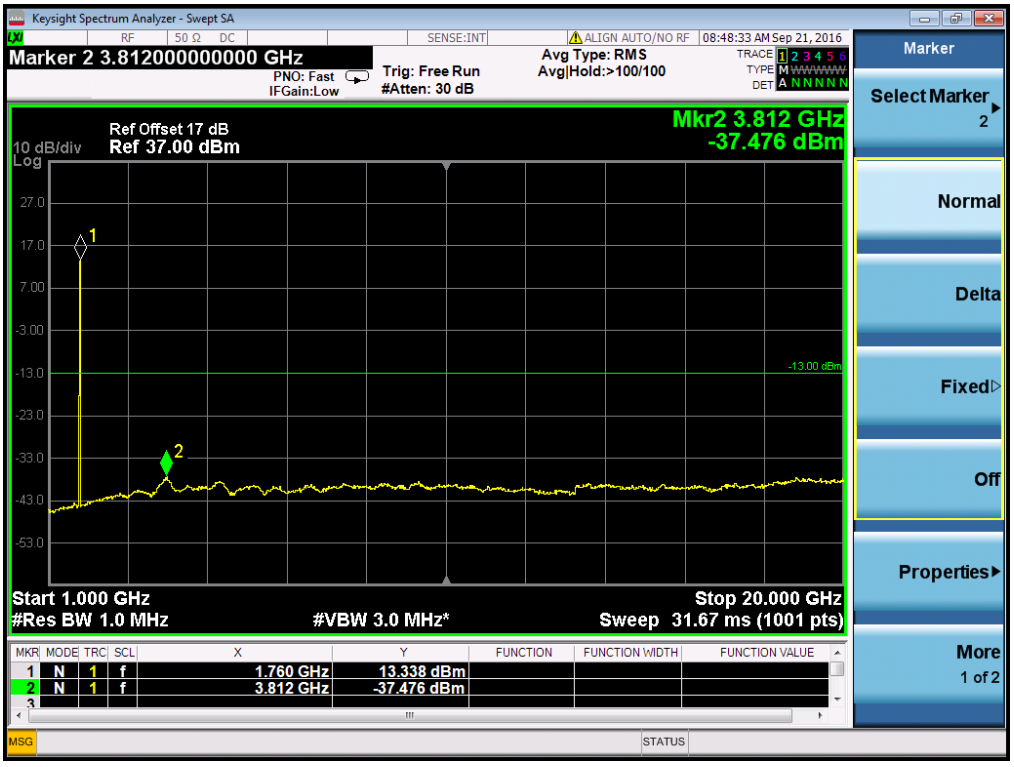


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	3MHz	Modulation	QPSK

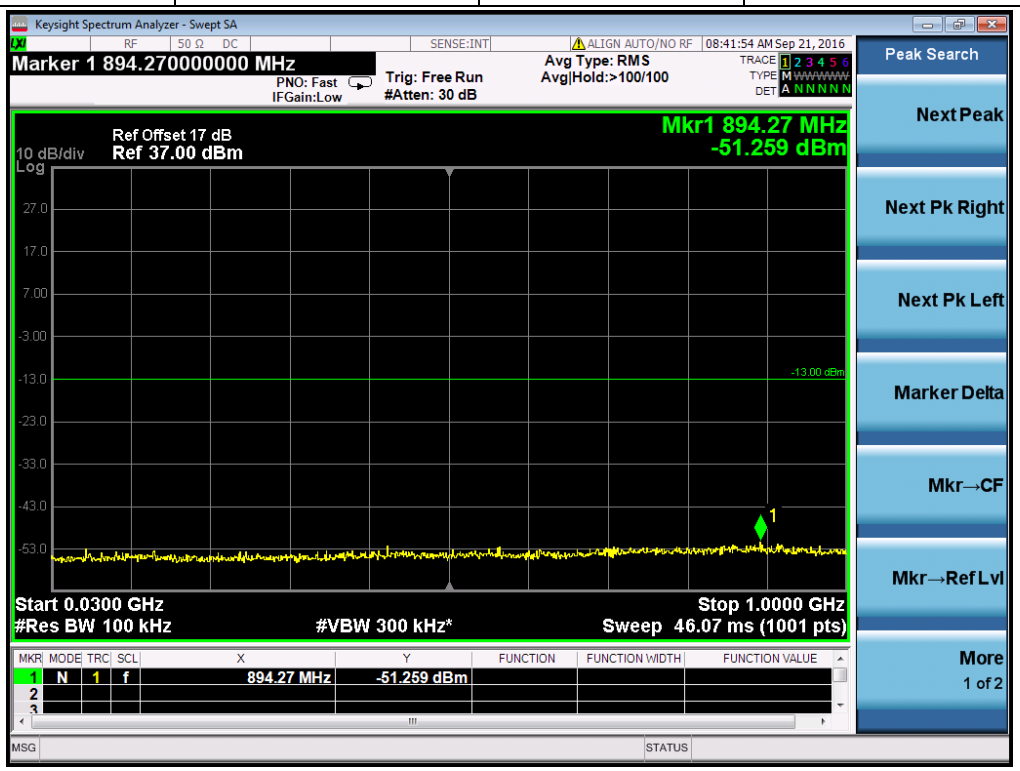


RB Size 1, RB Offset 0 30MHz to 1GHz

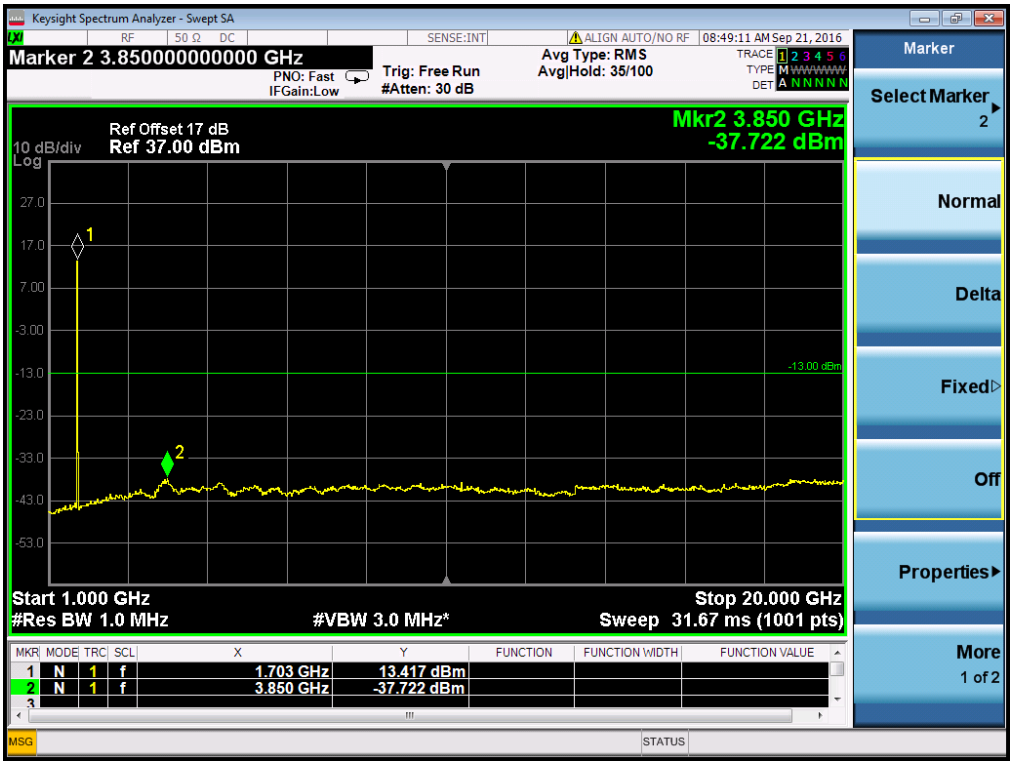


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Low
Bandwidth	5MHz	Modulation	QPSK

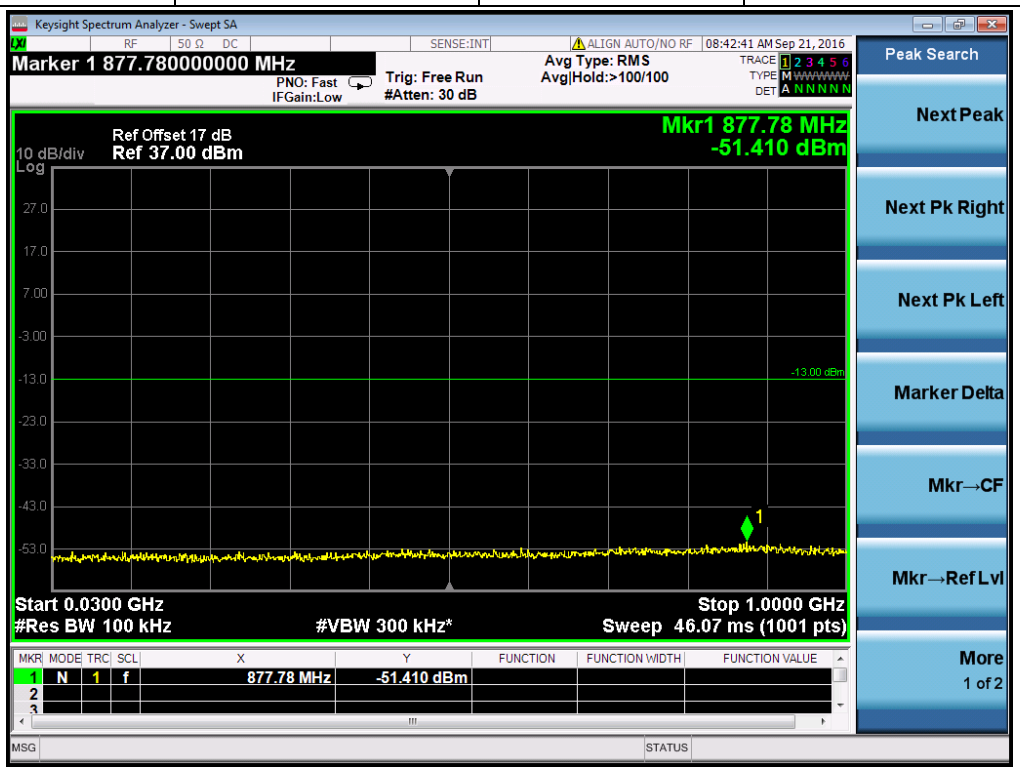


RB Size 1, RB Offset 0 30MHz to 1GHz



RB Size 1, RB Offset 0 1GHz to 20GHz

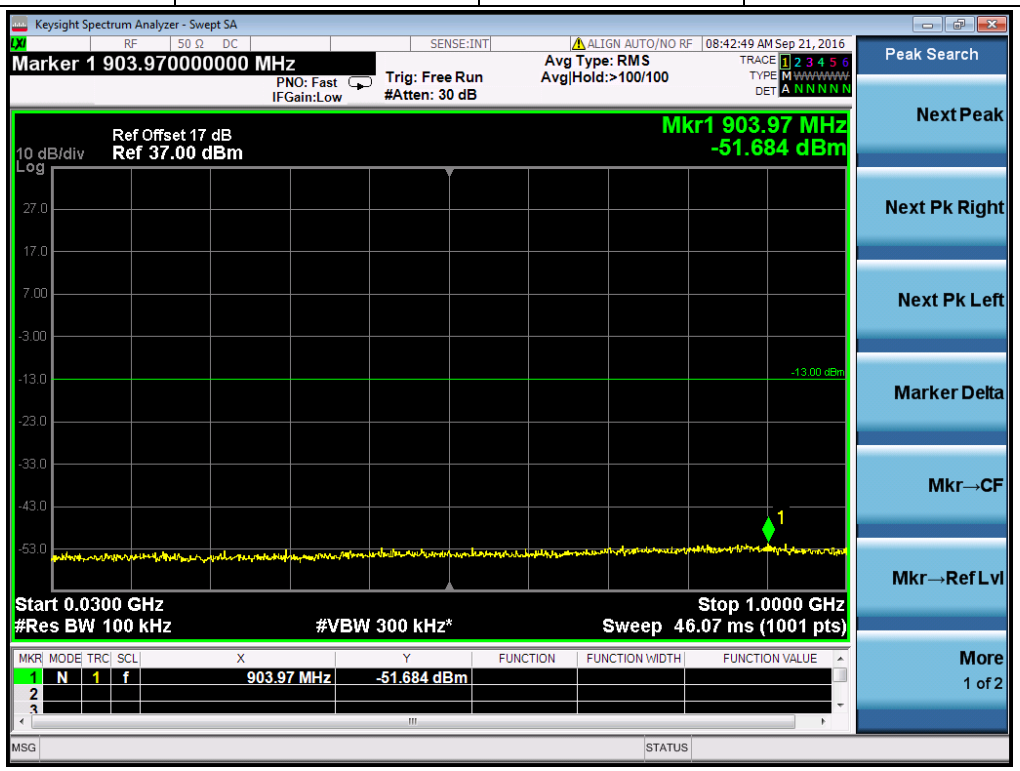
Band	LTE Band 4	Channel	Middle
Bandwidth	5MHz	Modulation	QPSK



