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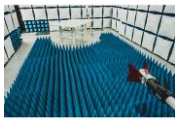

PART 27 MEASUREMENT REPORT

Applicant Name:
LG Electronics USA, Inc.
111 Sylvan Avenue, North Building
Englewood Cliffs, NJ 07632
United States

Date of Testing:
11/18/2020 - 12/14/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2011170181-04.ZNF

FCC ID:	**ZNFK330PM**
APPLICANT:	**LG Electronics USA, Inc.**

Application Type:	Certification
Model:	LM-K330PM
Additional Model(s):	LM-K330TM, LM-K330MM, LG L460DL, LM-K330QM, LM-K330QM6, LM-K330QN, LM-K330VM, LMK330PM, LMK330TM, LMK330MM, LGL460DL, LMK330QM, LMK330QM6, LMK330QN, LMK330VM, K330PM, K330TM, K330MM, L460DL, K330QM, K330QM6, K330QN, K330VM
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	27
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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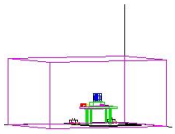
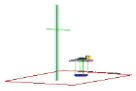


MEASUREMENT REPORT
FCC Part 27



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 12	10 MHz	QPSK	704.0 - 711.0	0.101	20.06	0.166	22.21	9M04G7D
		16QAM	704.0 - 711.0	0.085	19.31	0.140	21.46	9M05W7D
		64QAM	704.0 - 711.0	0.068	18.36	0.112	20.51	9M03W7D
	5 MHz	QPSK	701.5 - 713.5	0.097	19.87	0.159	22.02	4M55G7D
		16QAM	701.5 - 713.5	0.086	19.33	0.140	21.48	4M55W7D
		64QAM	701.5 - 713.5	0.070	18.48	0.116	20.63	4M56W7D
	3 MHz	QPSK	700.5 - 714.5	0.098	19.90	0.160	22.05	2M70G7D
		16QAM	700.5 - 714.5	0.087	19.39	0.142	21.54	2M70W7D
		64QAM	700.5 - 714.5	0.072	18.56	0.118	20.71	2M70W7D
	1.4 MHz	QPSK	699.7 - 715.3	0.095	19.77	0.155	21.92	1M10G7D
		16QAM	699.7 - 715.3	0.083	19.22	0.137	21.37	1M11W7D
		64QAM	699.7 - 715.3	0.070	18.43	0.114	20.58	1M09W7D
LTE Band 13	10 MHz	QPSK	782.0	0.117	20.69	0.192	22.84	9M01G7D
		16QAM	782.0	0.091	19.61	0.150	21.76	9M00W7D
		64QAM	782.0	0.070	18.43	0.114	20.58	9M00W7D
	5 MHz	QPSK	779.5 - 784.5	0.116	20.64	0.190	22.79	4M50G7D
		16QAM	779.5 - 784.5	0.088	19.45	0.145	21.60	4M50W7D
		64QAM	779.5 - 784.5	0.067	18.26	0.110	20.41	4M51W7D
LTE Band 71	20 MHz	QPSK	673.0 - 688.0	0.060	17.75	0.098	19.90	18M0G7D
		16QAM	673.0 - 688.0	0.050	16.99	0.082	19.14	18M0W7D
		64QAM	673.0 - 688.0	0.039	15.87	0.063	18.02	17M9W7D
	15 MHz	QPSK	670.5 - 690.5	0.058	17.63	0.095	19.78	13M5G7D
		16QAM	670.5 - 690.5	0.051	17.10	0.084	19.25	13M5W7D
		64QAM	670.5 - 690.5	0.046	16.67	0.076	18.82	13M5W7D
	10 MHz	QPSK	668.0 - 693.0	0.062	17.93	0.102	20.08	9M04G7D
		16QAM	668.0 - 693.0	0.054	17.35	0.089	19.50	9M02W7D
		64QAM	668.0 - 693.0	0.044	16.46	0.073	18.61	9M04W7D
	5 MHz	QPSK	665.5 - 695.5	0.064	18.04	0.104	20.19	4M53G7D
		16QAM	665.5 - 695.5	0.054	17.36	0.089	19.51	4M51W7D
		64QAM	665.5 - 695.5	0.043	16.31	0.070	18.46	4M53W7D

Overview Table (<1GHz Bands)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
WCDMA1700	5 MHz	Spread Spectrum	1712.4 - 1752.6	0.189	22.76	4M19F9W
LTE Band 66/4	20 MHz	QPSK	1720.0 - 1770.0	0.183	22.63	18M0G7D
		16QAM	1720.0 - 1770.0	0.149	21.73	18M0W7D
		64QAM	1720.0 - 1770.0	0.122	20.86	18M0W7D
	15 MHz	QPSK	1717.5 - 1772.5	0.185	22.68	13M6G7D
		16QAM	1717.5 - 1772.5	0.146	21.65	13M6W7D
		64QAM	1717.5 - 1772.5	0.125	20.97	13M6W7D
	10 MHz	QPSK	1715.0 - 1775.0	0.189	22.76	9M02G7D
		16QAM	1715.0 - 1775.0	0.145	21.60	9M03W7D
		64QAM	1715.0 - 1775.0	0.116	20.64	9M06W7D
	5 MHz	QPSK	1712.5 - 1777.5	0.191	22.82	4M55G7D
		16QAM	1712.5 - 1777.5	0.144	21.58	4M53W7D
		64QAM	1712.5 - 1777.5	0.120	20.78	4M56W7D
	3 MHz	QPSK	1711.5 - 1778.5	0.189	22.77	2M70G7D
		16QAM	1711.5 - 1778.5	0.142	21.52	2M70W7D
		64QAM	1711.5 - 1778.5	0.112	20.50	2M70W7D
	1.4 MHz	QPSK	1710.7 - 1779.3	0.182	22.61	1M10G7D
		16QAM	1710.7 - 1779.3	0.144	21.57	1M11W7D
		64QAM	1710.7 - 1779.3	0.123	20.91	1M09W7D

Overview Table (>1GHz Bands)

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFK330PM**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 21251, 21269, 21202, 21194

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, CDMA/EvDO Rev. 0/A 800/850/1900 (BC10/BC0/BC1), Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE)

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – cable loss $_{[dB]}$.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

E[dBµV/m] = Measured amplitude level[dBm] + 107 + Cable Loss[dB] + Antenna Factor[dB/m]

And

EIRP[dBm] = E[dBµV/m] + 20logD – 104.8; where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx2
-	LTx3	LIcensed Transmitter Cable Set	8/28/2020	Annual	8/28/2021	LTx3
Anritsu	MT8820C	Radio Communication Analyzer	N/A			6201300731
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201381794
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6200901190
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Keysight Technologies	N9020A	MXA Signal Analyzer	8/14/2020	Annual	8/14/2021	MY54500644
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			833855/0010
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/3/2020	Annual	3/3/2021	A042511
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307

Table 5-1. Summary of Test Results

Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics USA, Inc.

FCC ID: ZNFK330PM

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): WCDMA AWS/ LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 27.53	RSS-139(6.6)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Transmitter Conducted Output Power	2.1046	RSS-139(4.1)	N/A	PASS	See RF Exposure Report
	Frequency Stability	2.1055, 27.54	RSS-139(6.4)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 71)	27.50(c)(10)	RSS-130(4.4)	< 3 Watts max. ERP < 5 Watts max. EIRP	PASS	Section 7.6
	Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 12)				PASS	Section 7.6
	Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 13)	27.50(b)(10)	RSS-130(4.4)	< 3 Watts max. ERP < 5 Watts max. EIRP	PASS	Section 7.6
	Equivalent Isotropic Radiated Power (WCDMA)	27.50(d)(4)	RSS-139(6.5)	< 1 Watts max. EIRP	PASS	Section 7.6
	Equivalent Isotropic Radiated Power (LTE Band 4/66)				PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 13)	2.1053, 27.53(f)	RSS-139(6.6)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 - 1610 MHz	PASS	Section 7.7
	Radiated Spurious Emissions (LTE B4/66, B71, B12, B13 and WCDMA B4)	2.1053, 27.53	RSS-139(6.6)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST 2G/3G Automation Version 4.2, LTE Automation Version 5.3.

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7.2 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

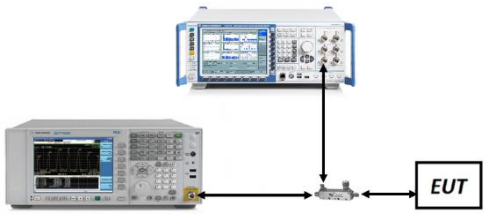

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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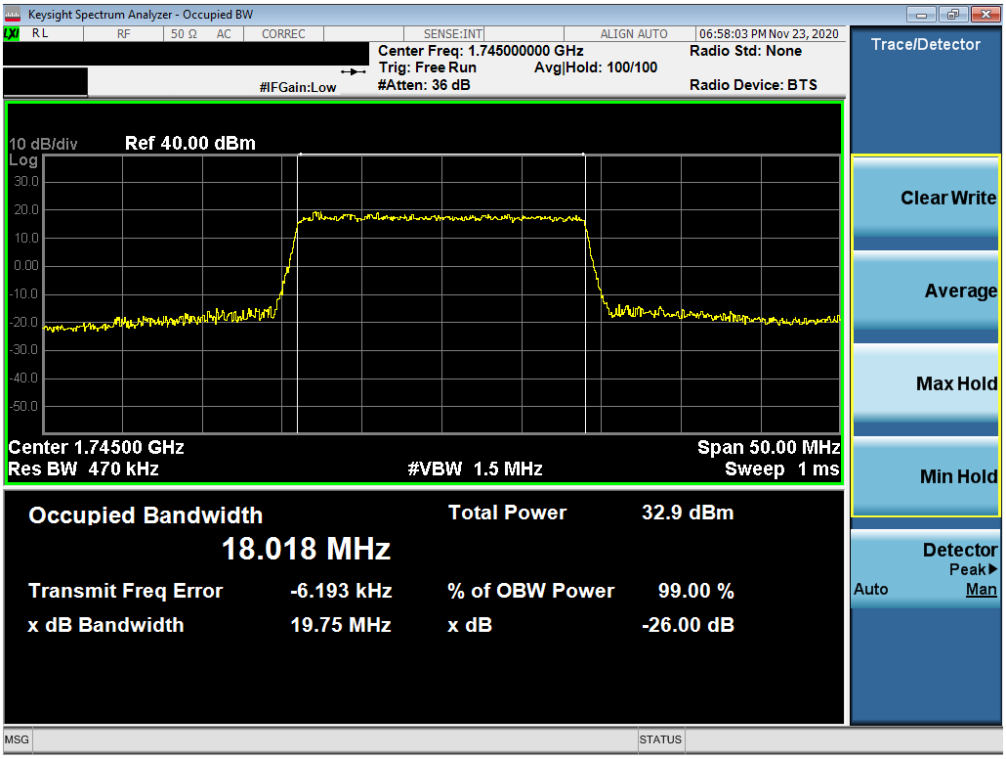
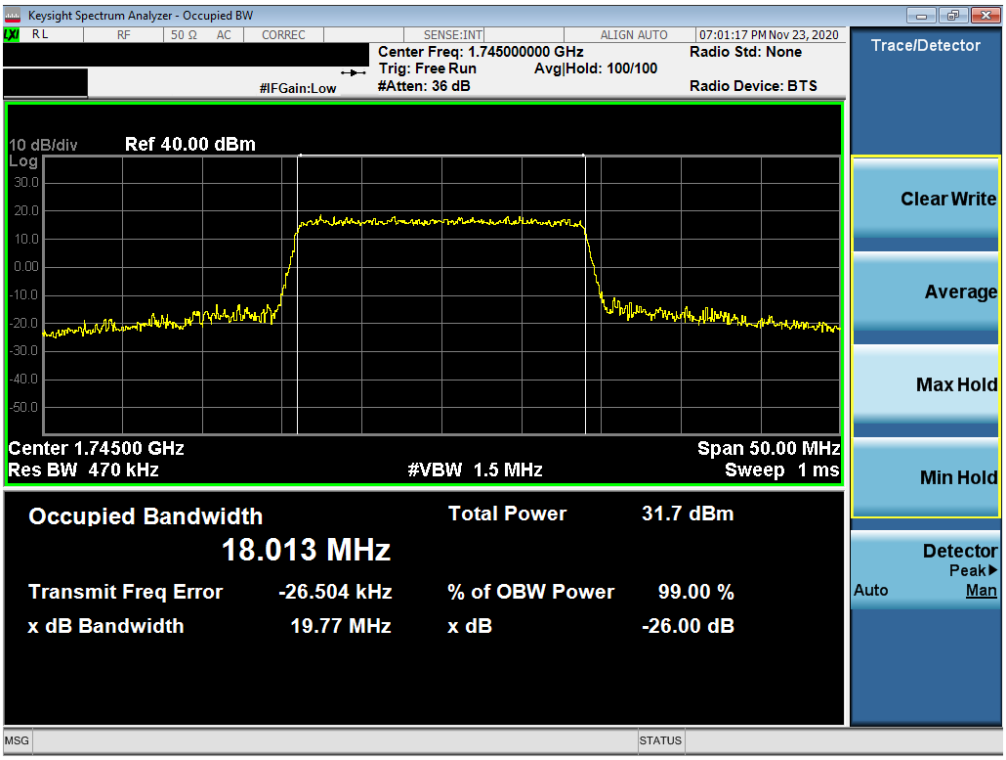


Plot 7-1. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz 16-QAM - Full RB Configuration)

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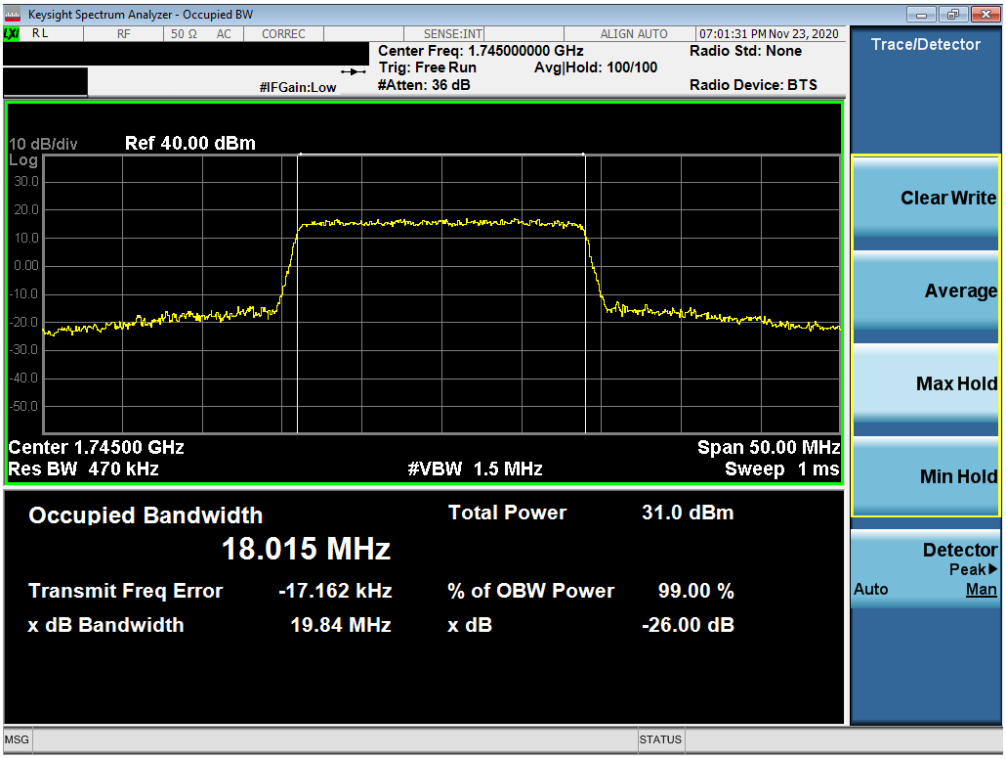
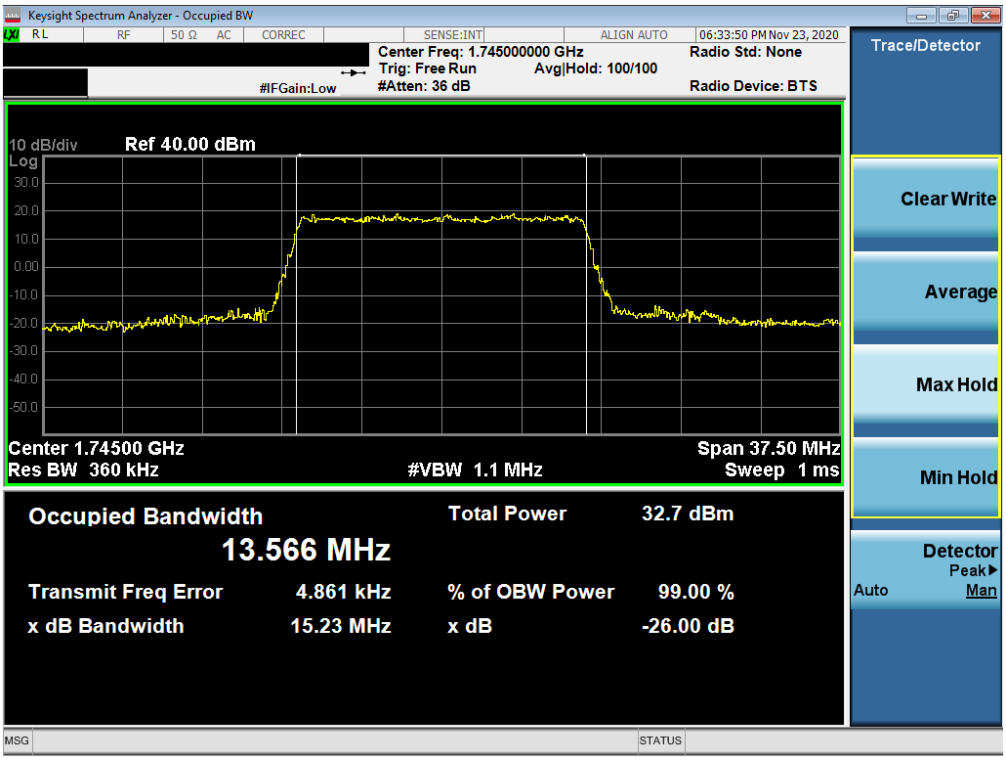


Plot 7-3. Occupied Bandwidth Plot (LTE Band 66/4 - 20MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz QPSK - Full RB Configuration)

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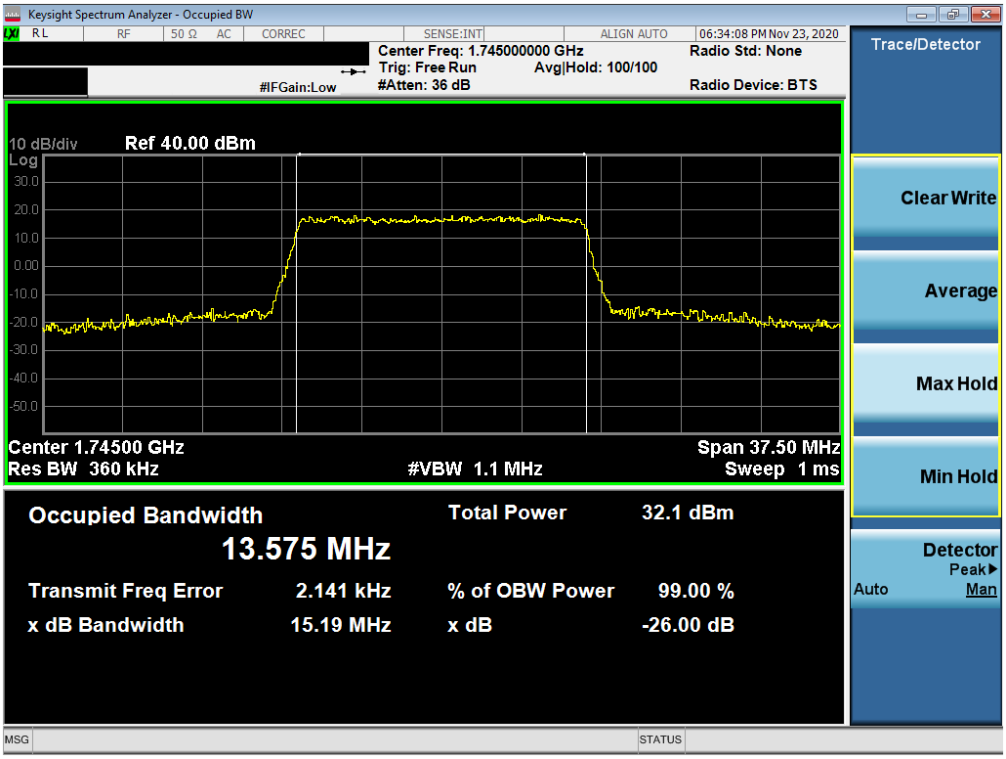
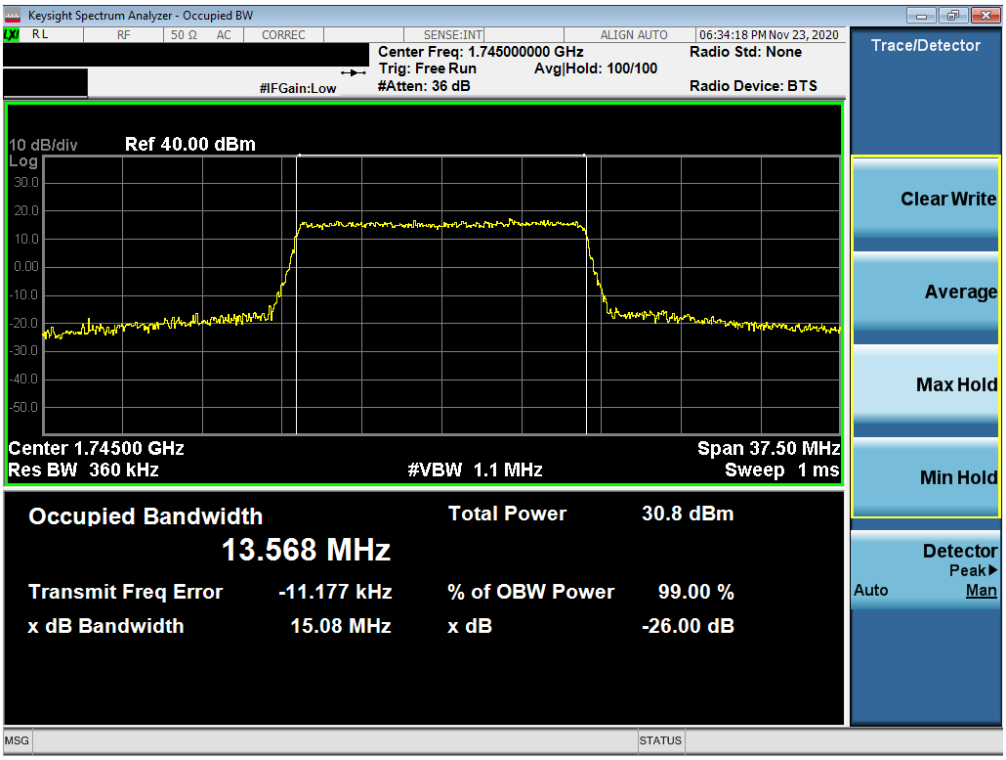


Plot 7-5. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz 16-QAM - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 66/4 - 15MHz 64-QAM - Full RB Configuration)