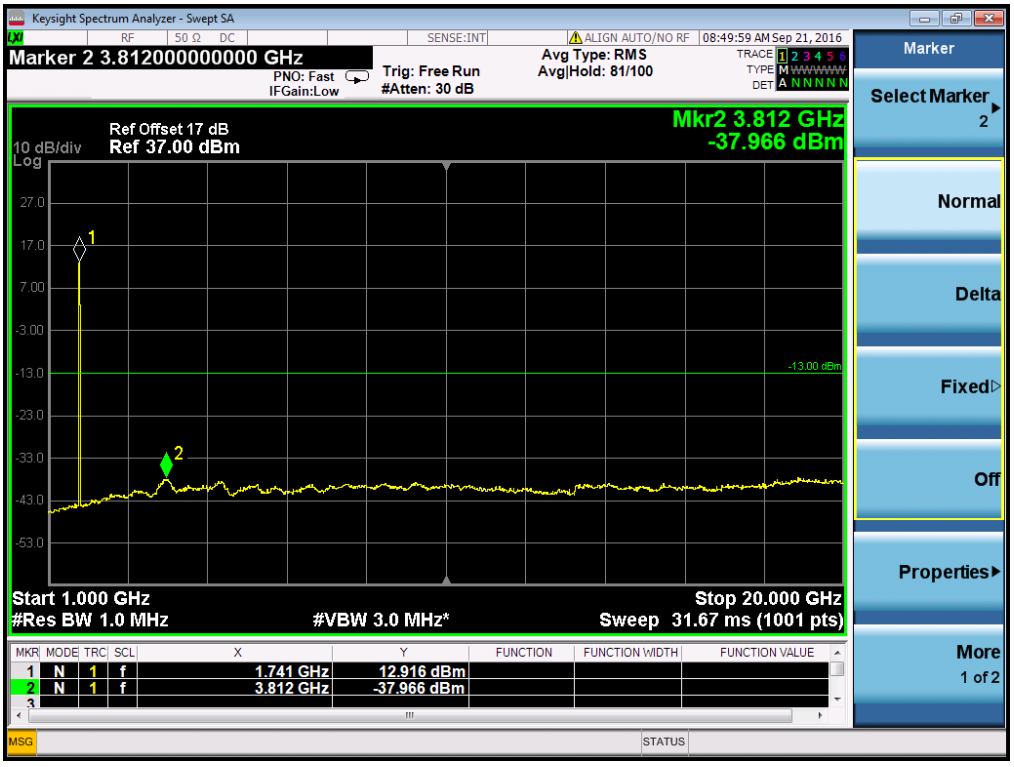
RB Size 1, RB Offset 0 30MHz to 1GHz

RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	5MHz	Modulation	QPSK

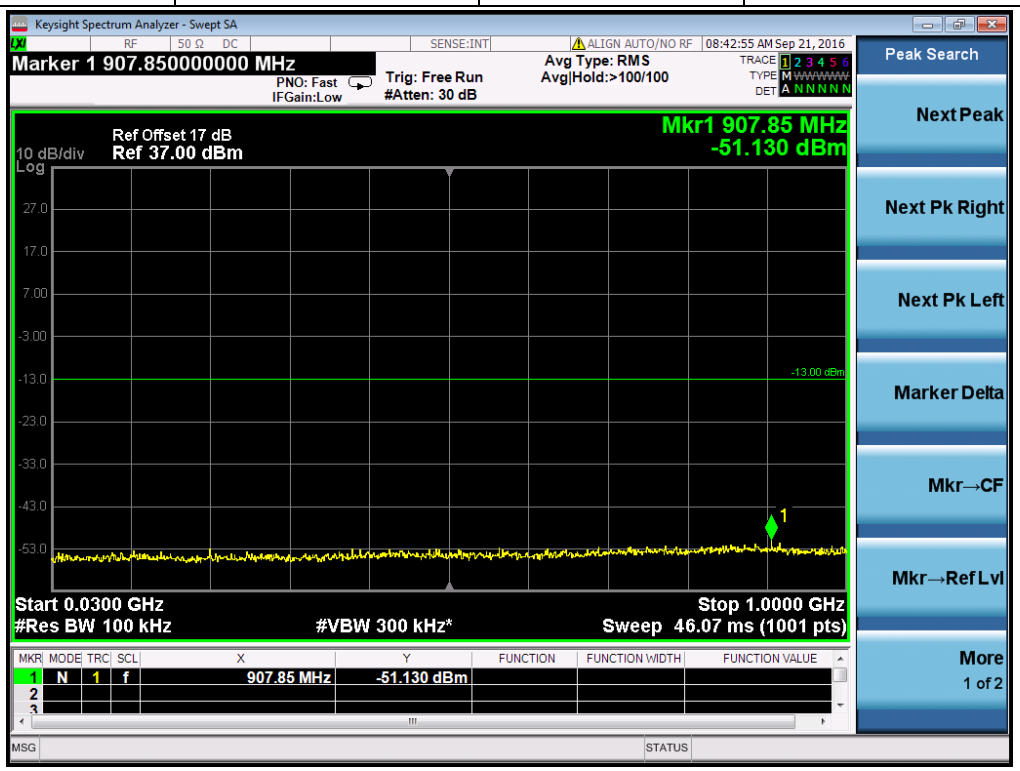


RB Size 1, RB Offset 0 30MHz to 1GHz

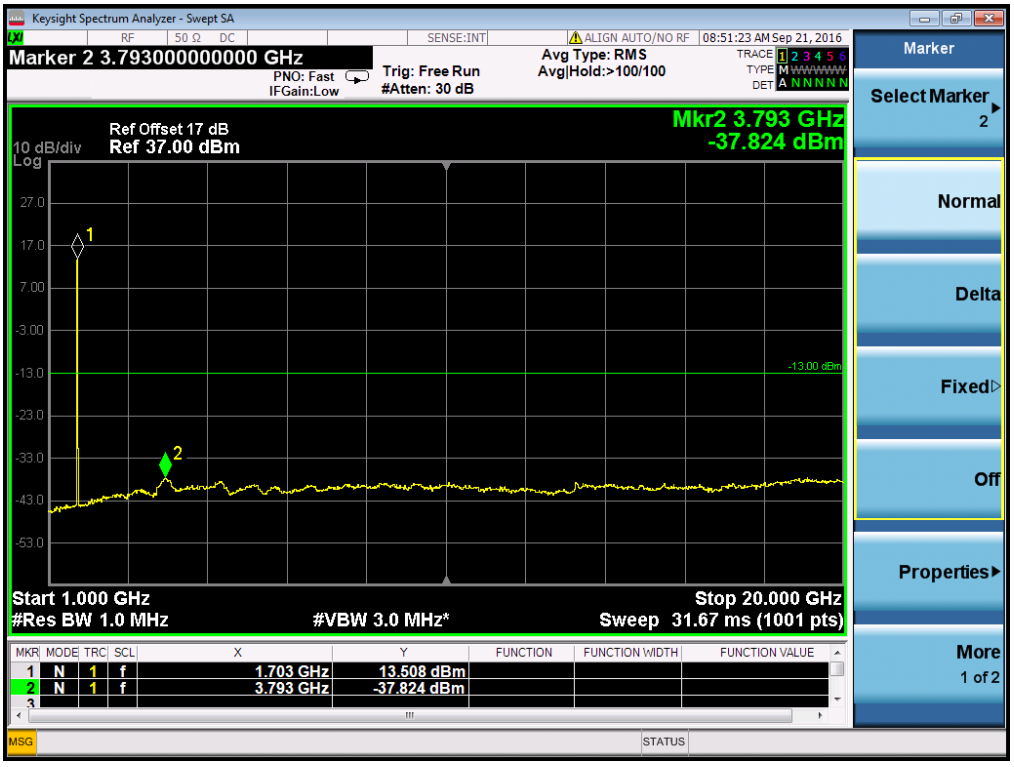


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Low
Bandwidth	10MHz	Modulation	QPSK

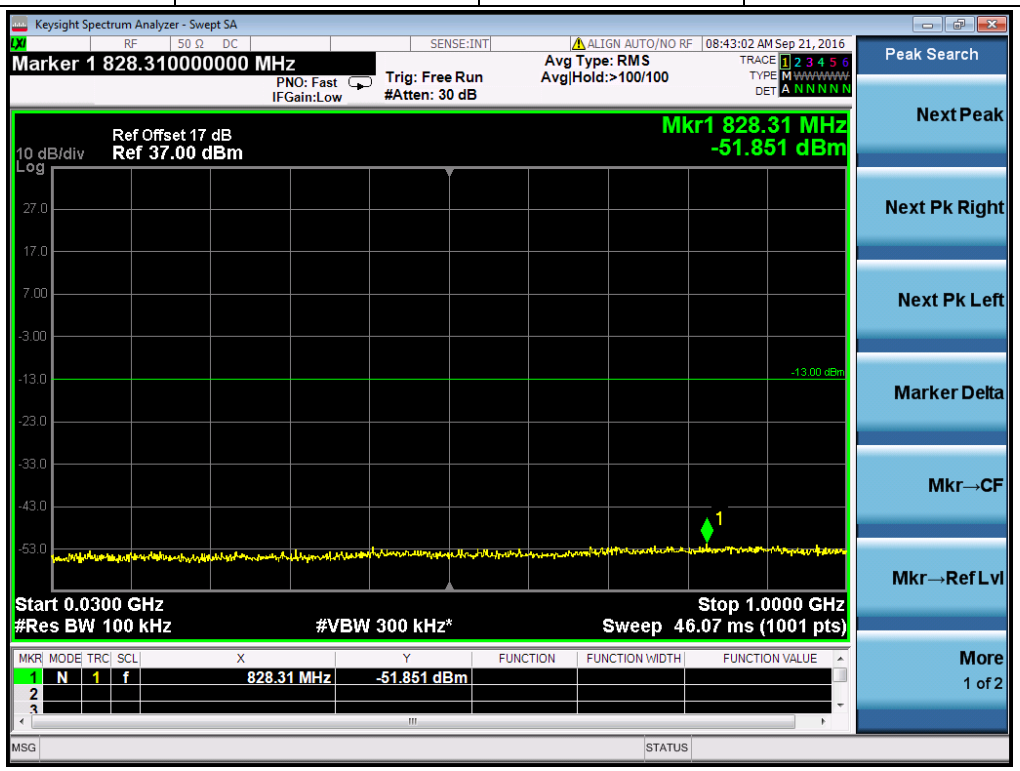


RB Size 1, RB Offset 0 30MHz to 1GHz

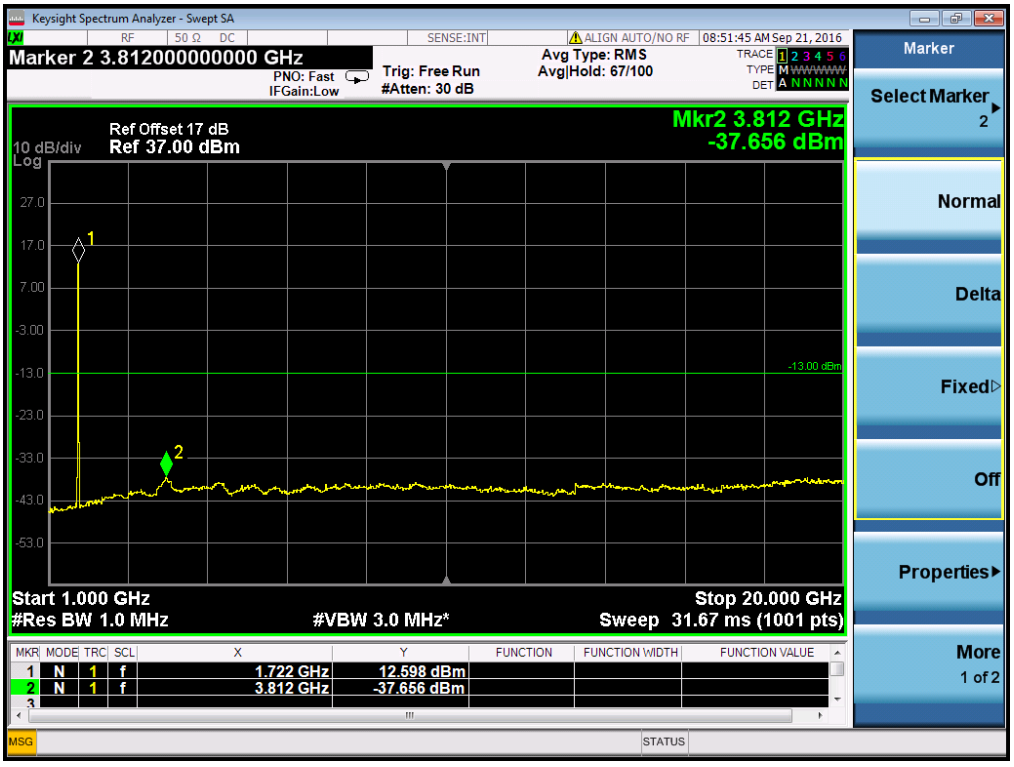


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Middle
Bandwidth	10MHz	Modulation	QPSK