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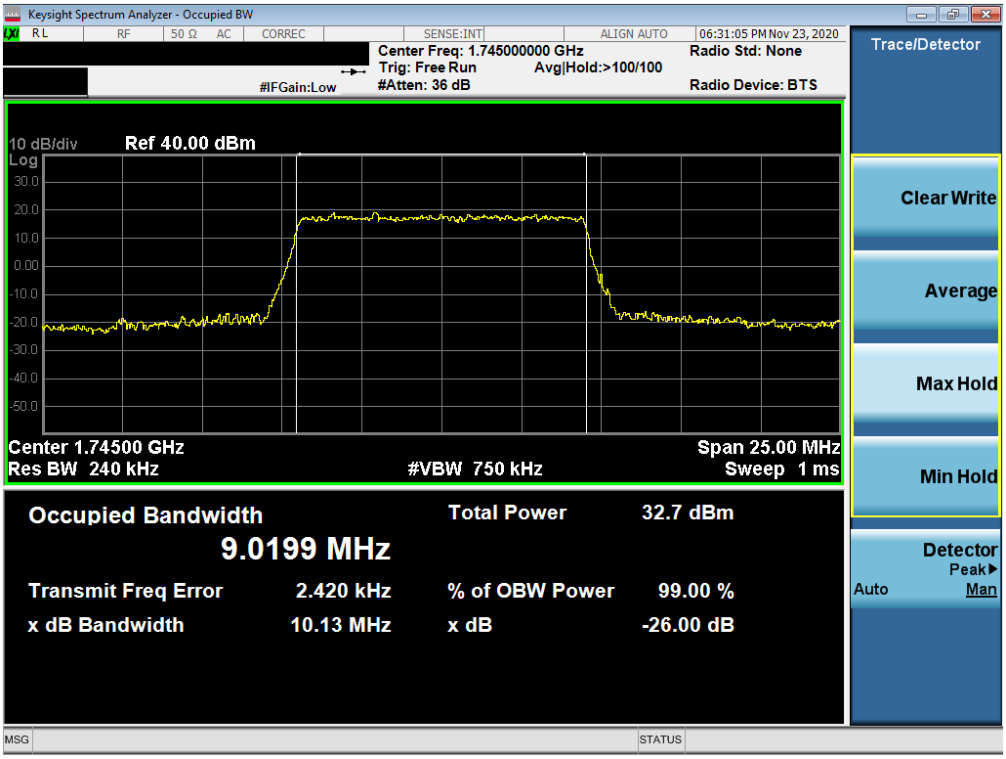
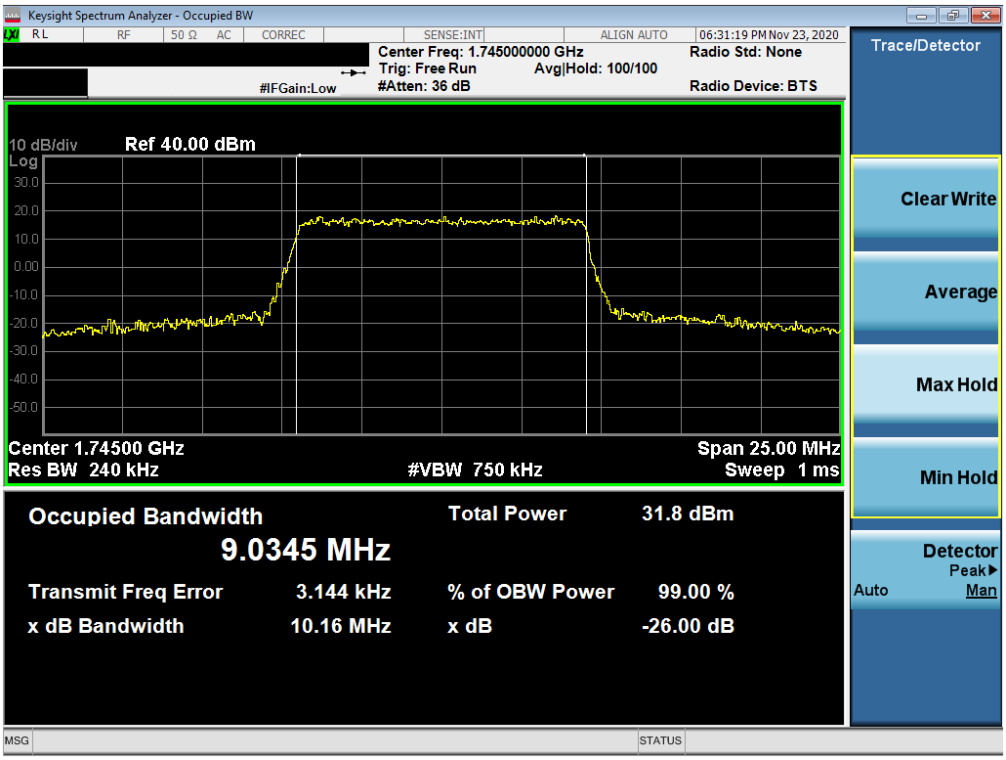


Plot 7-7. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz QPSK - Full RB Configuration)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz 16-QAM - Full RB Configuration)

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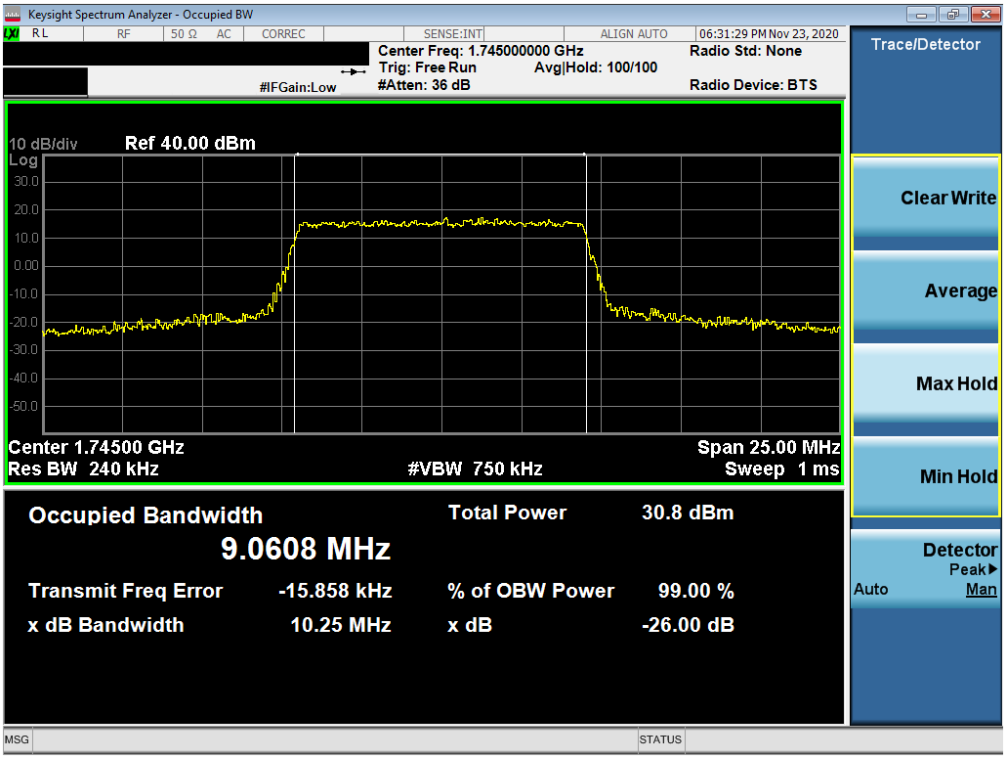
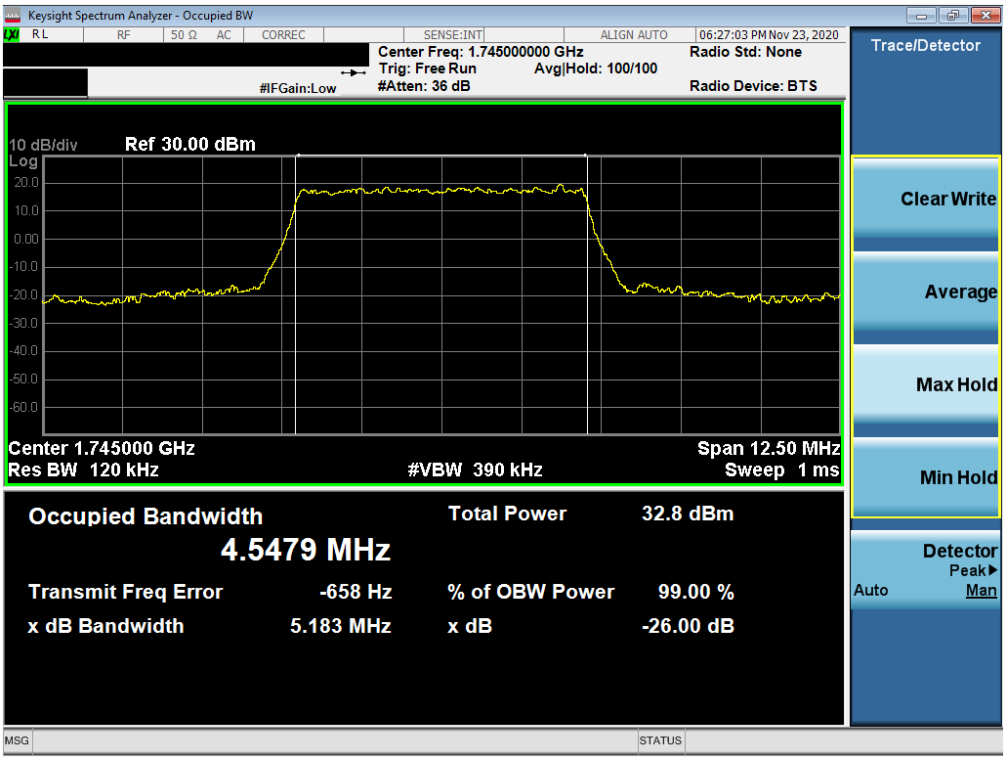


Plot 7-9. Occupied Bandwidth Plot (LTE Band 66/4 - 10MHz 64-QAM - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz QPSK - Full RB Configuration)

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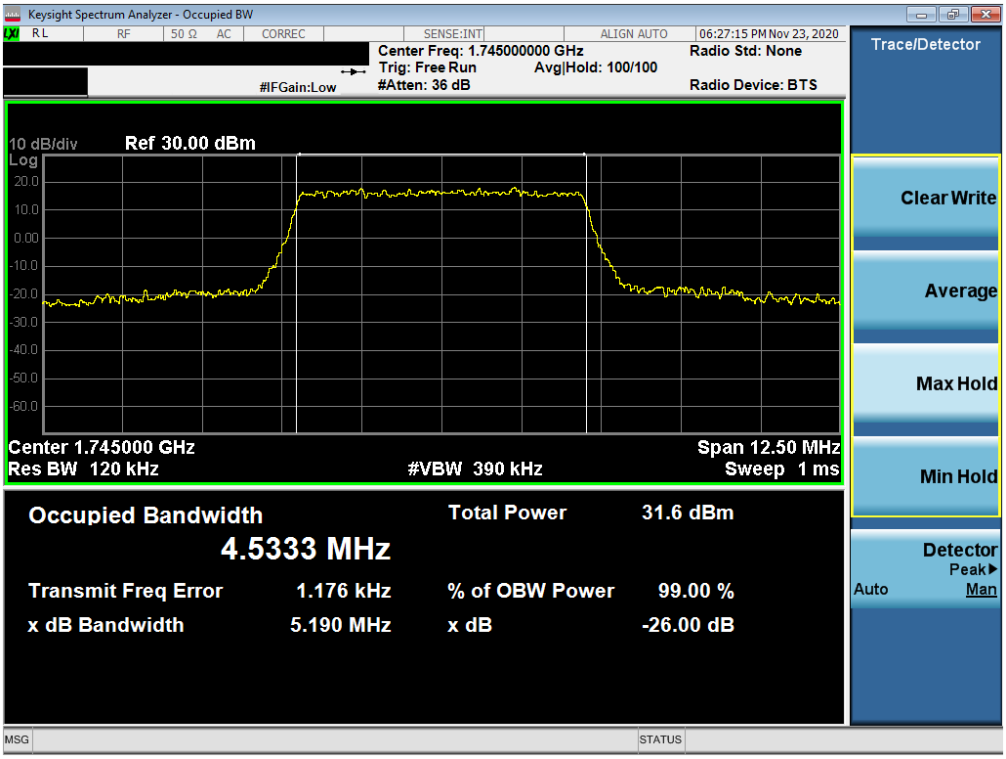
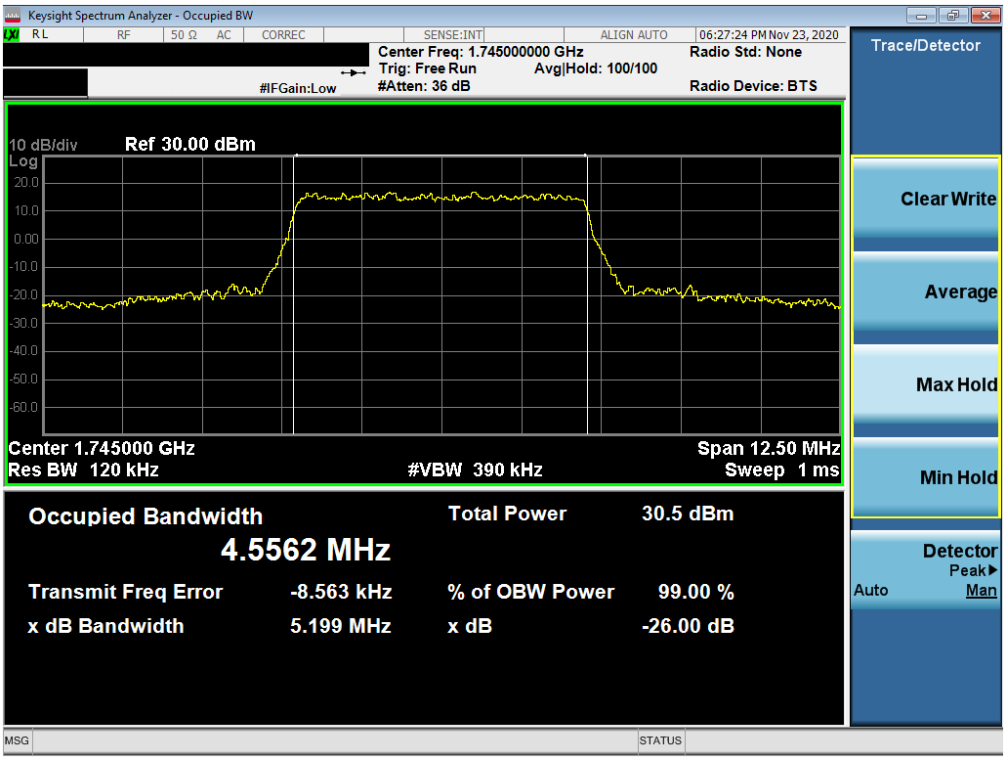


Plot 7-11. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 66/4 - 5MHz 64-QAM - Full RB Configuration)