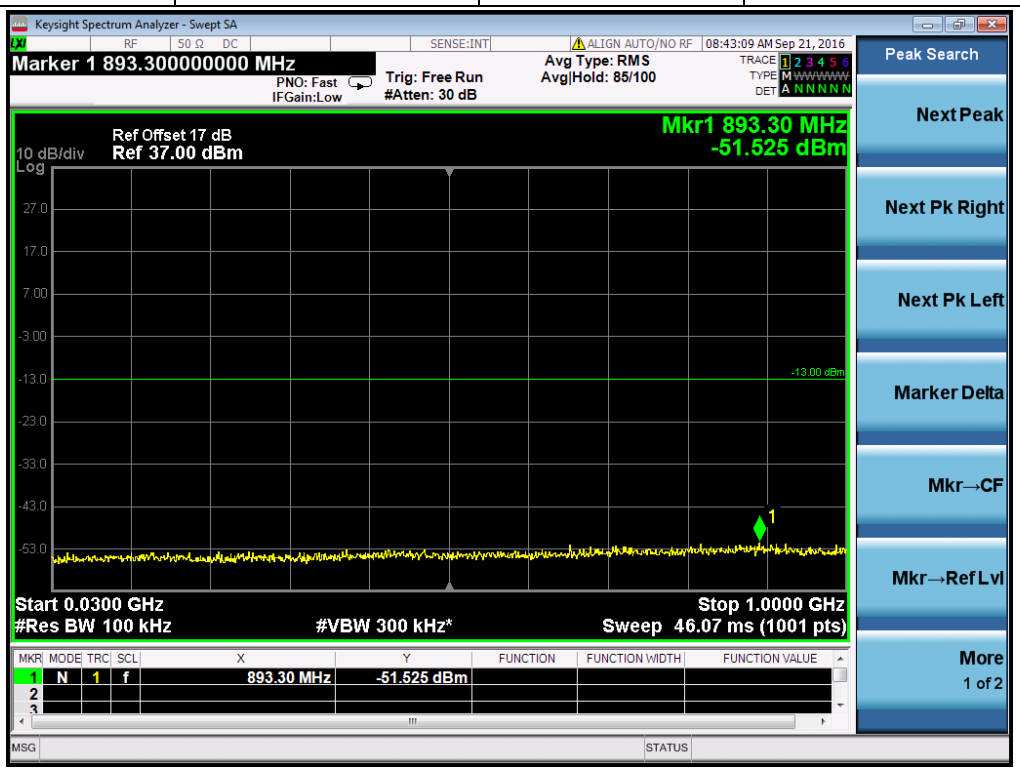


RB Size 1, RB Offset 0 30MHz to 1GHz

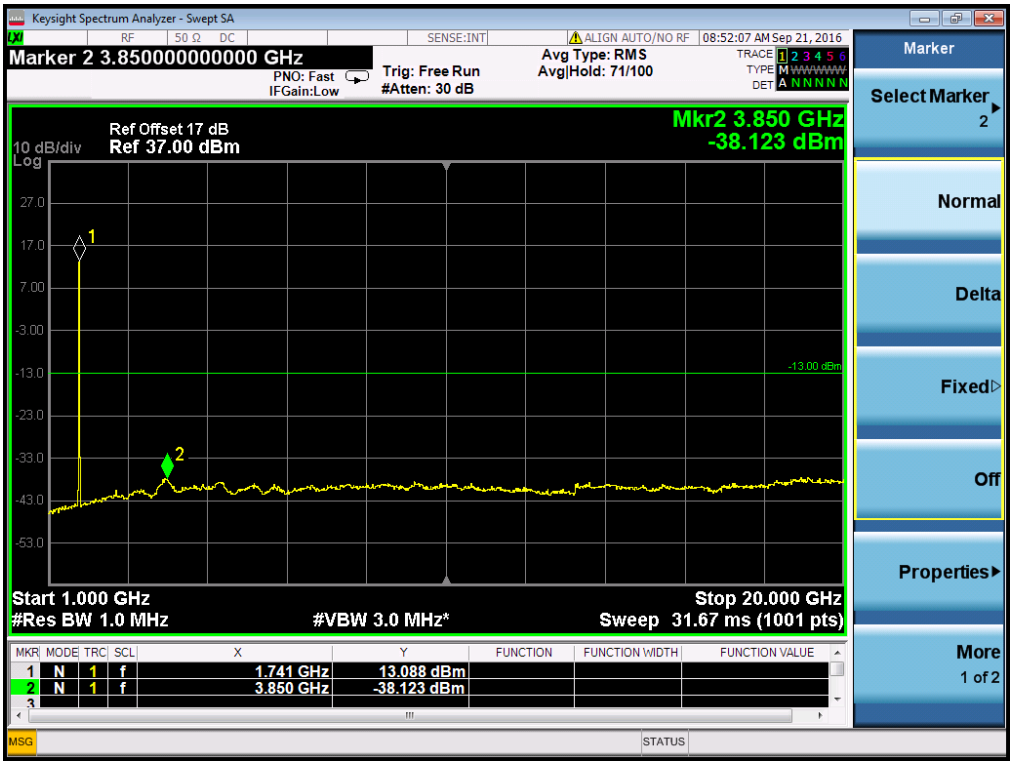


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	10MHz	Modulation	QPSK

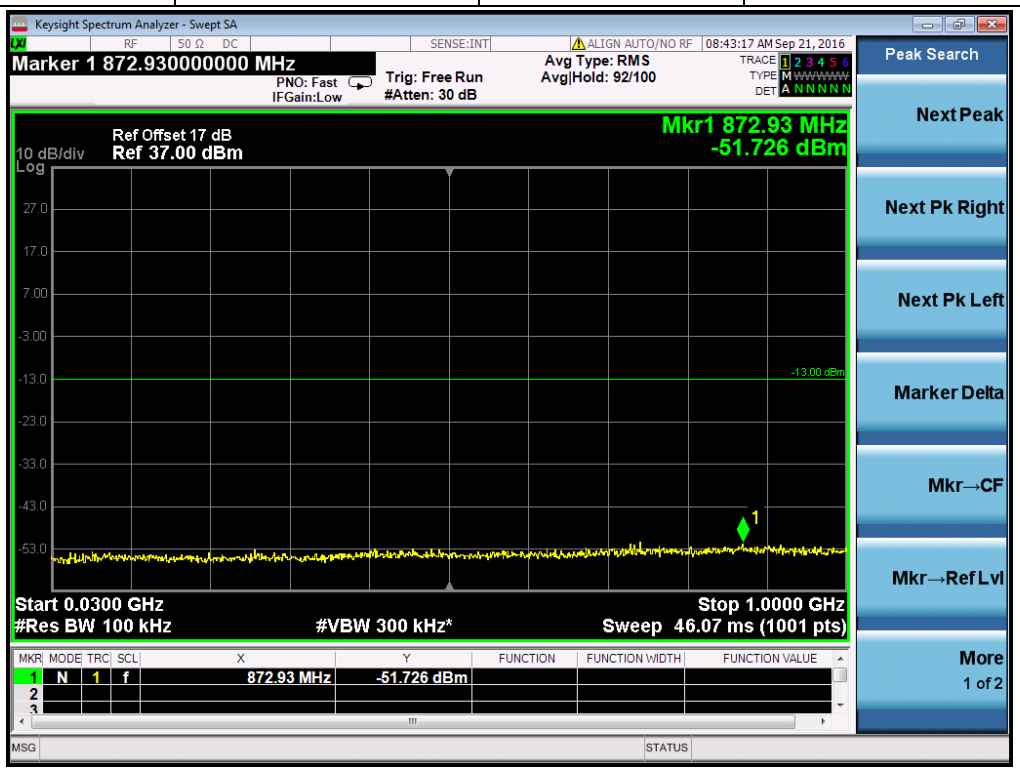


RB Size 1, RB Offset 0 30MHz to 1GHz

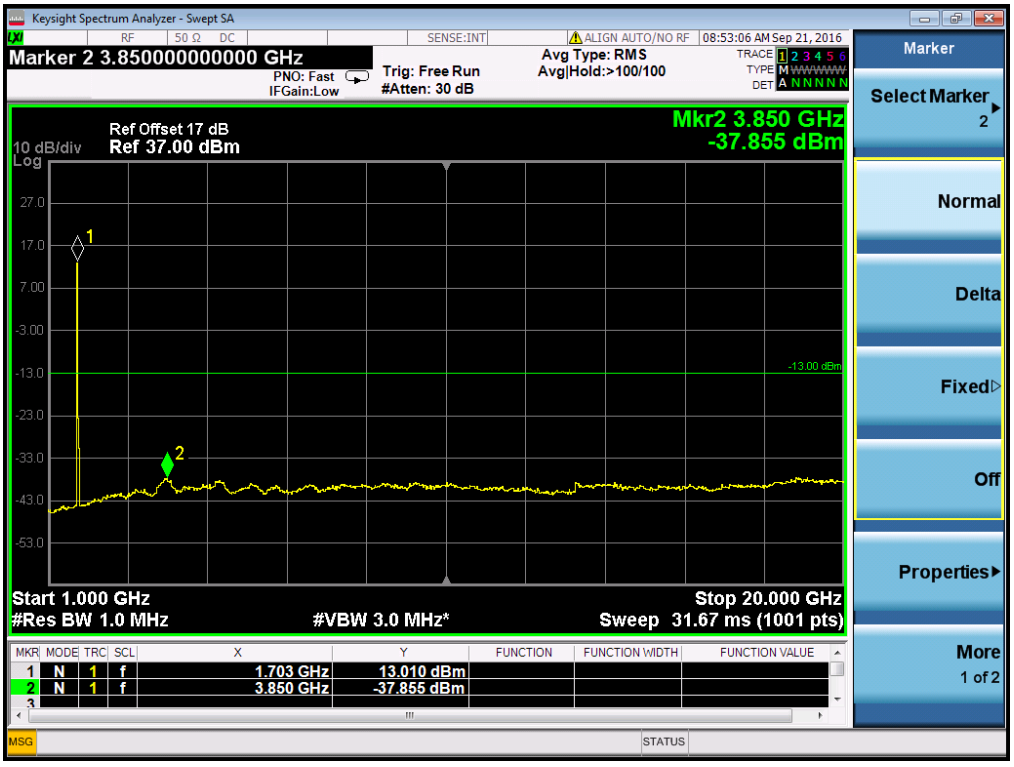


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Low
Bandwidth	15MHz	Modulation	QPSK

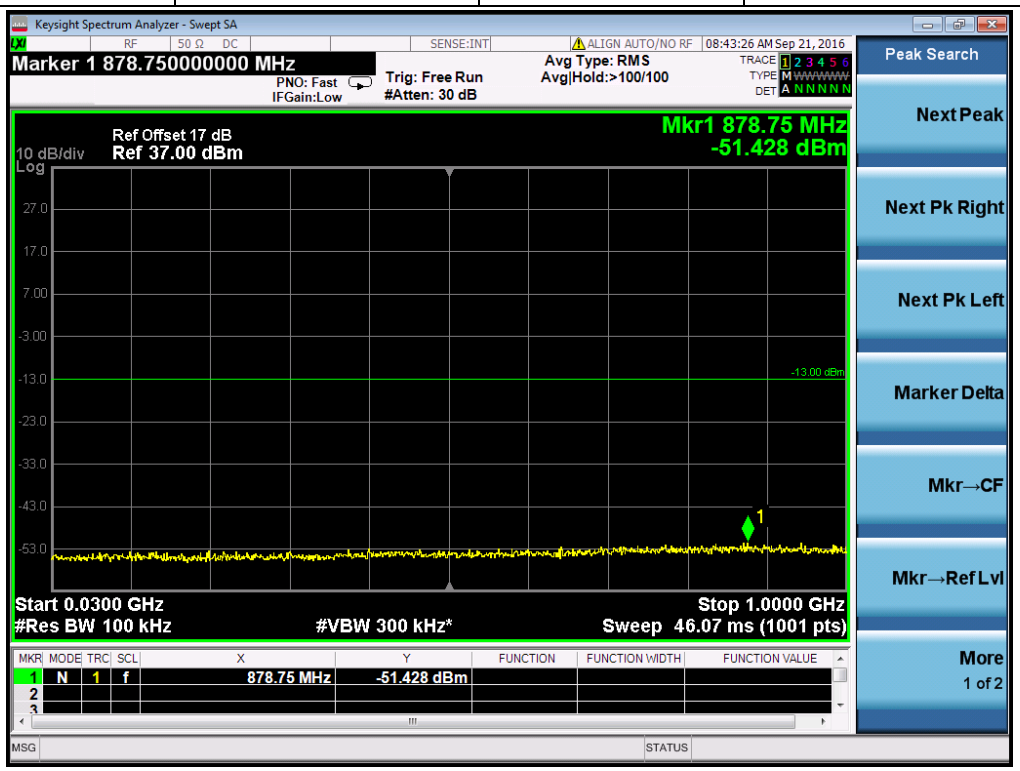


RB Size 1, RB Offset 0 30MHz to 1GHz

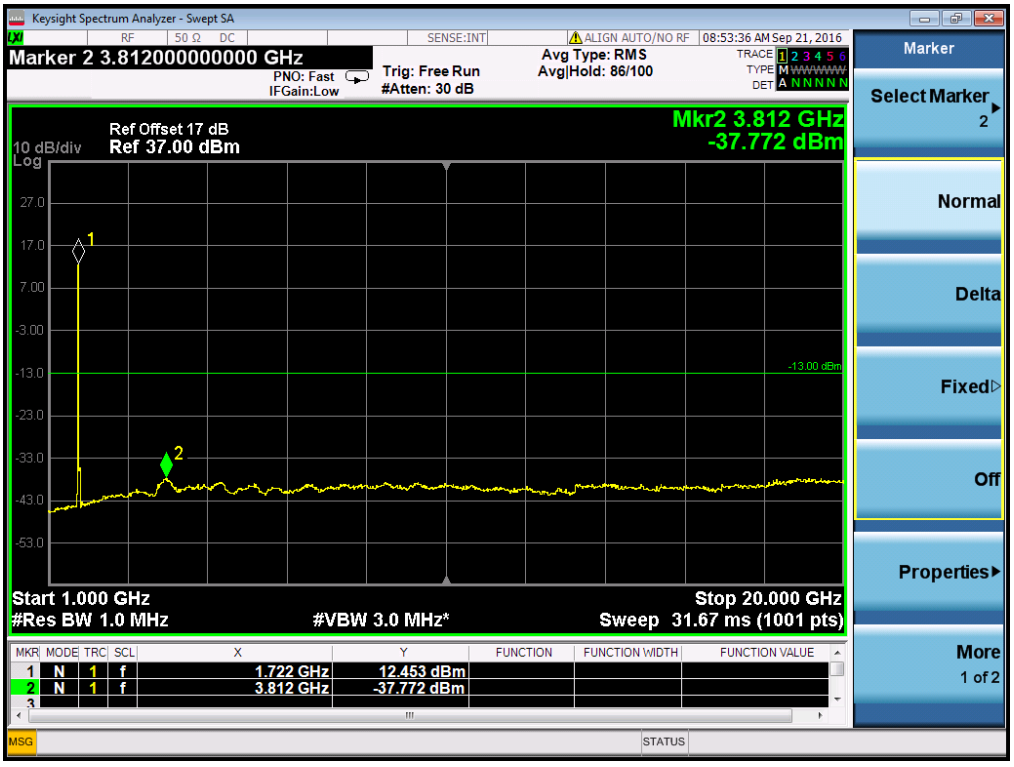


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Middle
Bandwidth	15MHz	Modulation	QPSK

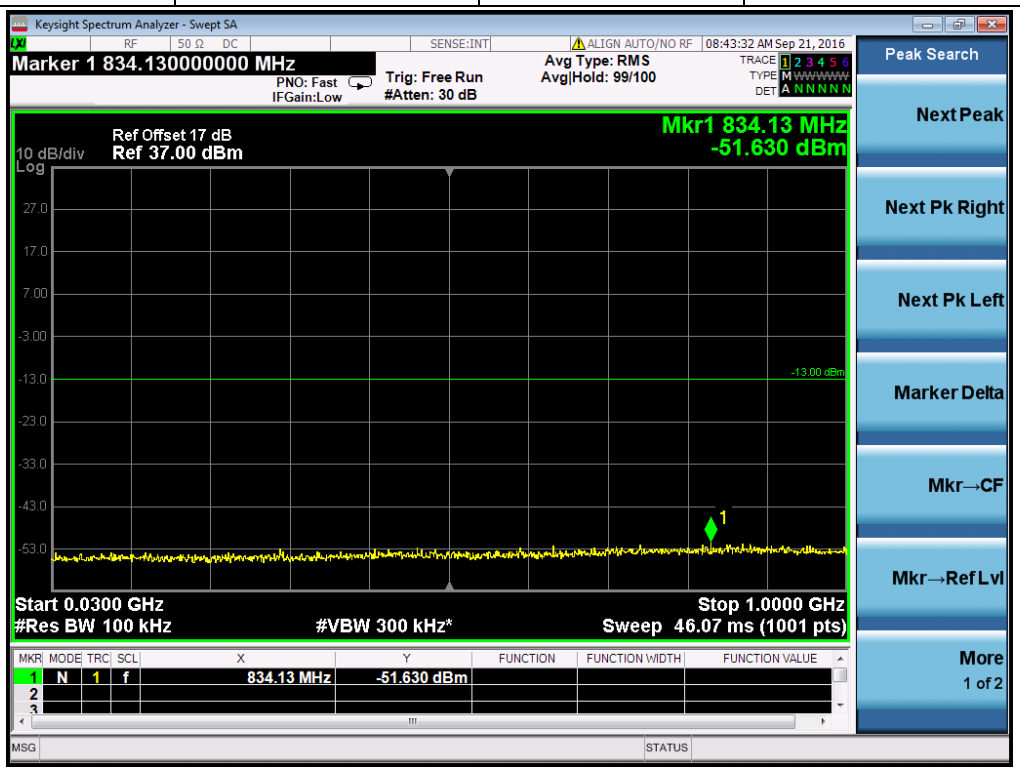


RB Size 1, RB Offset 0 30MHz to 1GHz

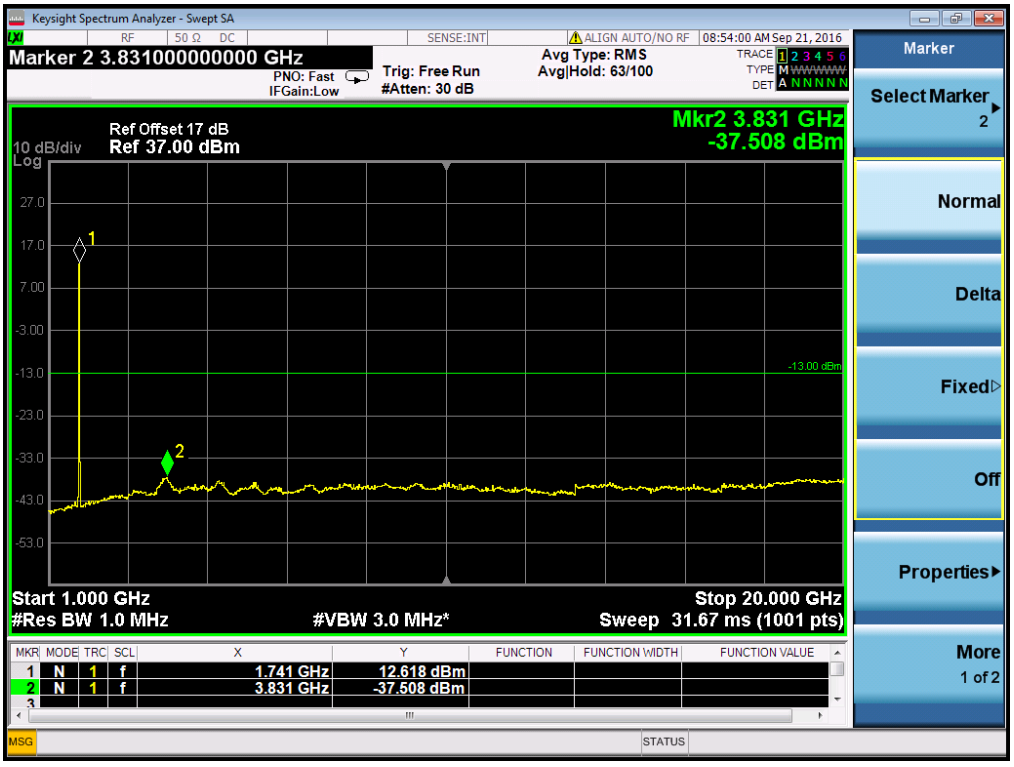


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	15MHz	Modulation	QPSK

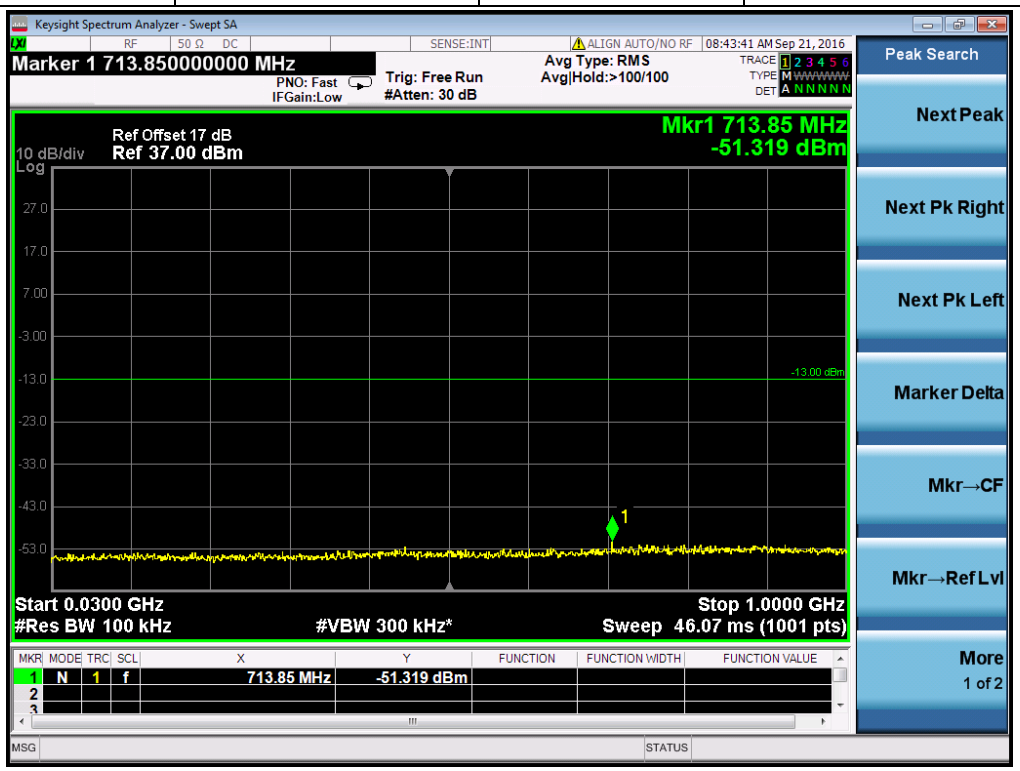


RB Size 1, RB Offset 0 30MHz to 1GHz

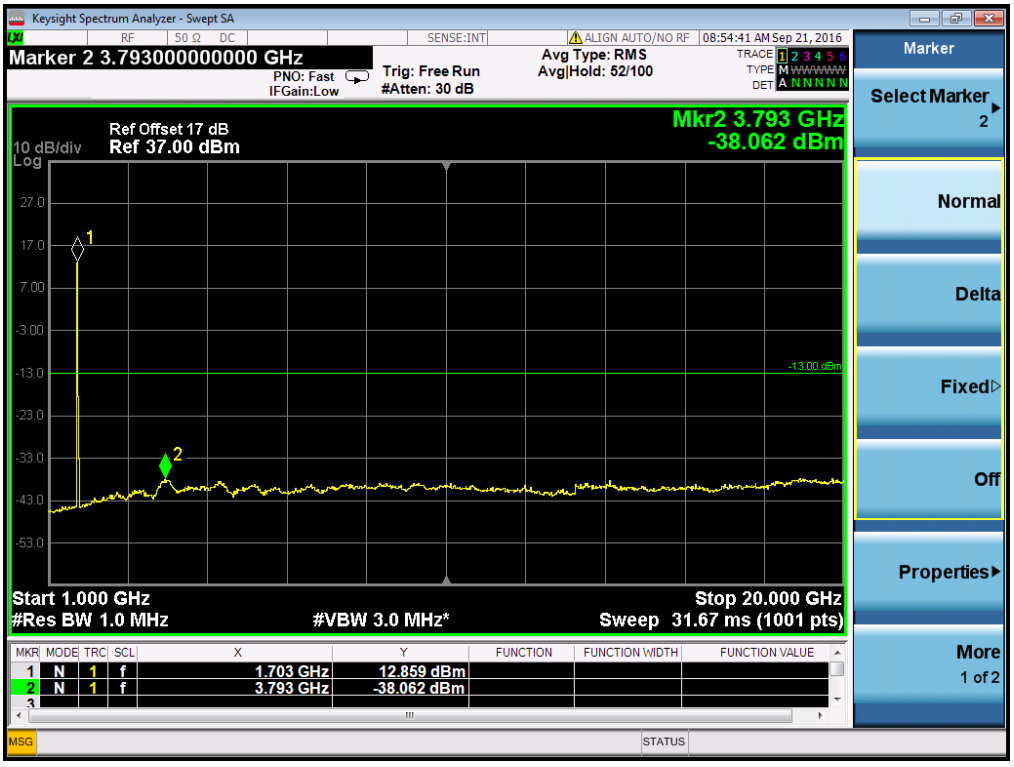


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Low
Bandwidth	20MHz	Modulation	QPSK

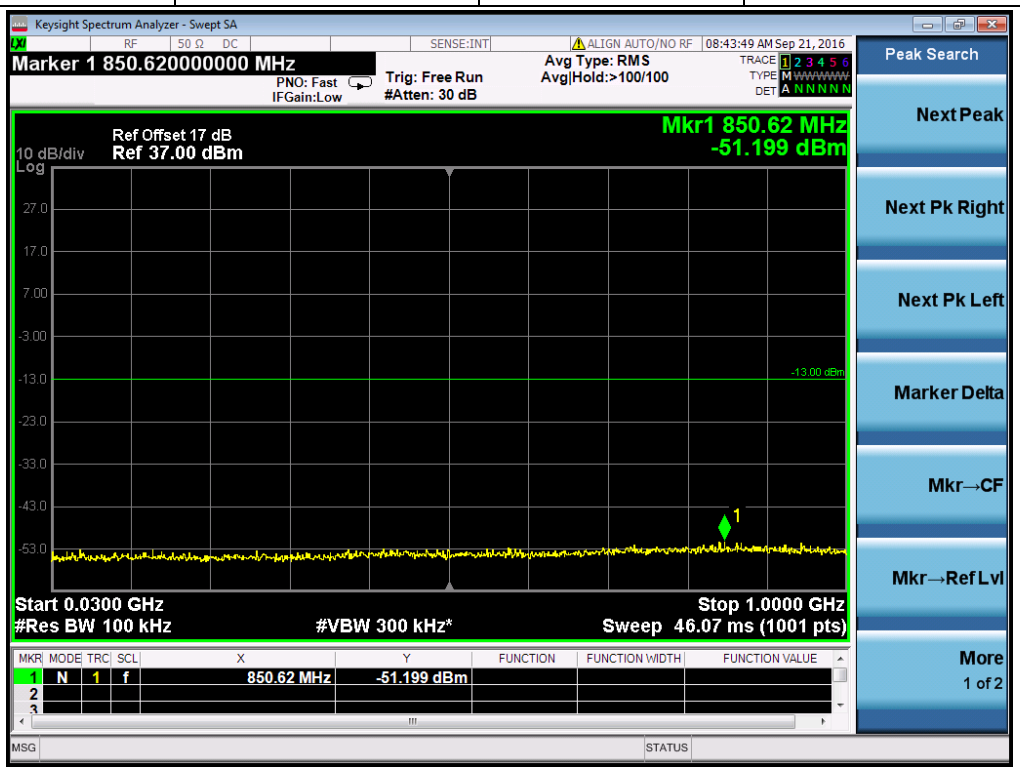


RB Size 1, RB Offset 0 30MHz to 1GHz

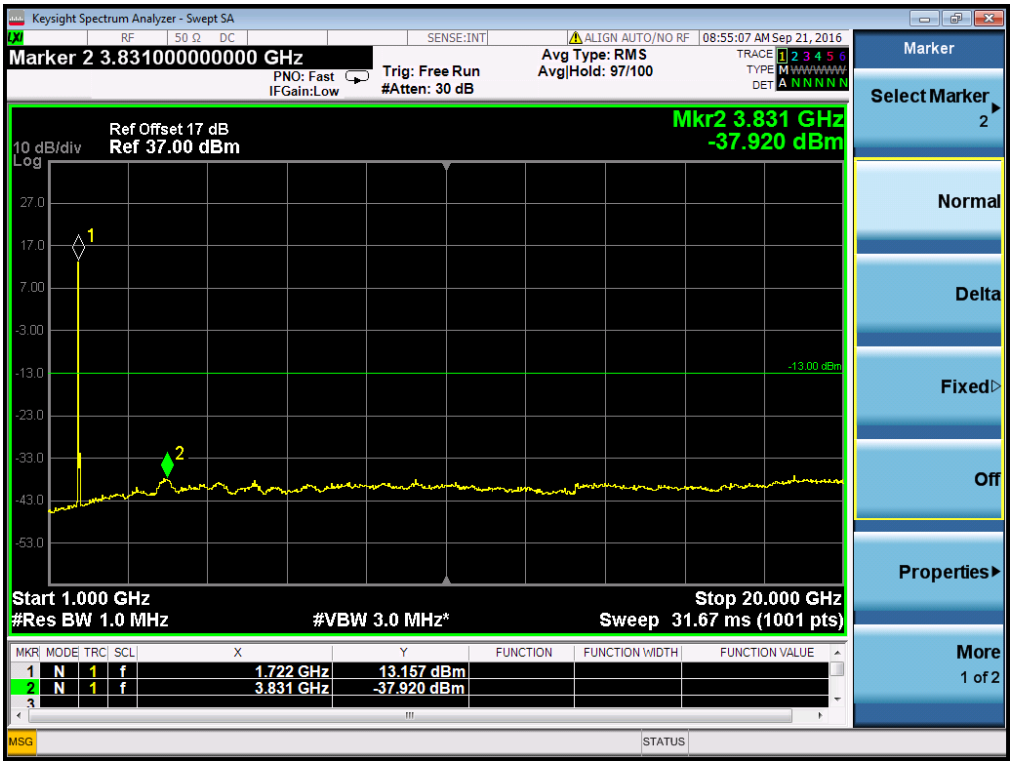


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	Middle
Bandwidth	20MHz	Modulation	QPSK