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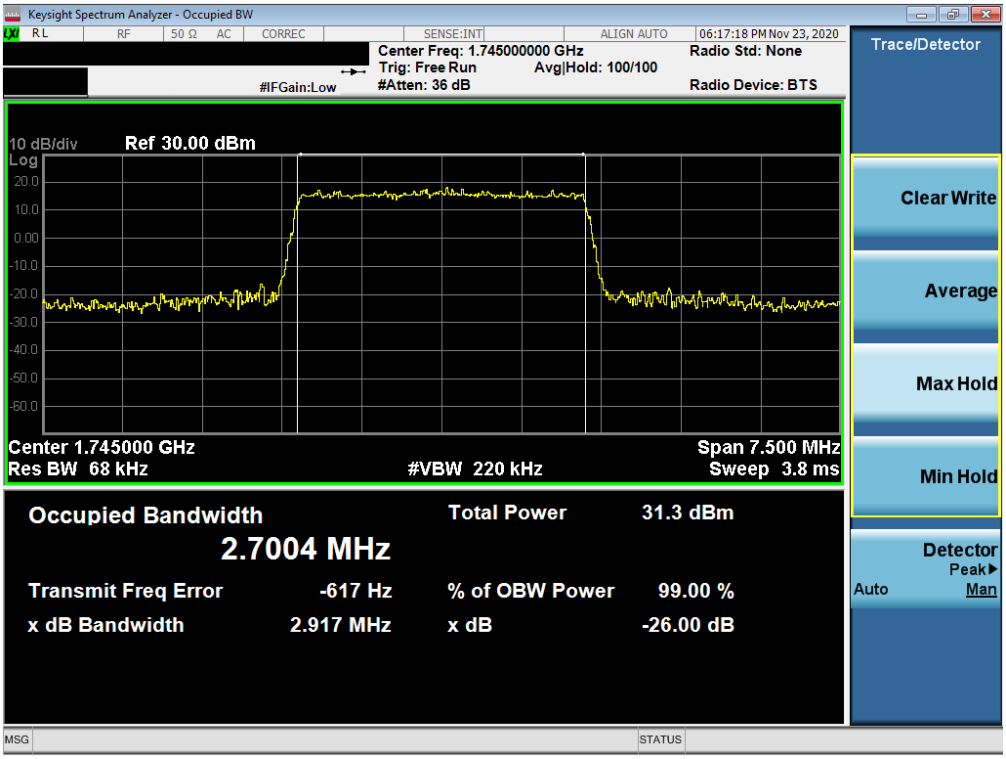
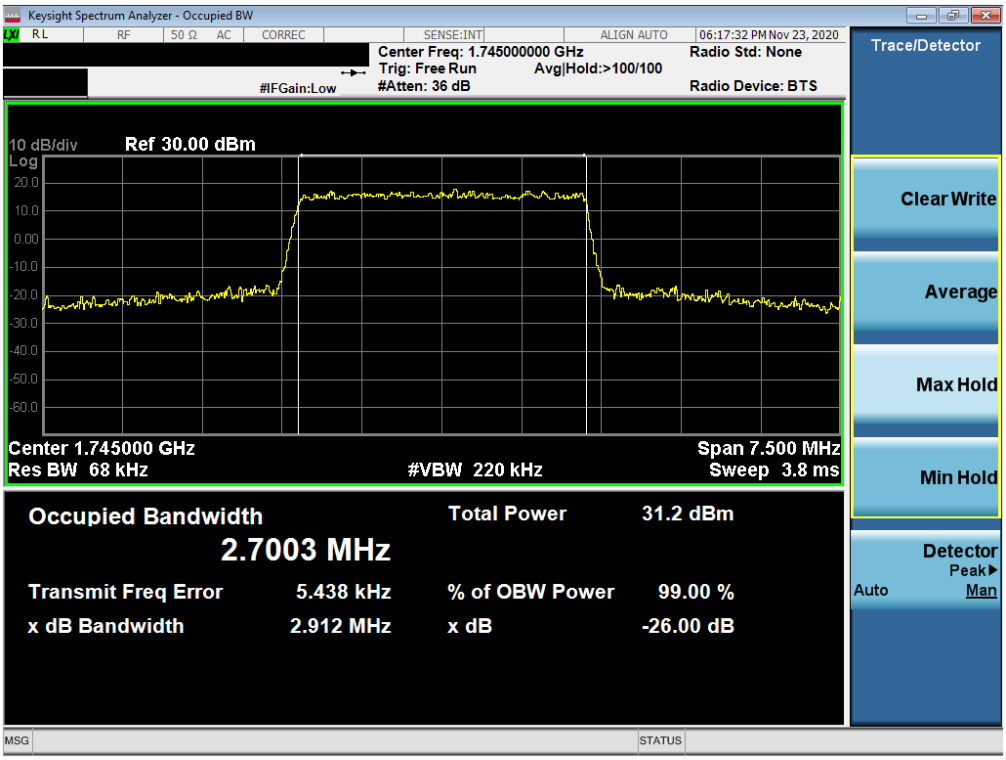


Plot 7-13. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz 16-QAM - Full RB Configuration)

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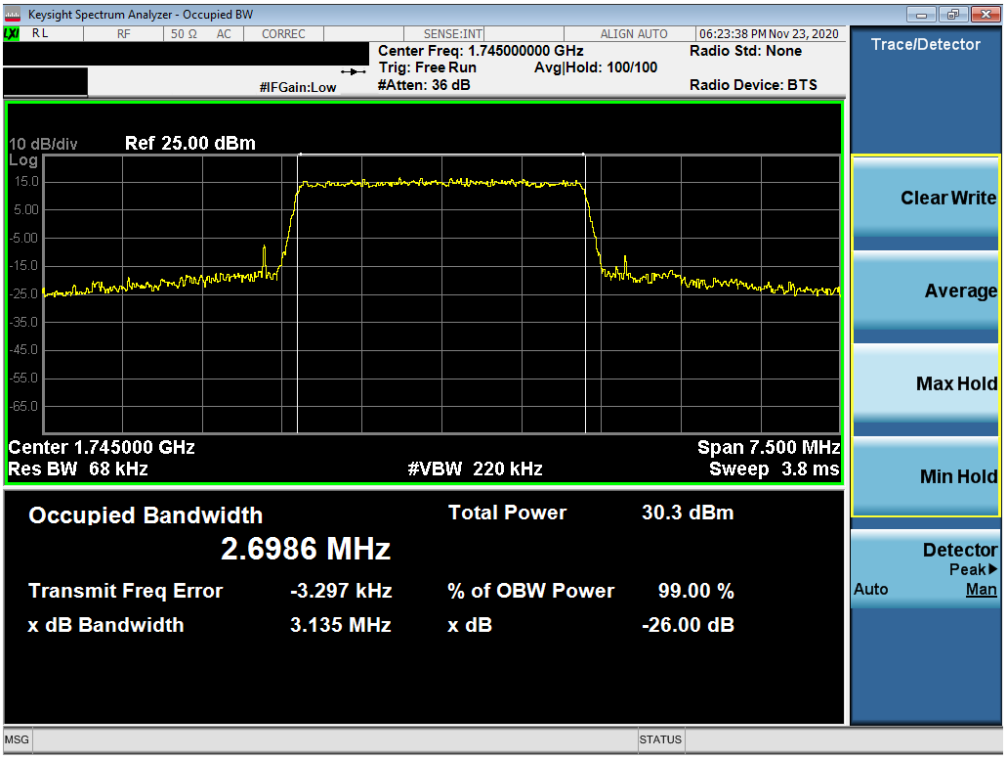
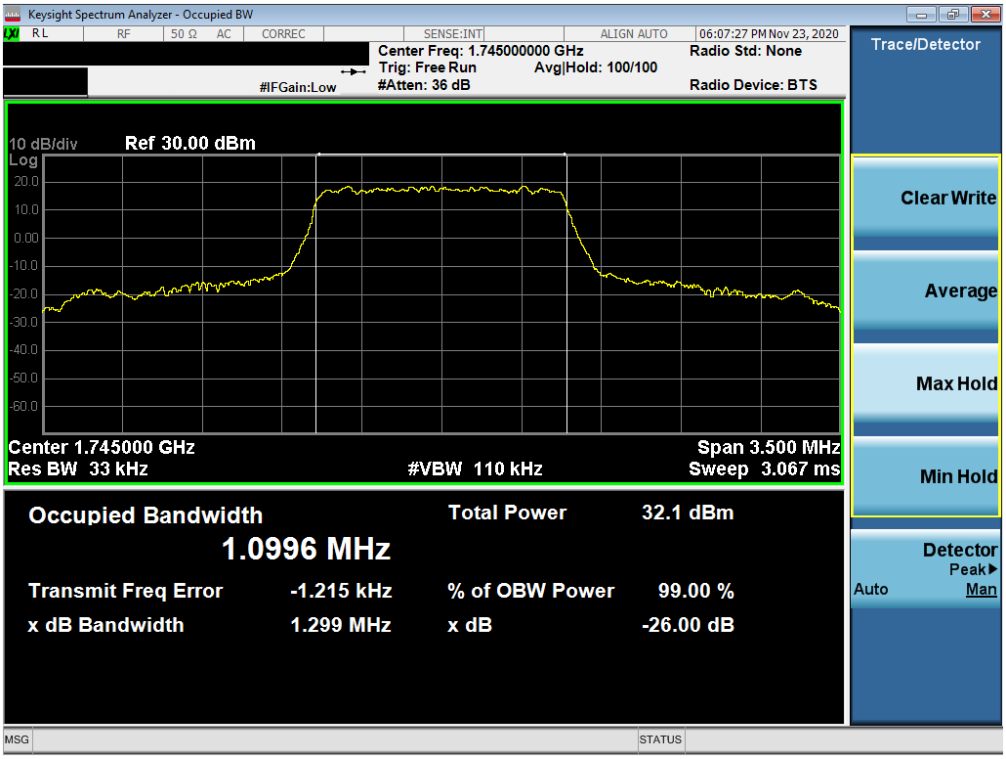


Plot 7-15. Occupied Bandwidth Plot (LTE Band 66/4 - 3MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz QPSK - Full RB Configuration)

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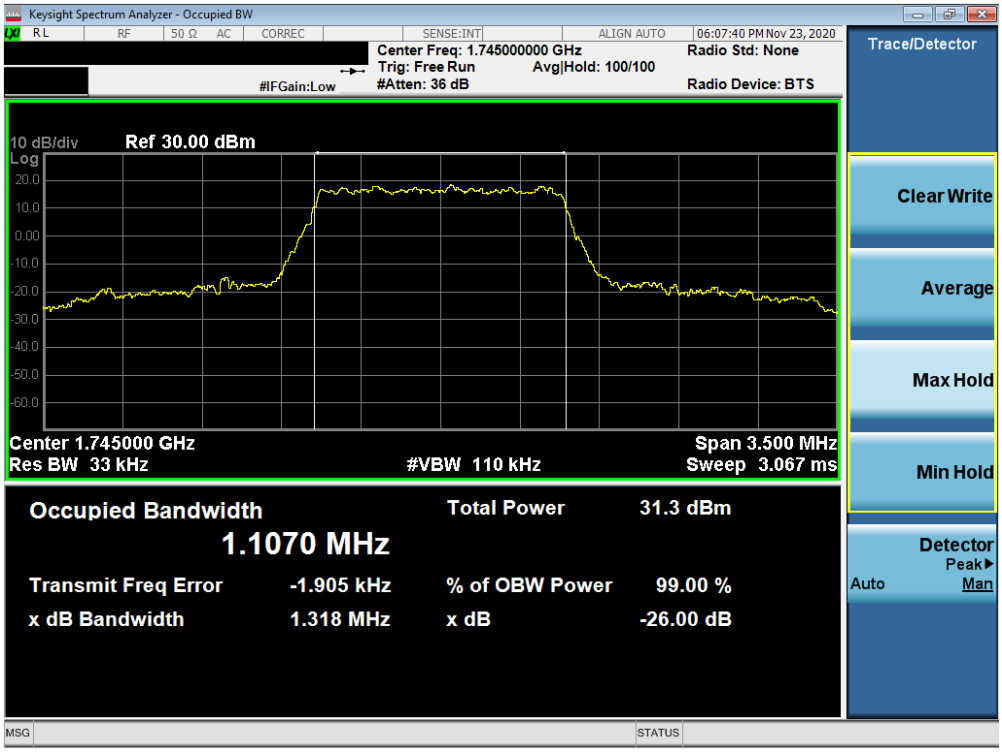
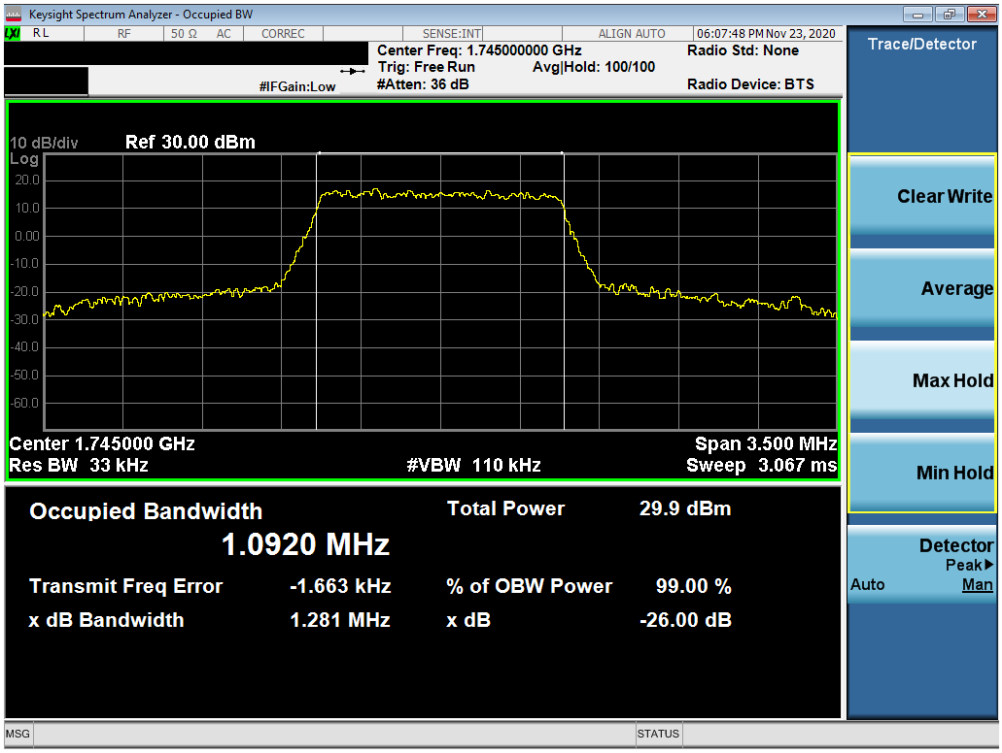