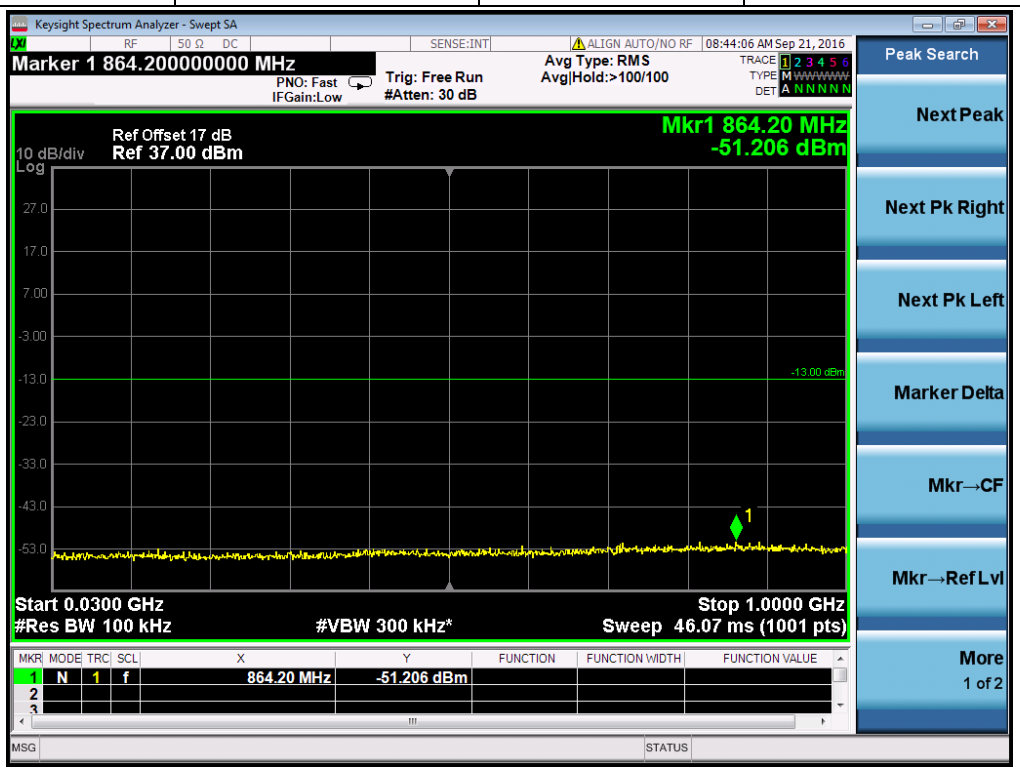


RB Size 1, RB Offset 0 30MHz to 1GHz

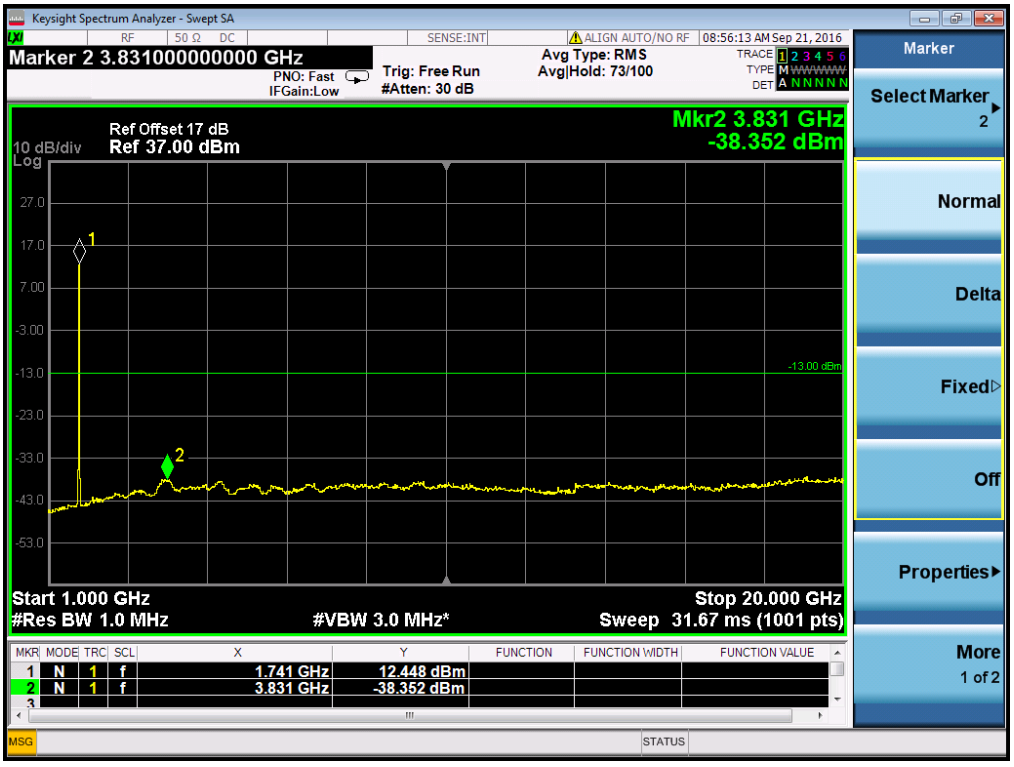


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 4	Channel	High
Bandwidth	20MHz	Modulation	QPSK

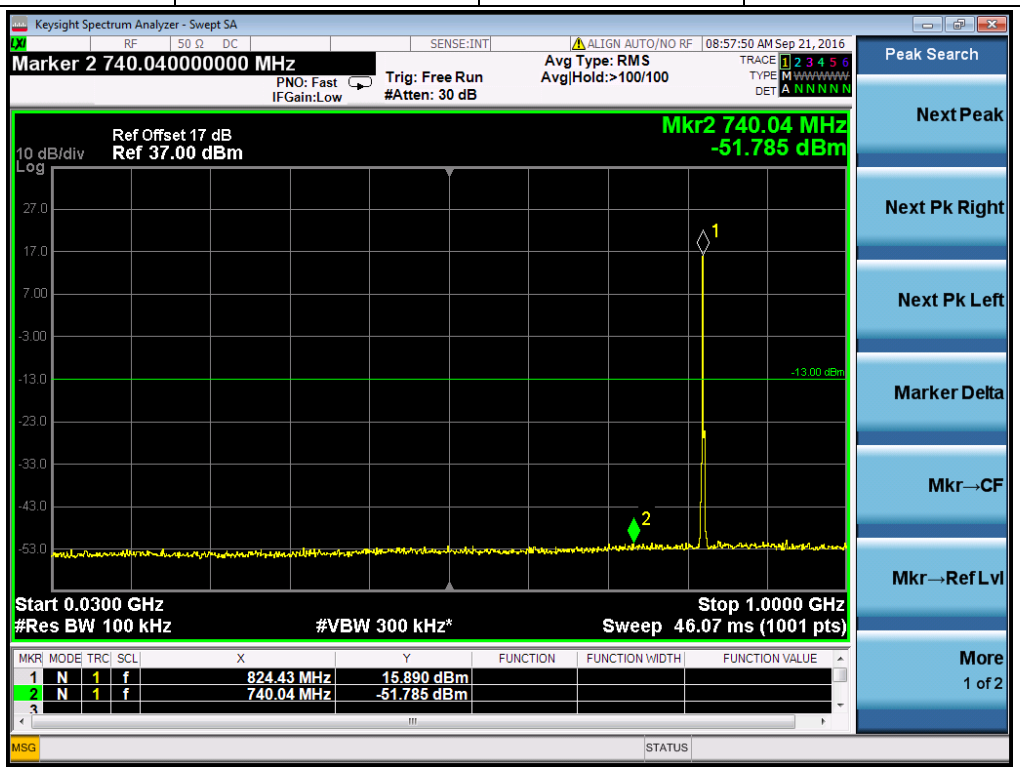


RB Size 1, RB Offset 0 30MHz to 1GHz

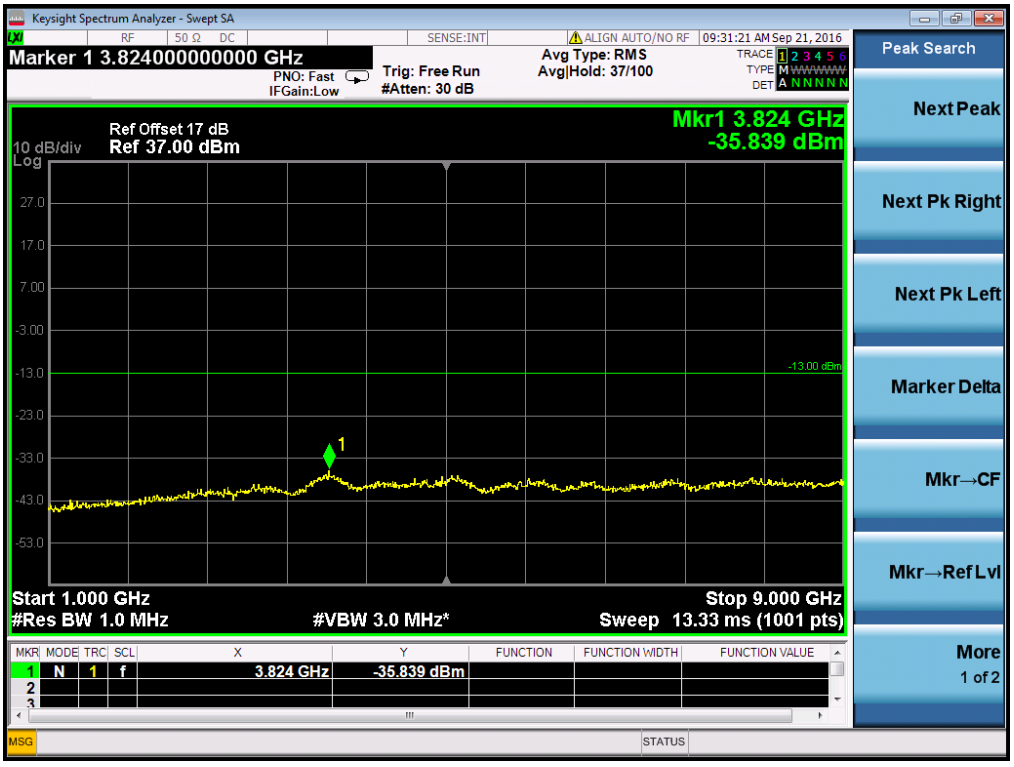


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 5	Channel	Low
Bandwidth	1.4MHz	Modulation	QPSK

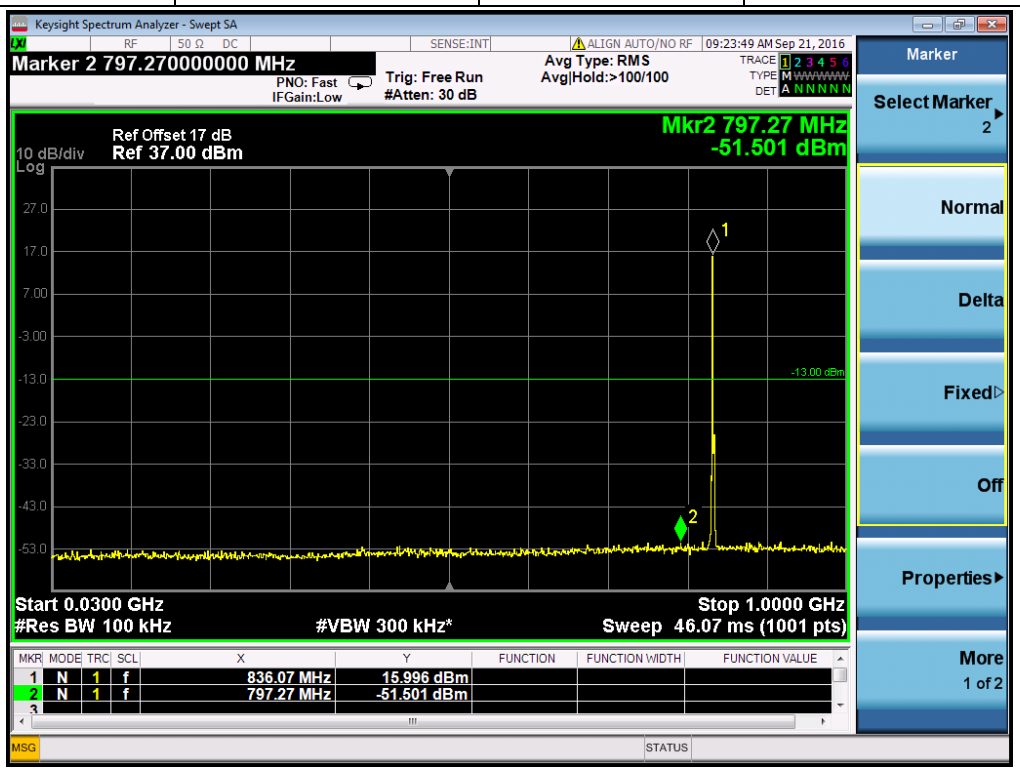


RB Size 1, RB Offset 0 30MHz to 1GHz

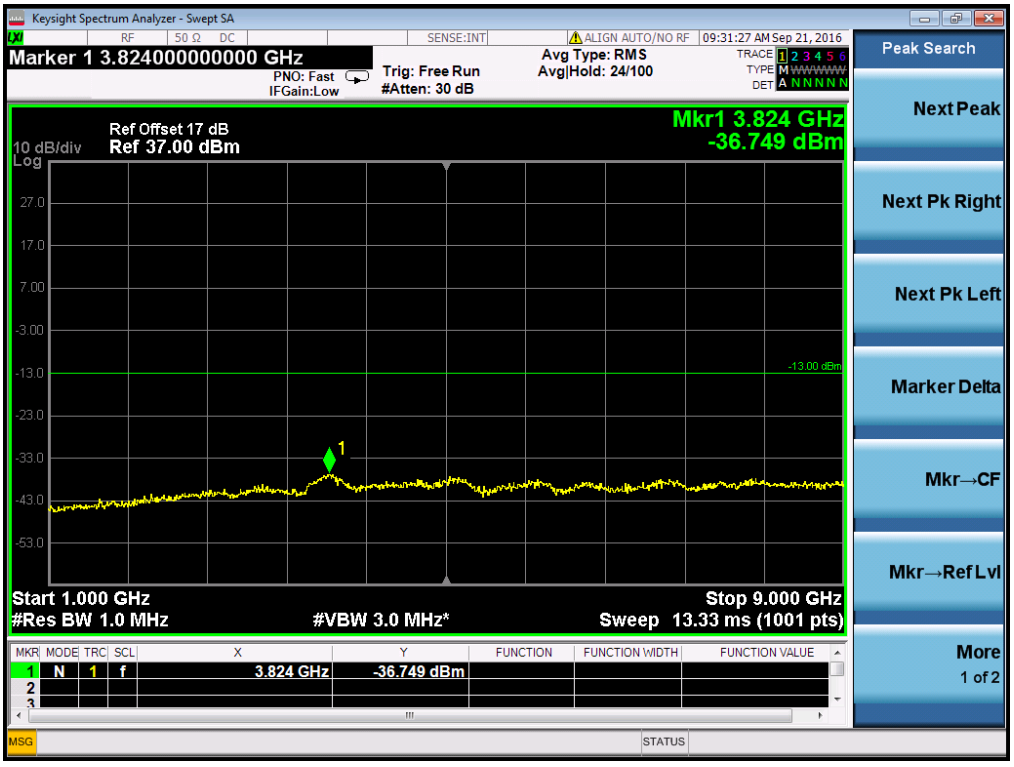


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Middle
Bandwidth	1.4MHz	Modulation	QPSK

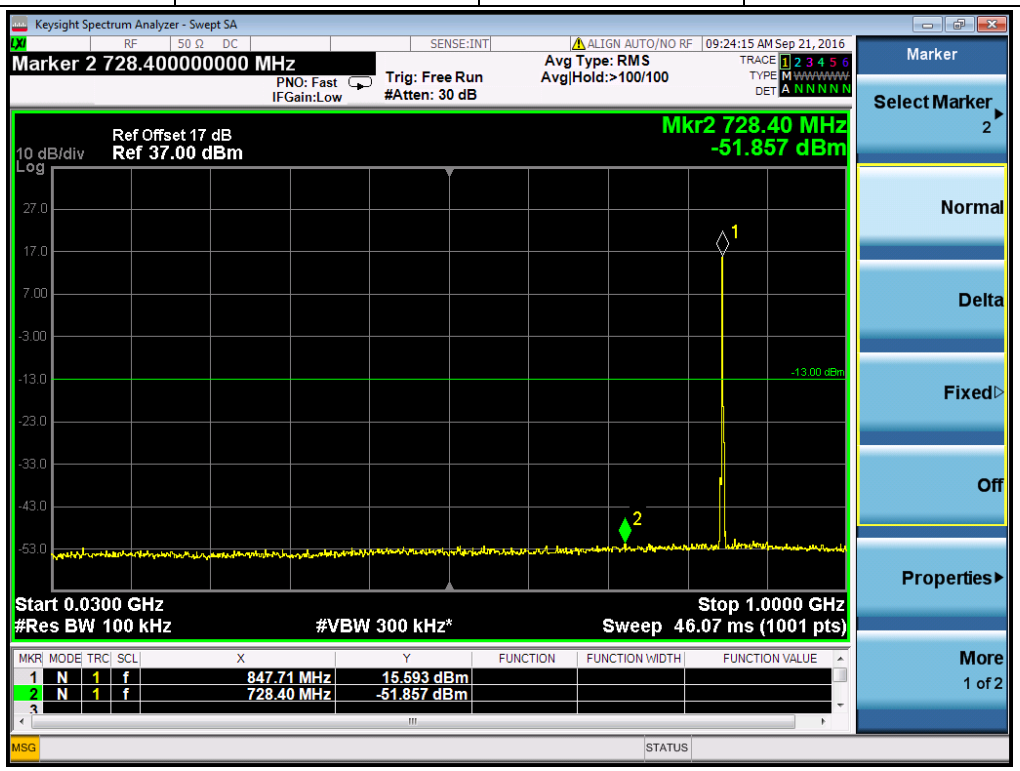


RB Size 1, RB Offset 0 30MHz to 1GHz

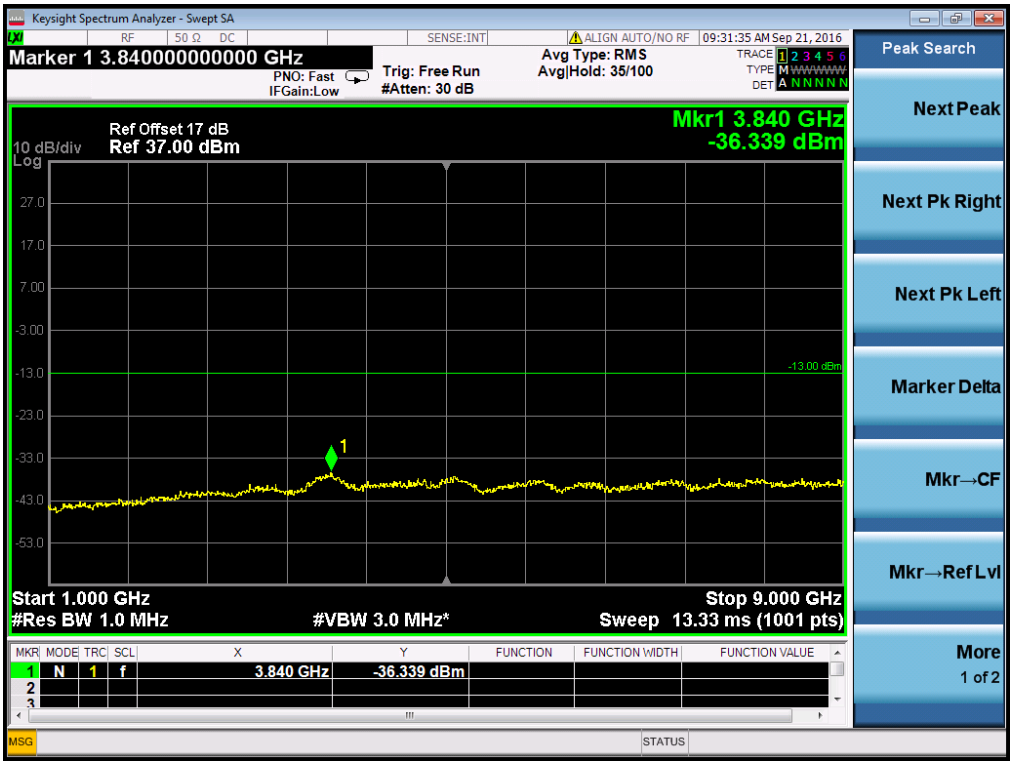


RB Size 1, RB Offset 0 1GHz to 20GHz

Band	LTE Band 5	Channel	High
Bandwidth	1.4MHz	Modulation	QPSK

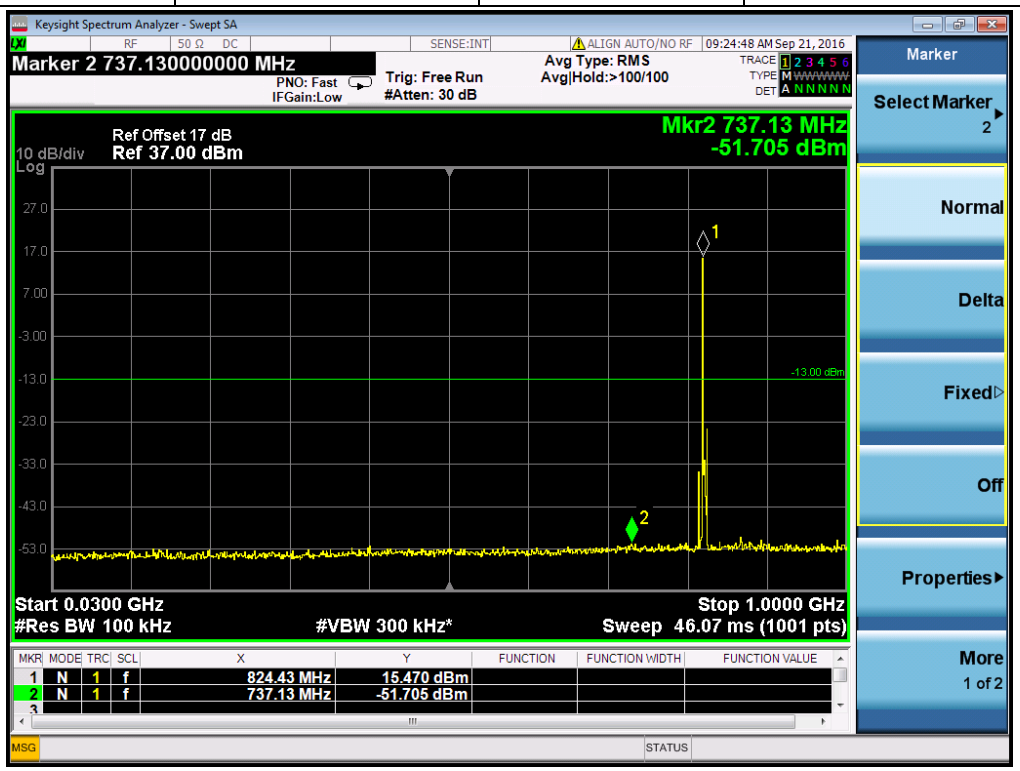


RB Size 1, RB Offset 0 30MHz to 1GHz

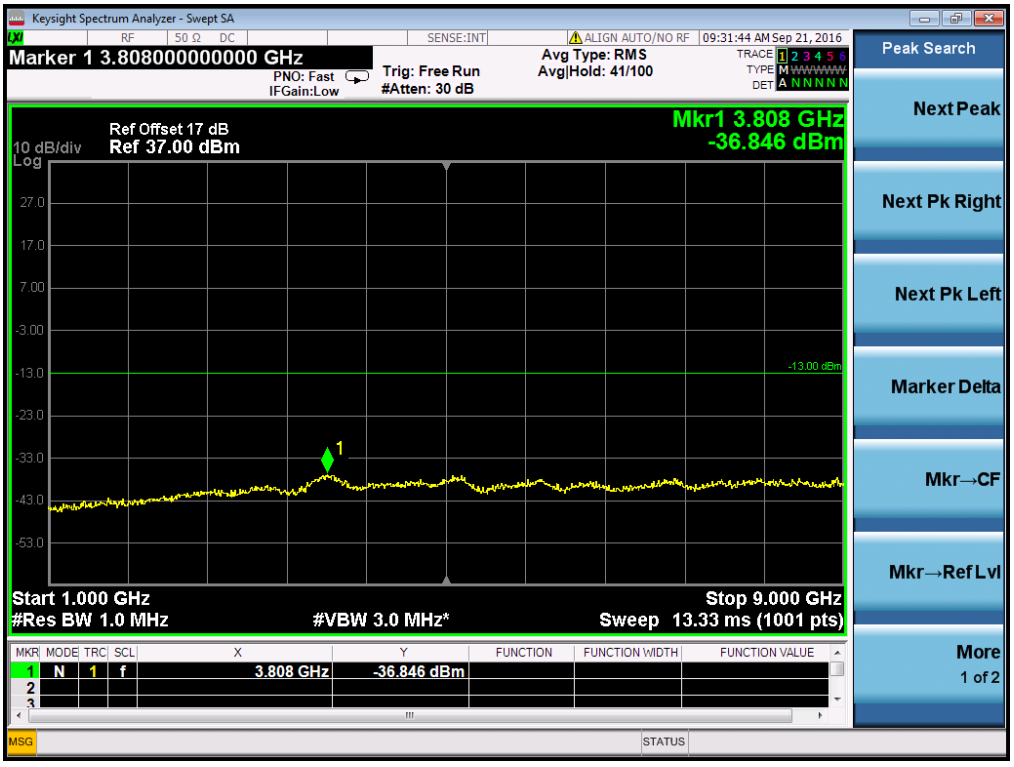


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Low
Bandwidth	3MHz	Modulation	QPSK

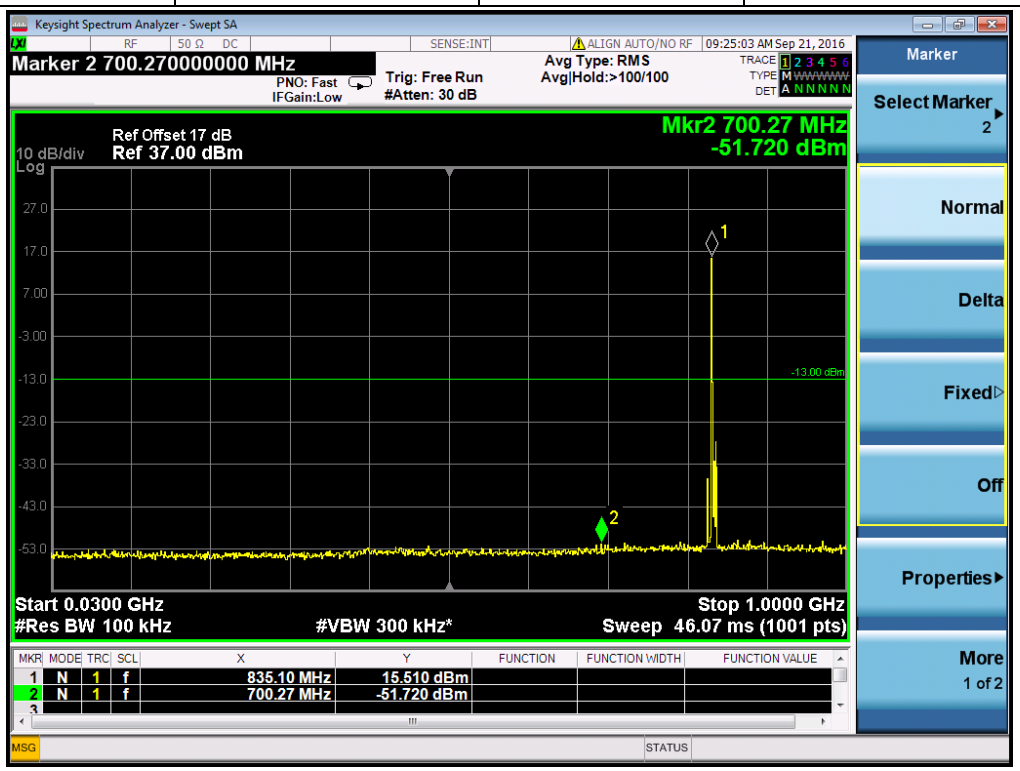


RB Size 1, RB Offset 0 30MHz to 1GHz

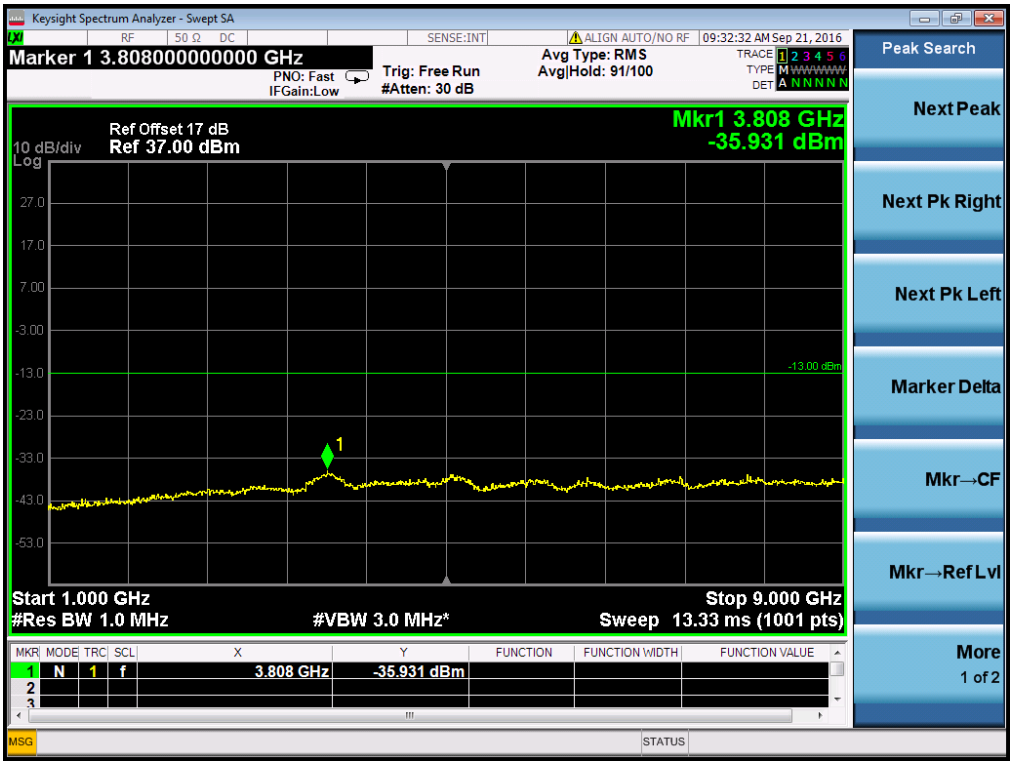


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Middle
Bandwidth	3MHz	Modulation	QPSK