Plot 7-17. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz 16-QAM - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (LTE Band 66/4 - 1.4MHz 64-QAM - Full RB Configuration)

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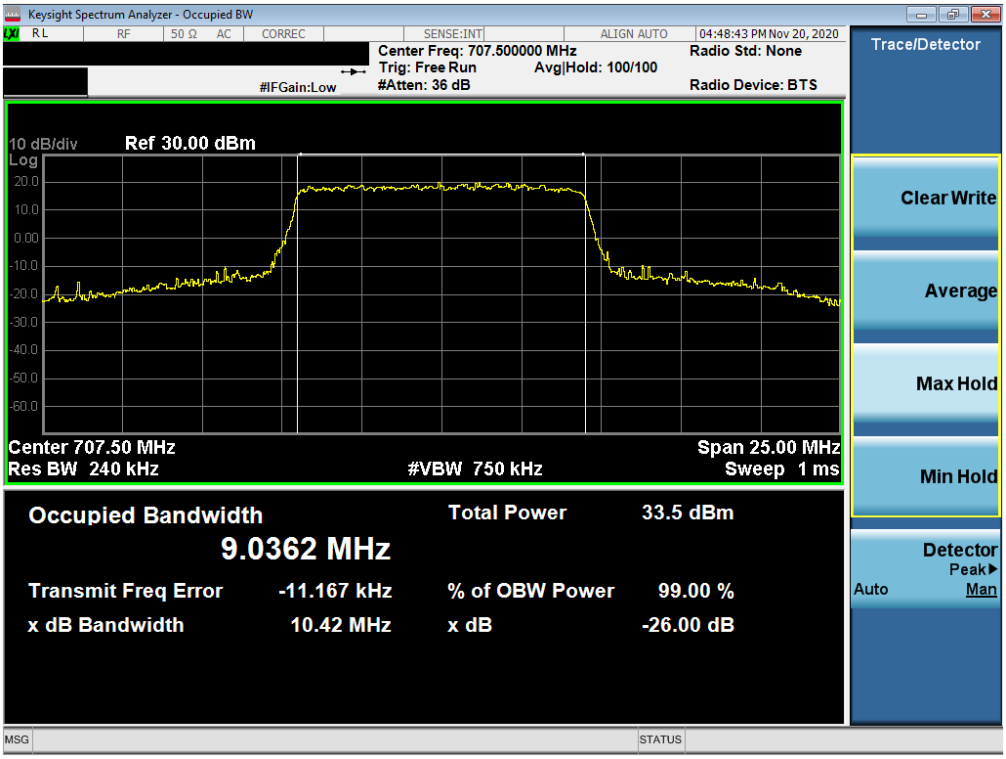
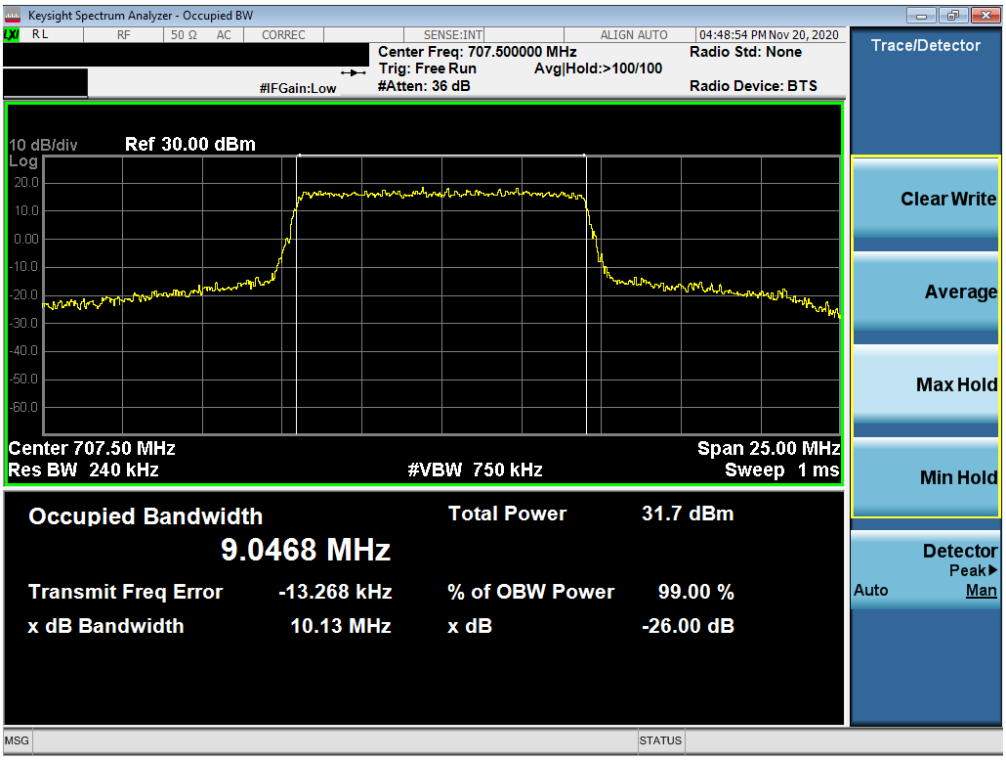


Plot 7-19. Occupied Bandwidth Plot (LTE Band 12 - 10MHz QPSK - Full RB Configuration)



Plot 7-20. Occupied Bandwidth Plot (LTE Band 12 - 10MHz 16-QAM - Full RB Configuration)

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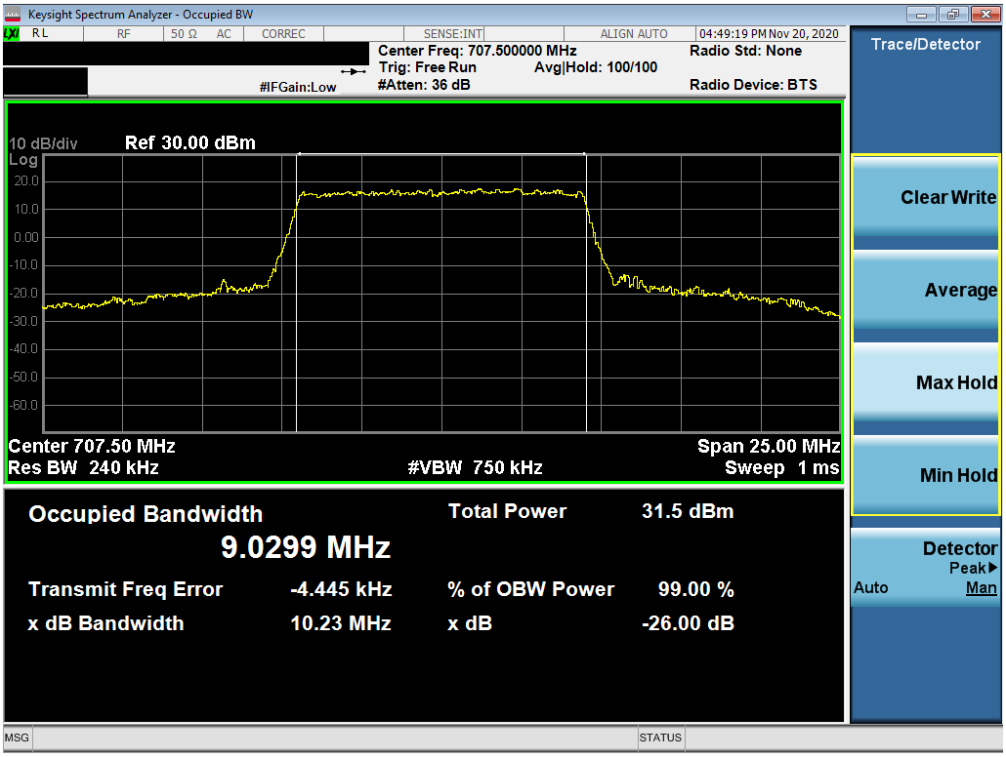
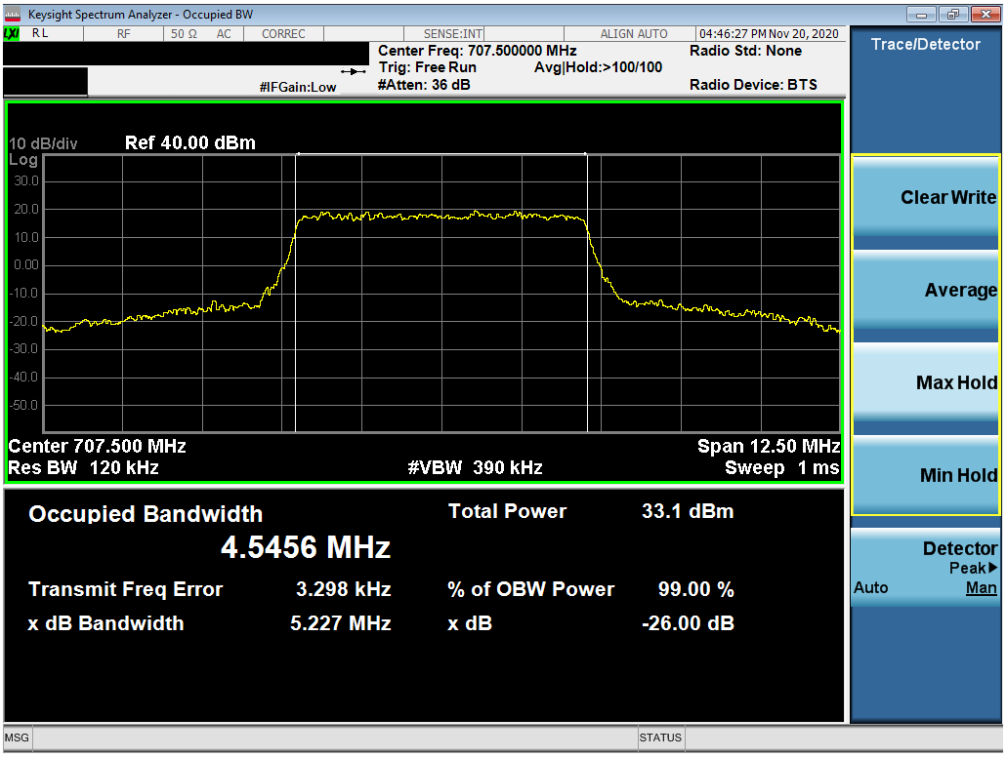


Plot 7-21. Occupied Bandwidth Plot (LTE Band 12 - 10MHz 64-QAM - Full RB Configuration)



Plot 7-22. Occupied Bandwidth Plot (LTE Band 12 - 5MHz QPSK - Full RB Configuration)

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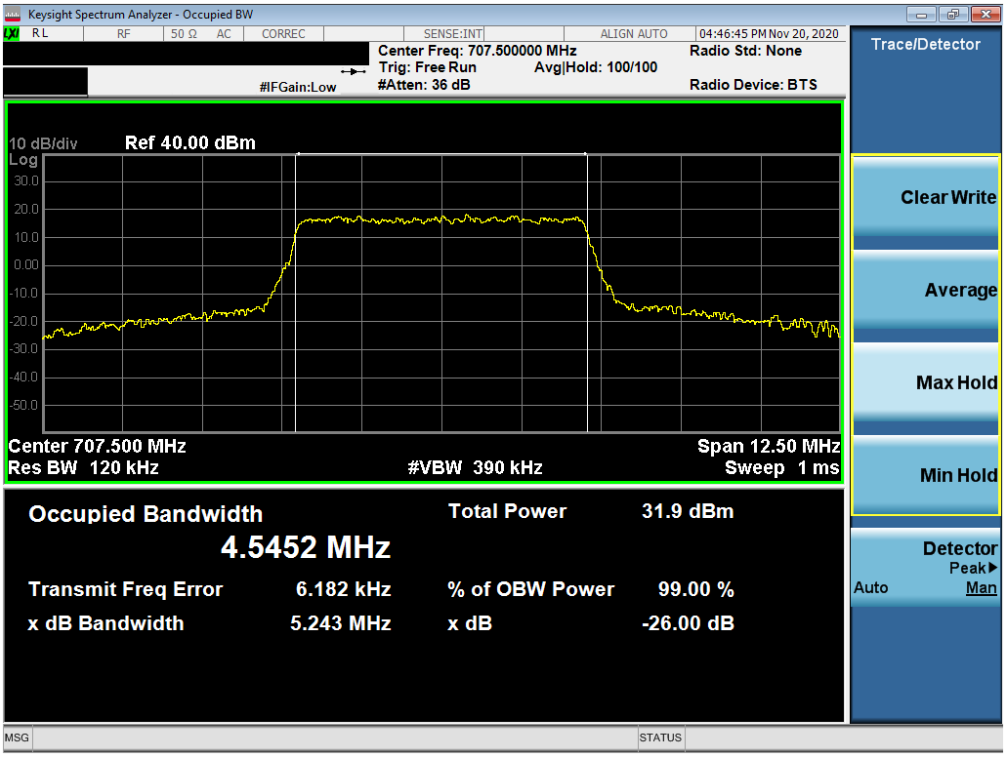
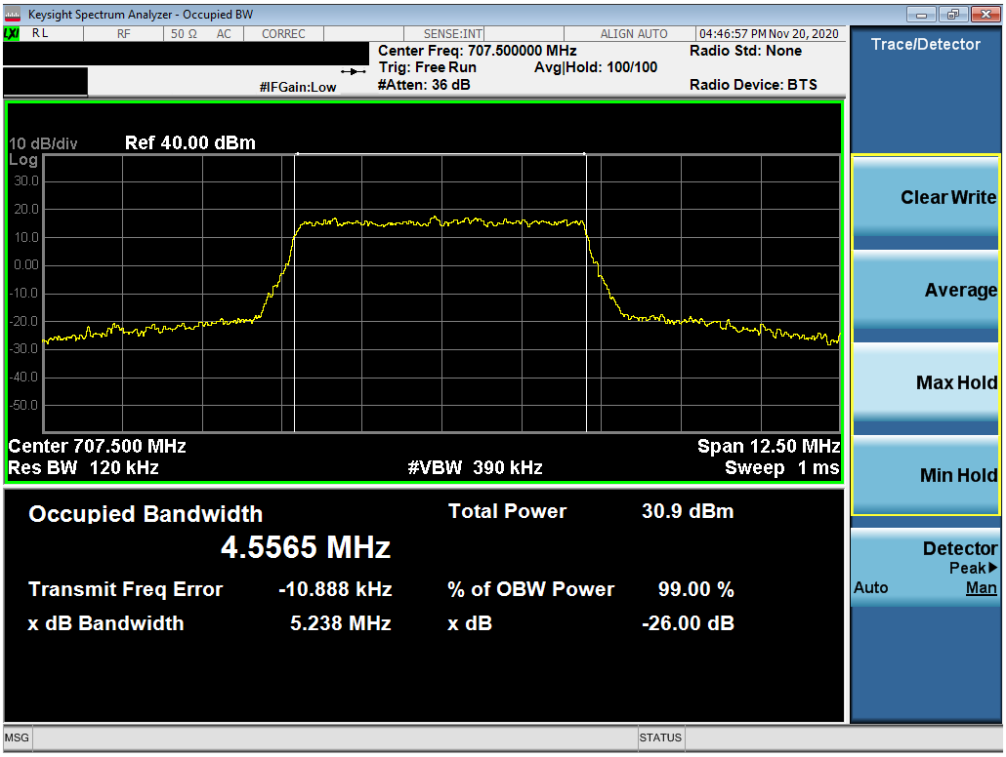


Plot 7-23. Occupied Bandwidth Plot (LTE Band 12 - 5MHz 16-QAM - Full RB Configuration)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 12 - 5MHz 64-QAM - Full RB Configuration)

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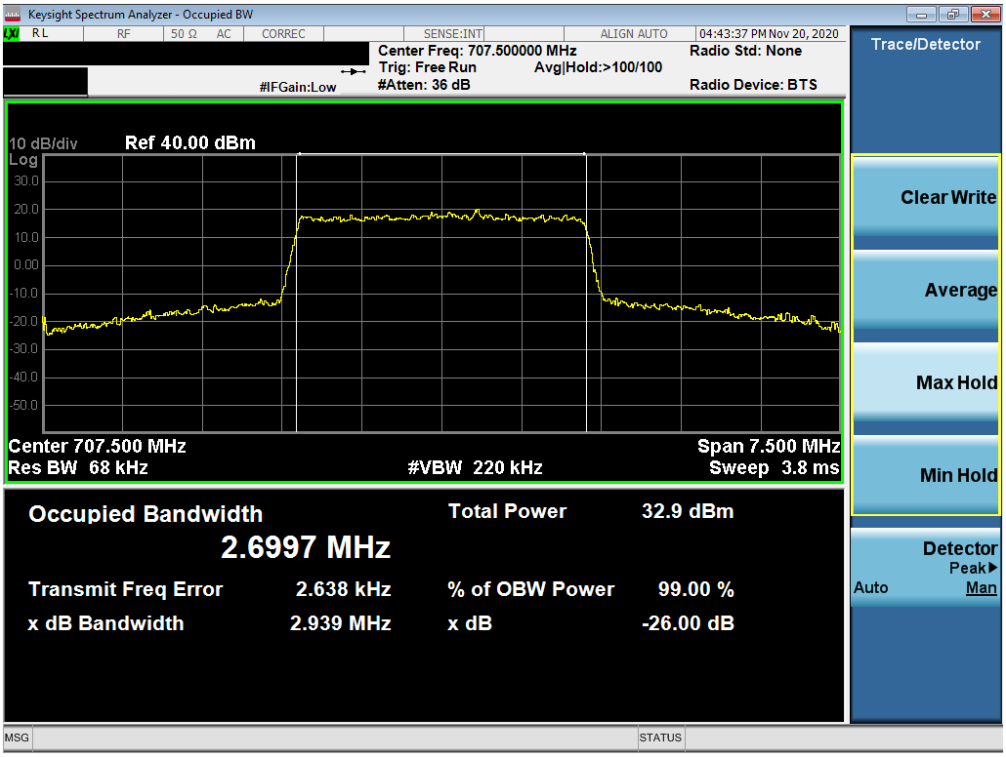
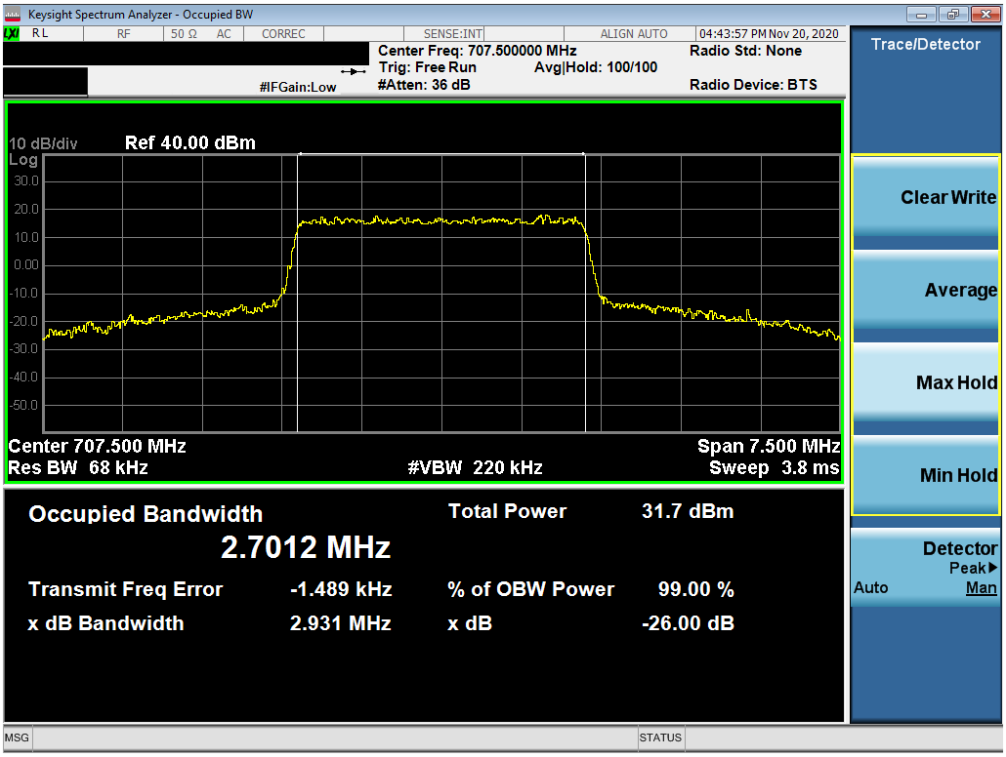


Plot 7-25. Occupied Bandwidth Plot (LTE Band 12 - 3MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (LTE Band 12 - 3MHz 16-QAM - Full RB Configuration)

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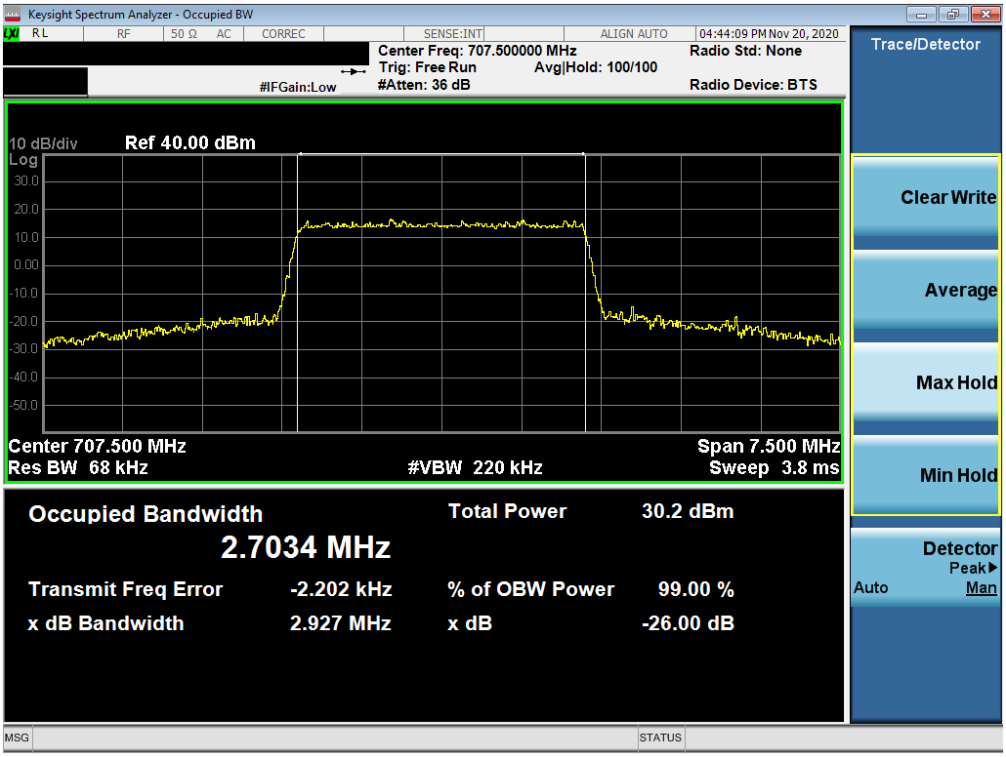
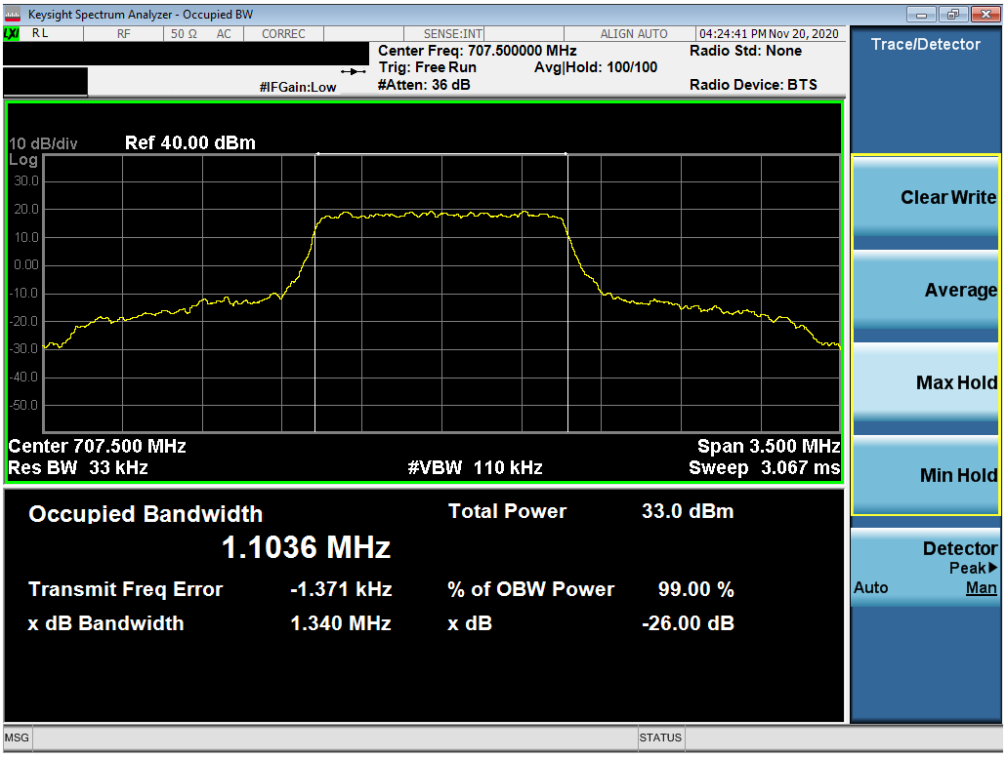