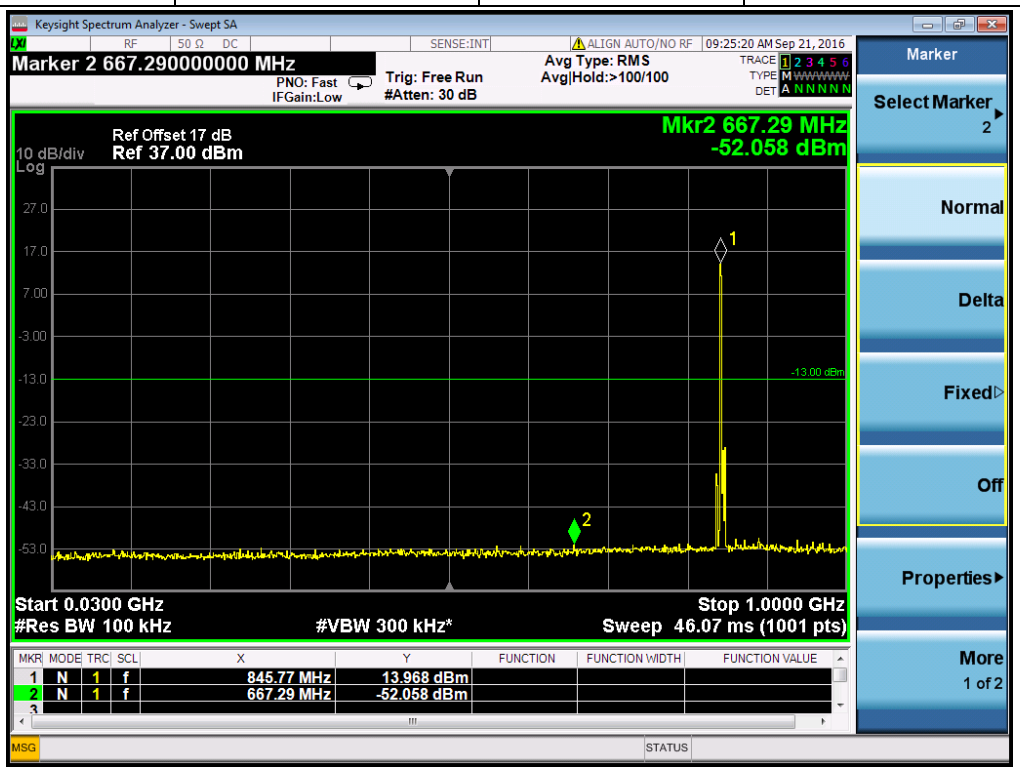


RB Size 1, RB Offset 0 30MHz to 1GHz

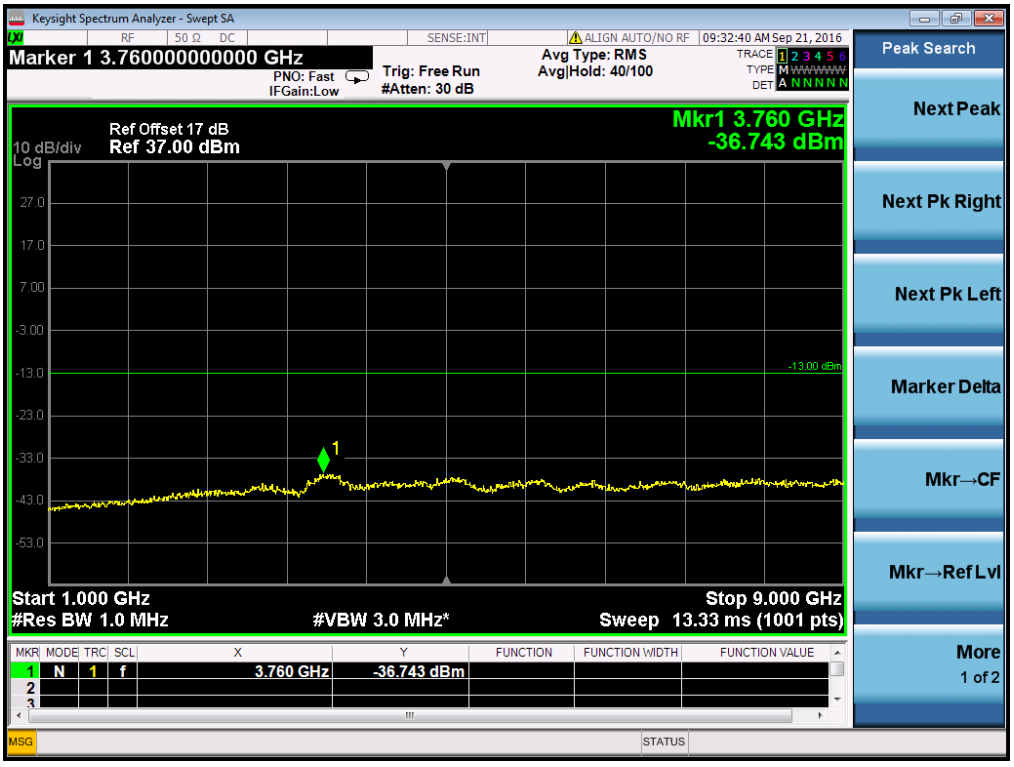


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	High
Bandwidth	3MHz	Modulation	QPSK

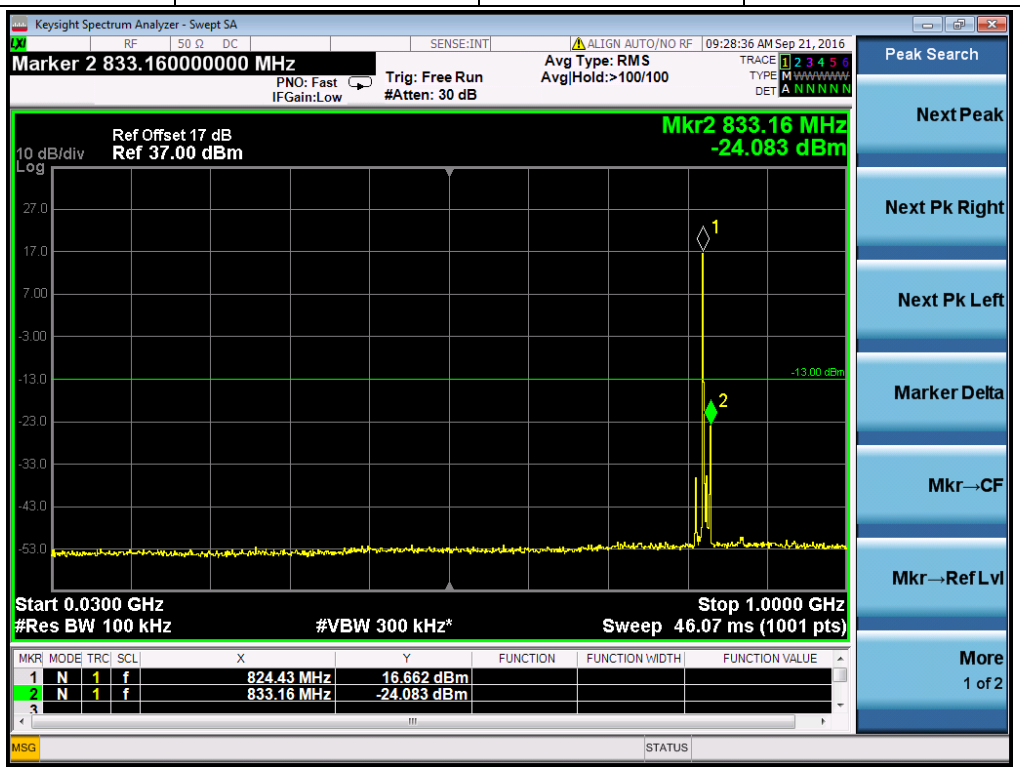


RB Size 1, RB Offset 0 30MHz to 1GHz

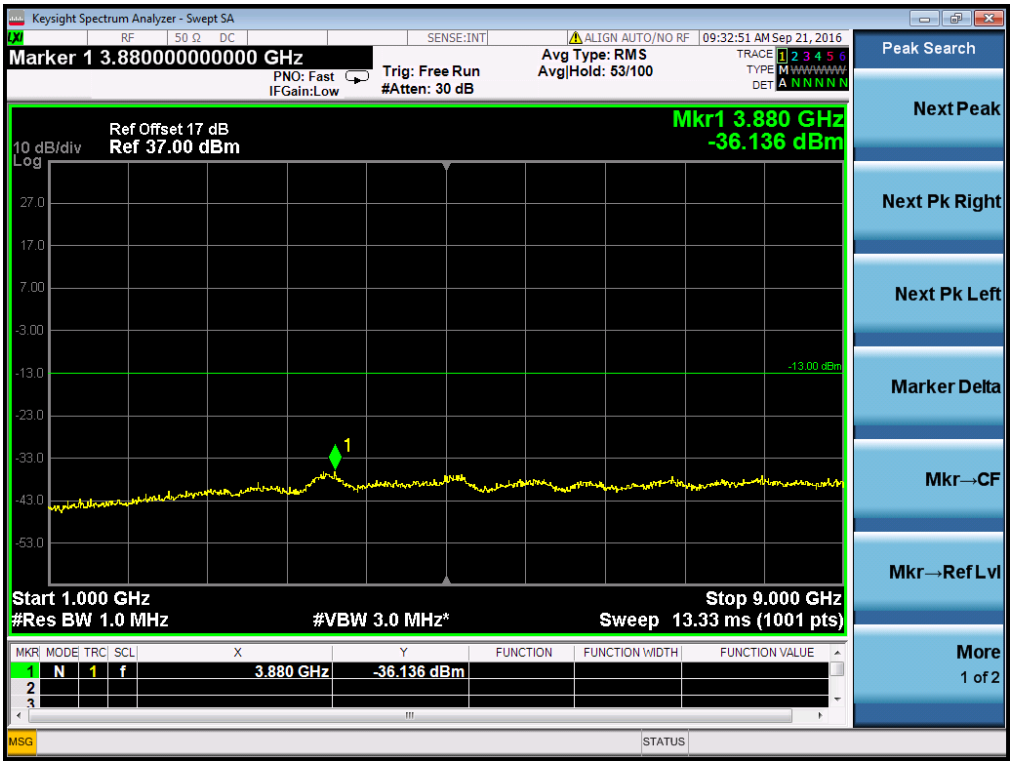


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Low
Bandwidth	5MHz	Modulation	QPSK

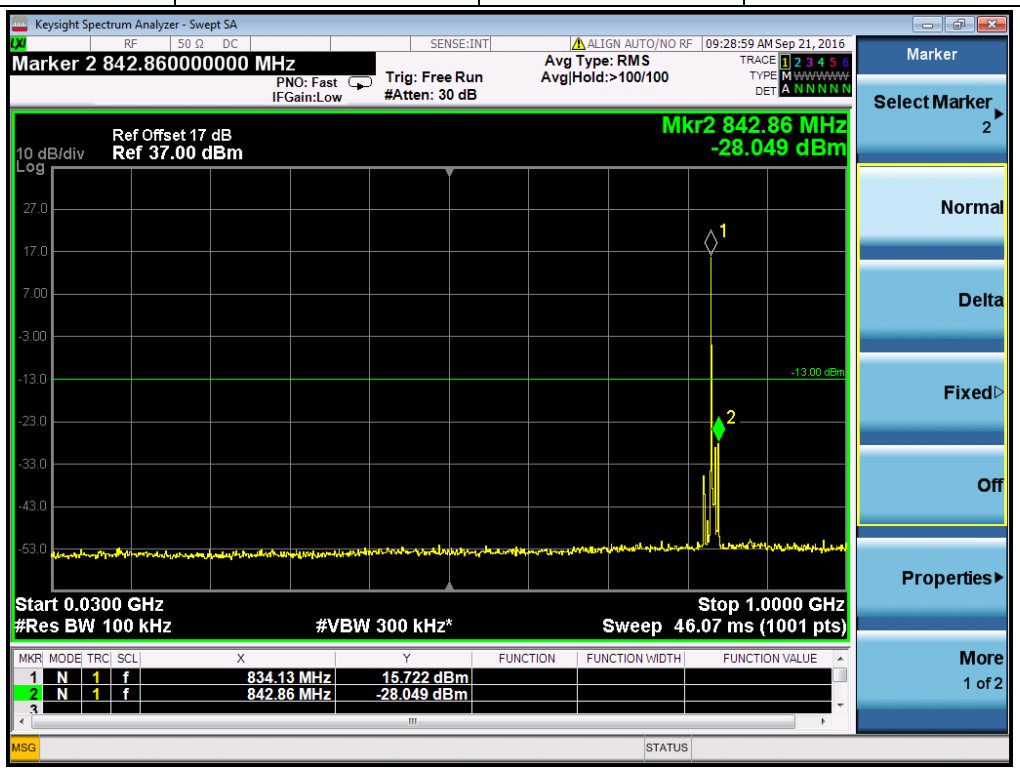


RB Size 1, RB Offset 0 30MHz to 1GHz

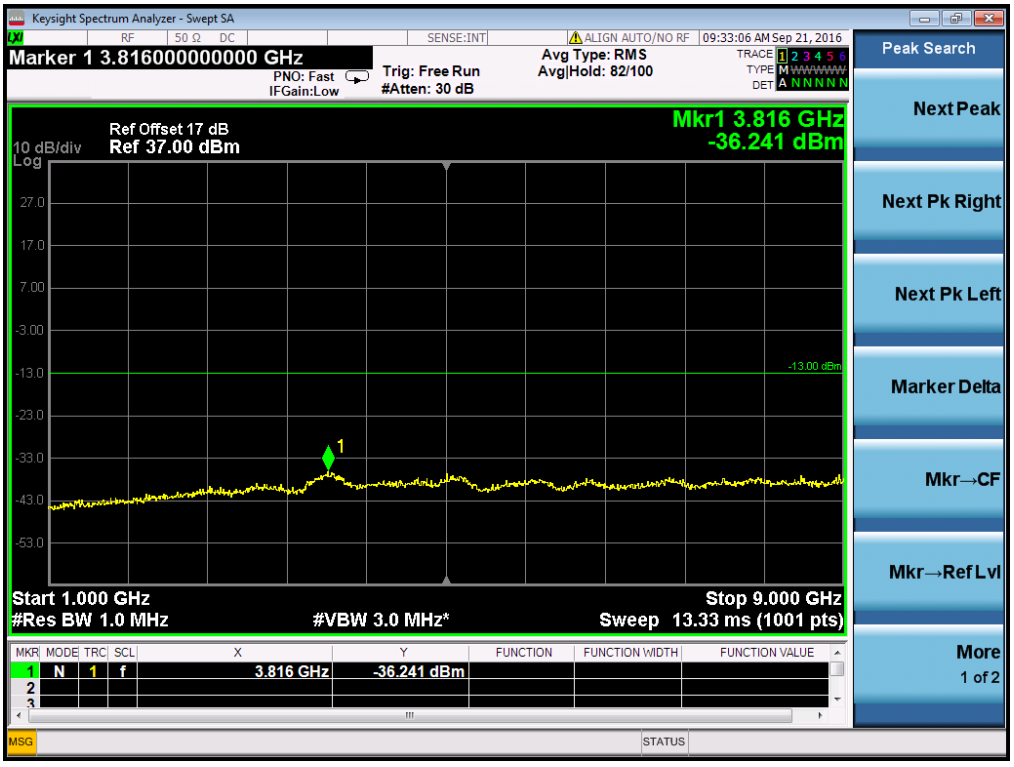


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Middle
Bandwidth	5MHz	Modulation	QPSK