Plot 7-27. Occupied Bandwidth Plot (LTE Band 12 - 3MHz 64-QAM - Full RB Configuration)



Plot 7-28. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz QPSK - Full RB Configuration)

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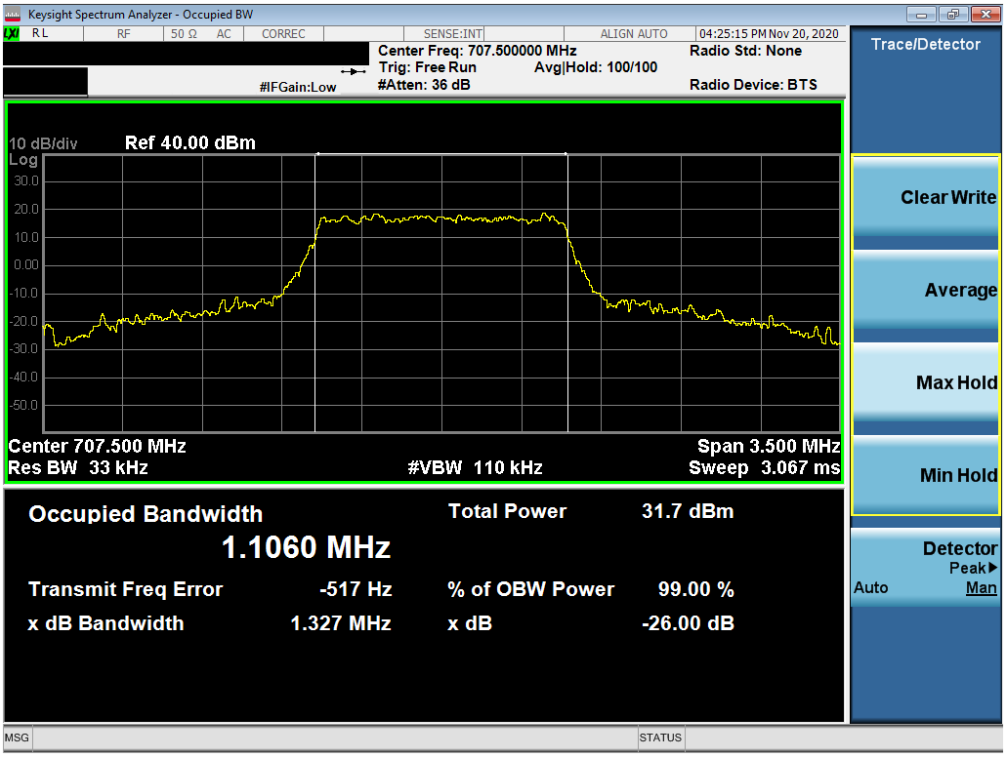
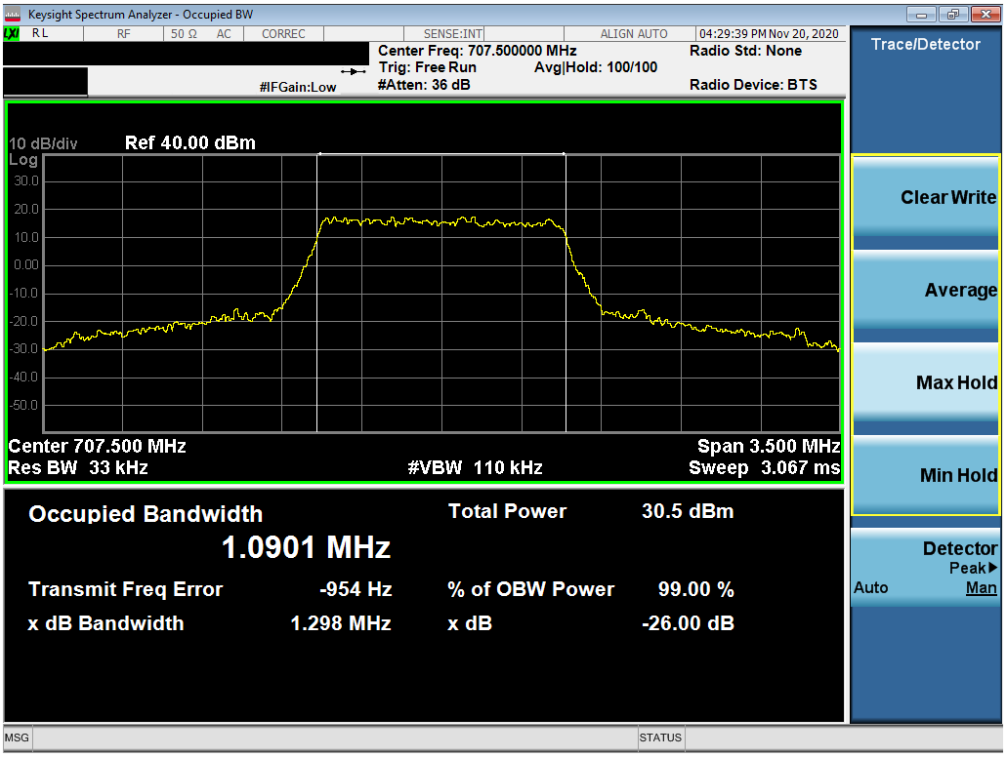


Plot 7-29. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz 16-QAM - Full RB Configuration)



Plot 7-30. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz 64-QAM - Full RB Configuration)

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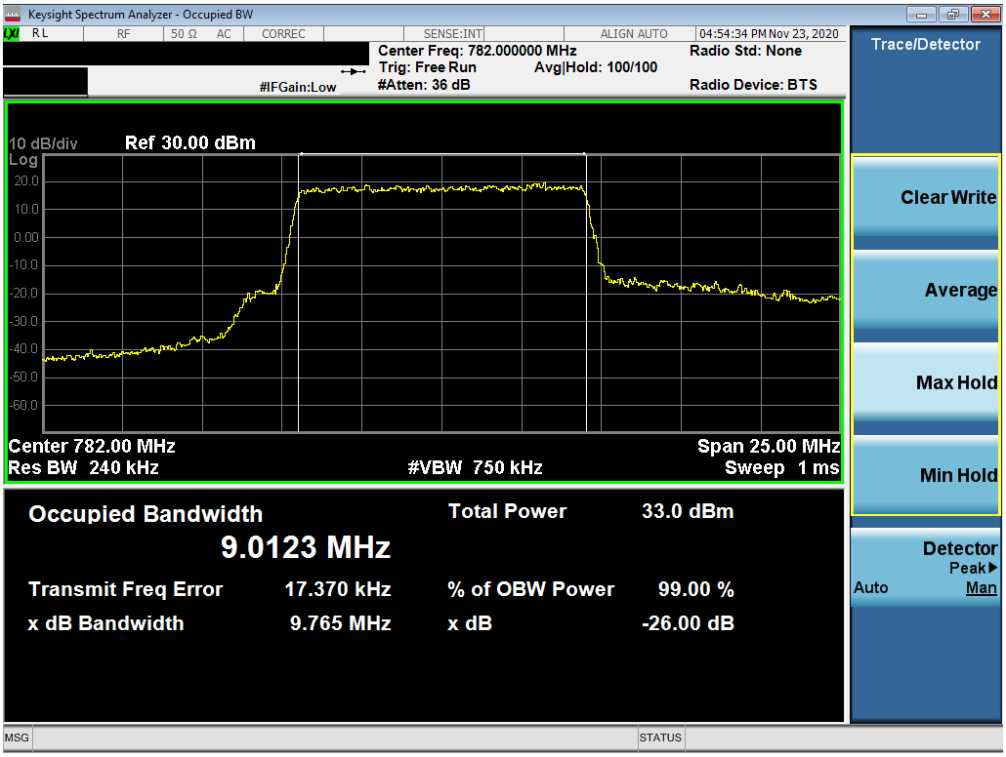
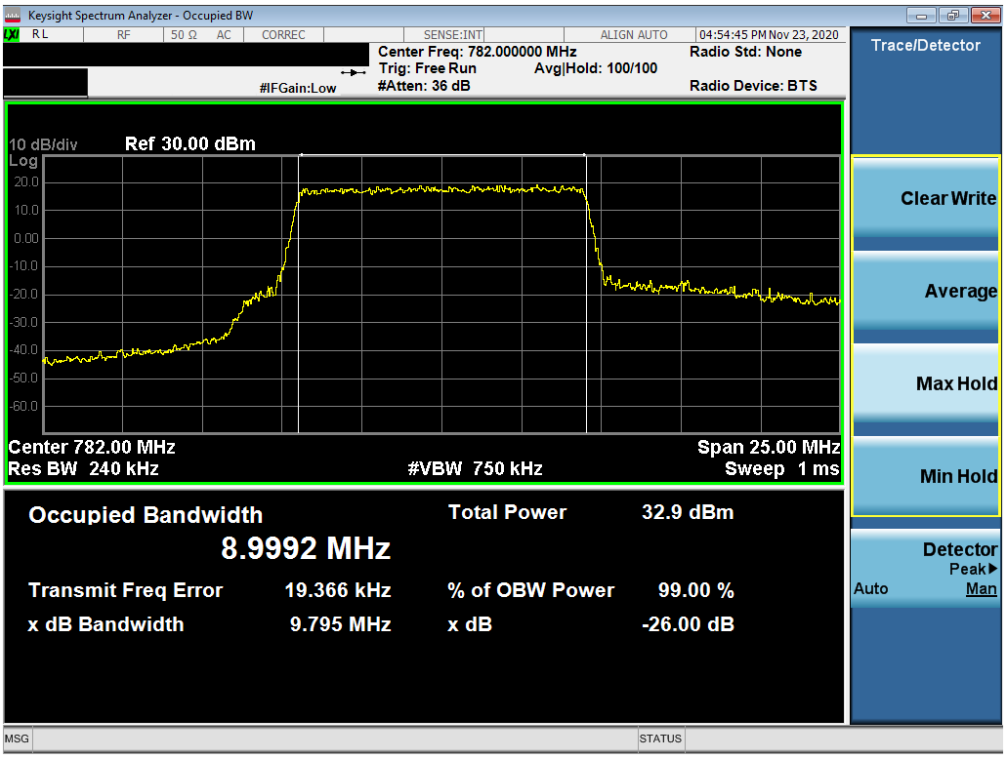
LTE Band 13



Plot 7-31. Occupied Bandwidth Plot (LTE Band 13 - 10MHz QPSK - Full RB Configuration)



Plot 7-32. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 16-QAM - Full RB Configuration)