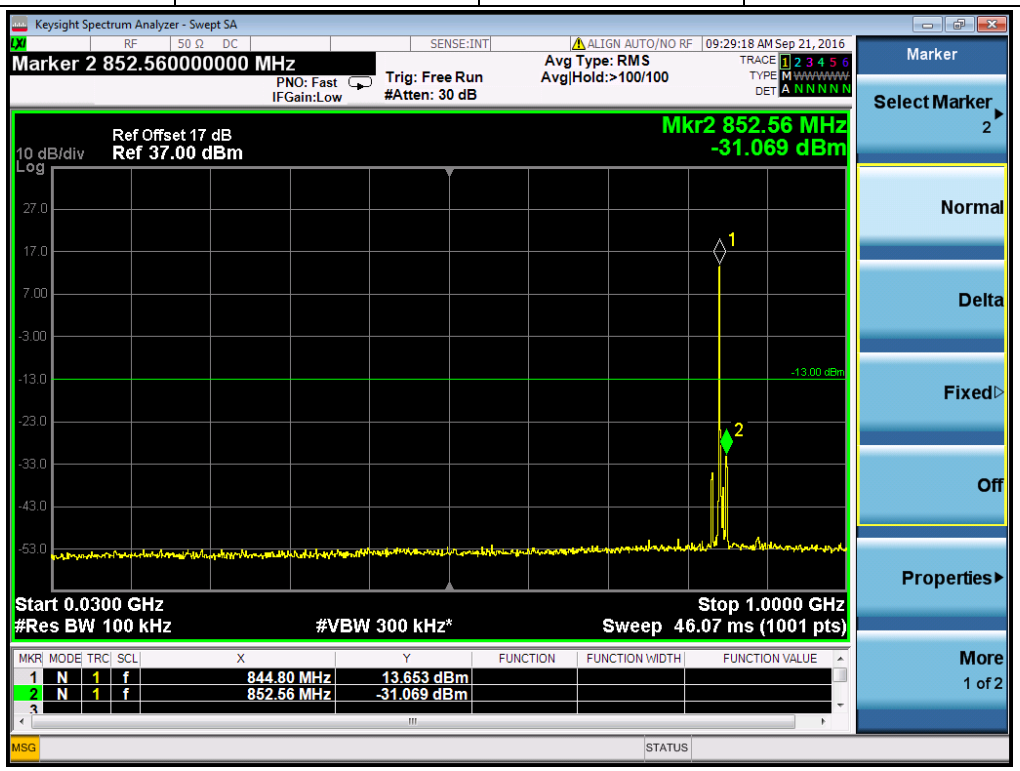


RB Size 1, RB Offset 0 30MHz to 1GHz

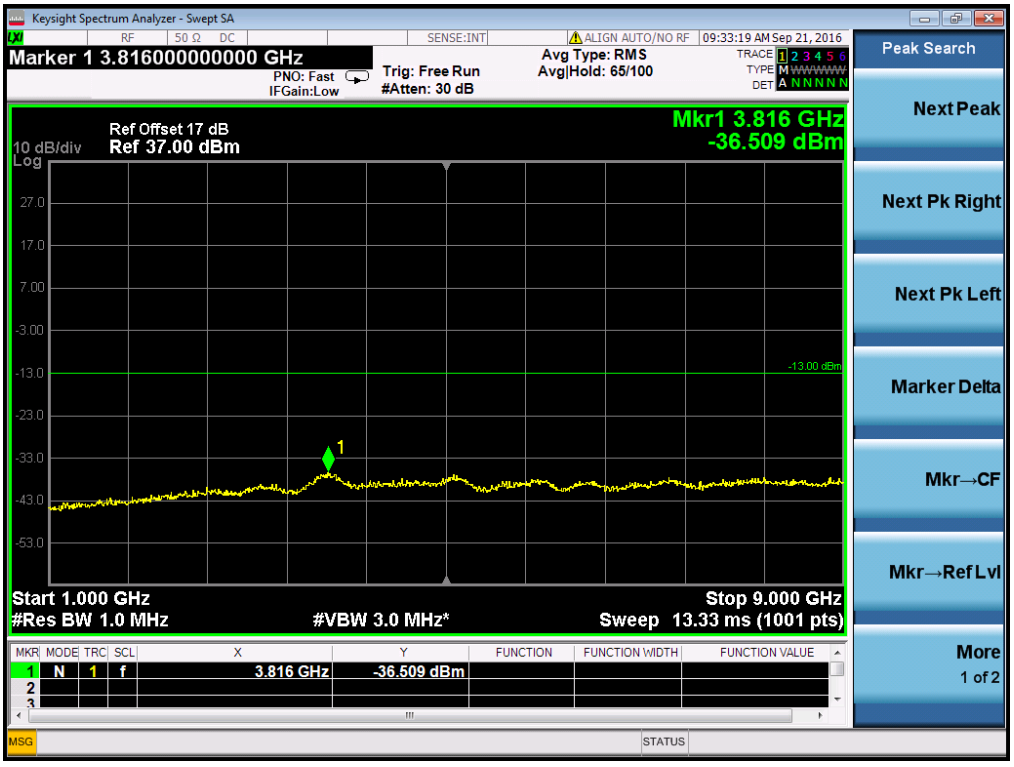


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	High
Bandwidth	5MHz	Modulation	QPSK

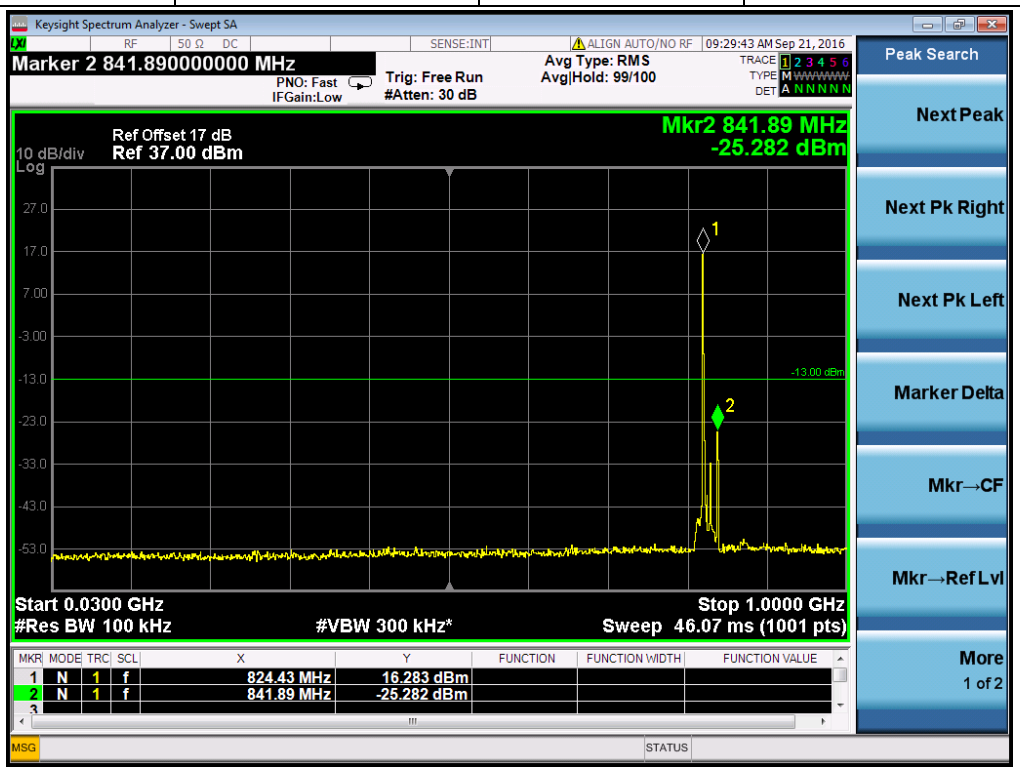


RB Size 1, RB Offset 0 30MHz to 1GHz

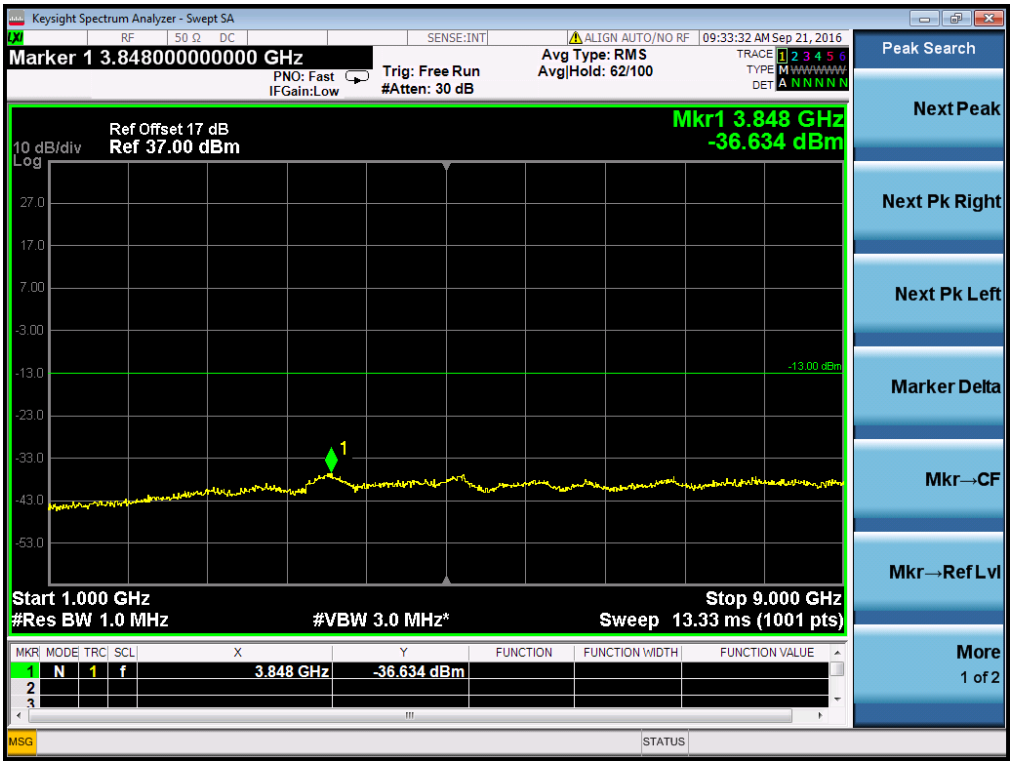


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Low
Bandwidth	10MHz	Modulation	QPSK

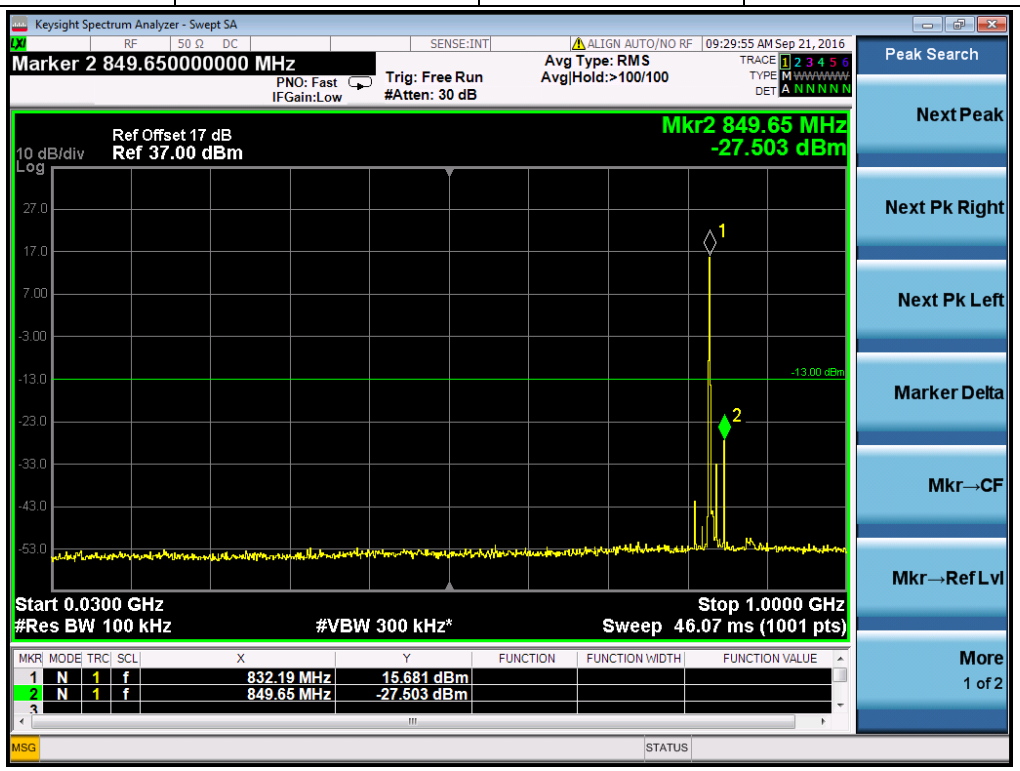


RB Size 1, RB Offset 0 30MHz to 1GHz

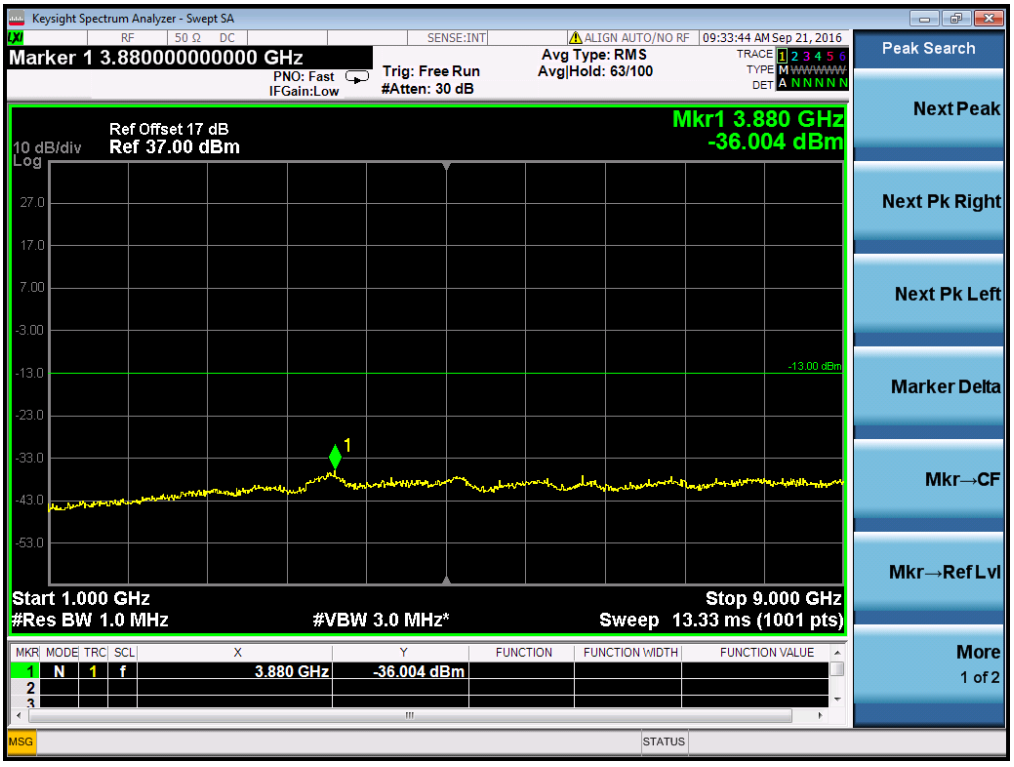


RB Size 1, RB Offset 0 1GHz to 9GHz

Band	LTE Band 5	Channel	Middle
Bandwidth	10MHz	Modulation	QPSK



RB Size 1, RB Offset 0 30MHz to 1GHz



RB Size 1, RB Offset 0 1GHz to 9GHz