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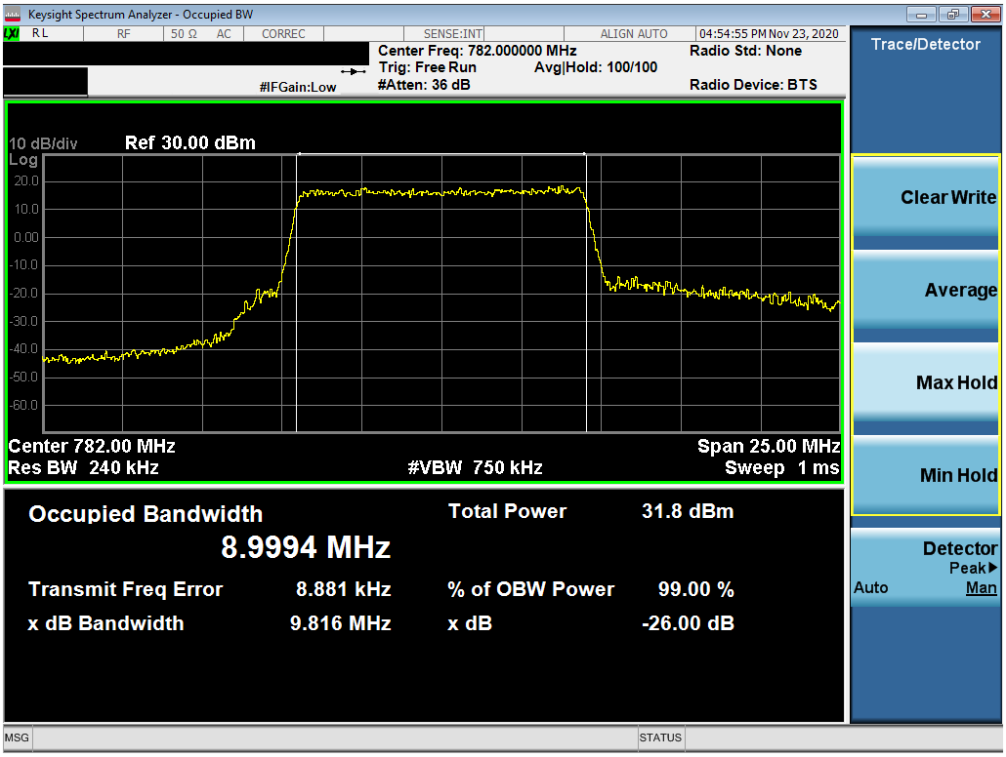

Plot 7-33. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 64-QAM - Full RB Configuration)

Plot 7-34. Occupied Bandwidth Plot (LTE Band 13 - 5MHz QPSK - Full RB Configuration)

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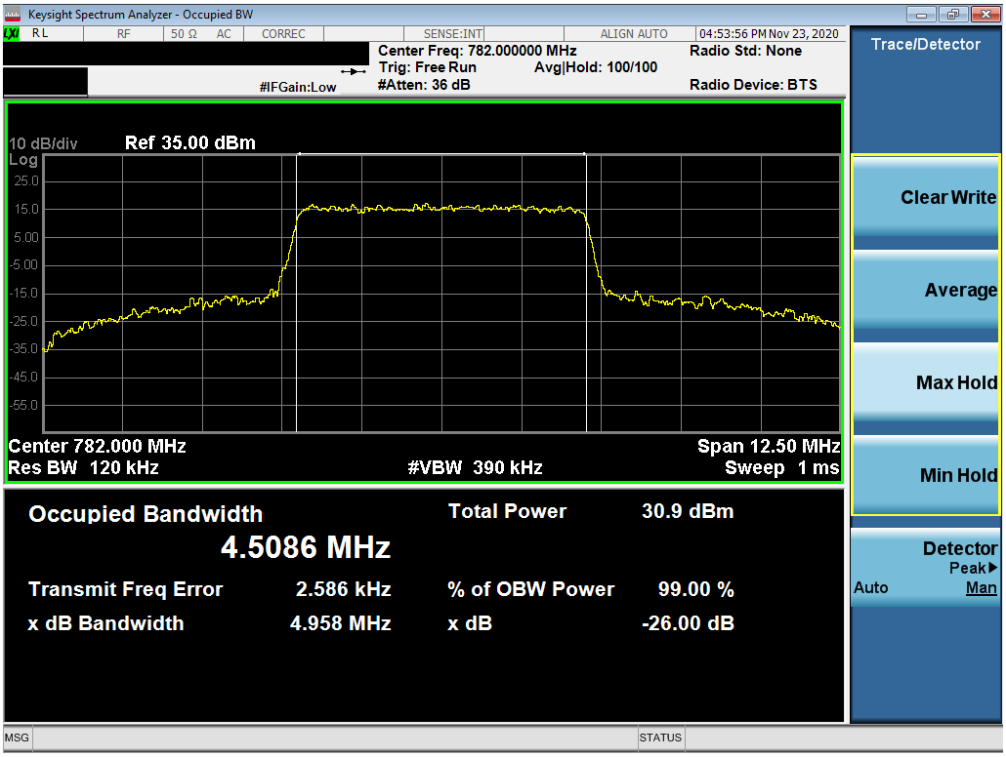
Plot 7-35. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 16-QAM - Full RB Configuration)



Plot 7-36. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 64-QAM - Full RB Configuration)

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Plot 7-37. Occupied Bandwidth Plot (LTE Band 71 - 20MHz QPSK - Full RB Configuration)

Plot 7-38. Occupied Bandwidth Plot (LTE Band 71 - 20MHz 16-QAM - Full RB Configuration)

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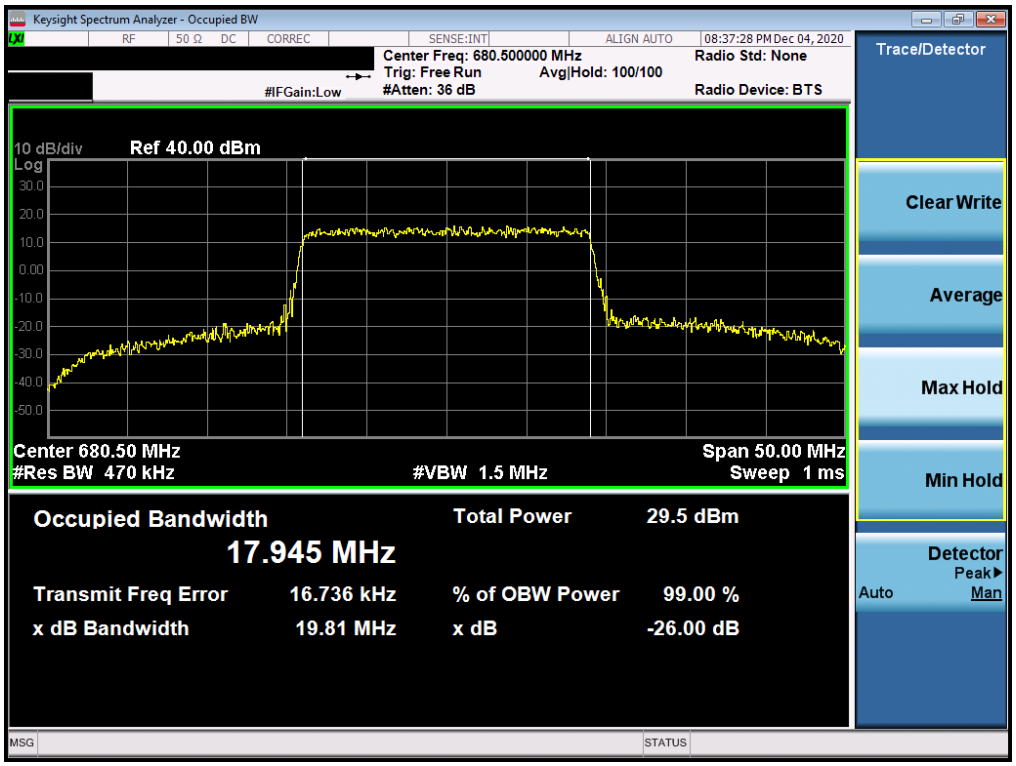

Plot 7-39. Occupied Bandwidth Plot (LTE Band 71 - 20MHz 64-QAM - Full RB Configuration)

Plot 7-40. Occupied Bandwidth Plot (LTE Band 71 - 15MHz QPSK - Full RB Configuration)

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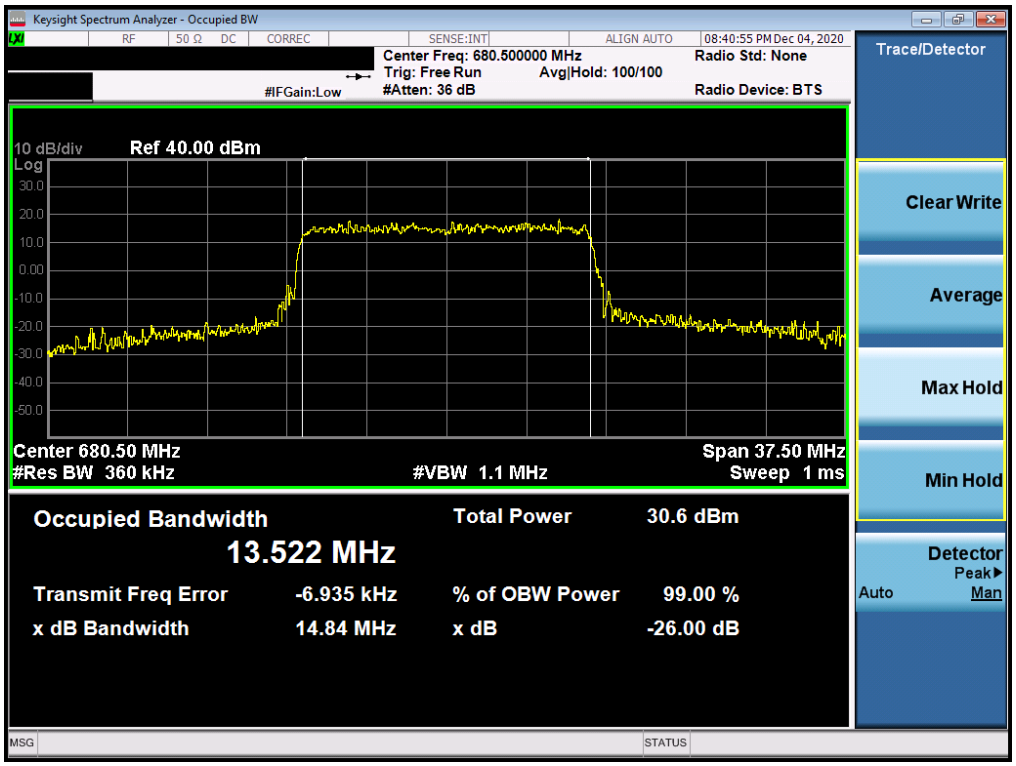

Plot 7-41. Occupied Bandwidth Plot (LTE Band 71 - 15MHz 16-QAM - Full RB Configuration)

Plot 7-42. Occupied Bandwidth Plot (LTE Band 71 - 15MHz 64-QAM - Full RB Configuration)

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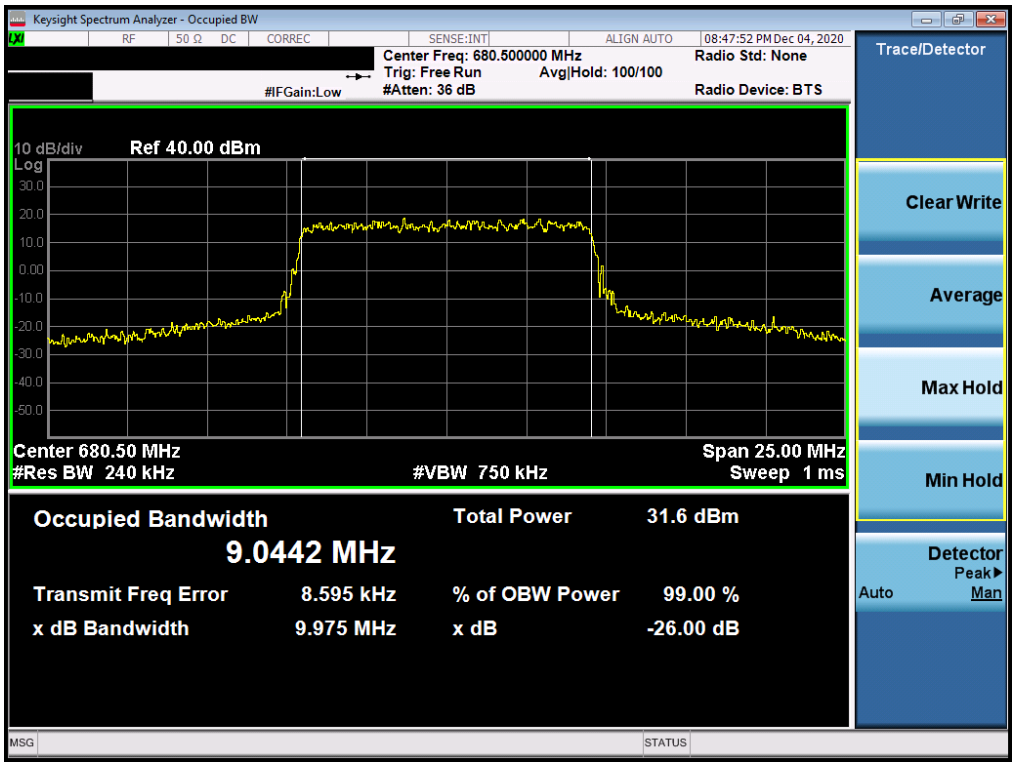

Plot 7-43. Occupied Bandwidth Plot (LTE Band 71 - 10MHz QPSK - Full RB Configuration)

Plot 7-44. Occupied Bandwidth Plot (LTE Band 71 - 10MHz 16-QAM - Full RB Configuration)

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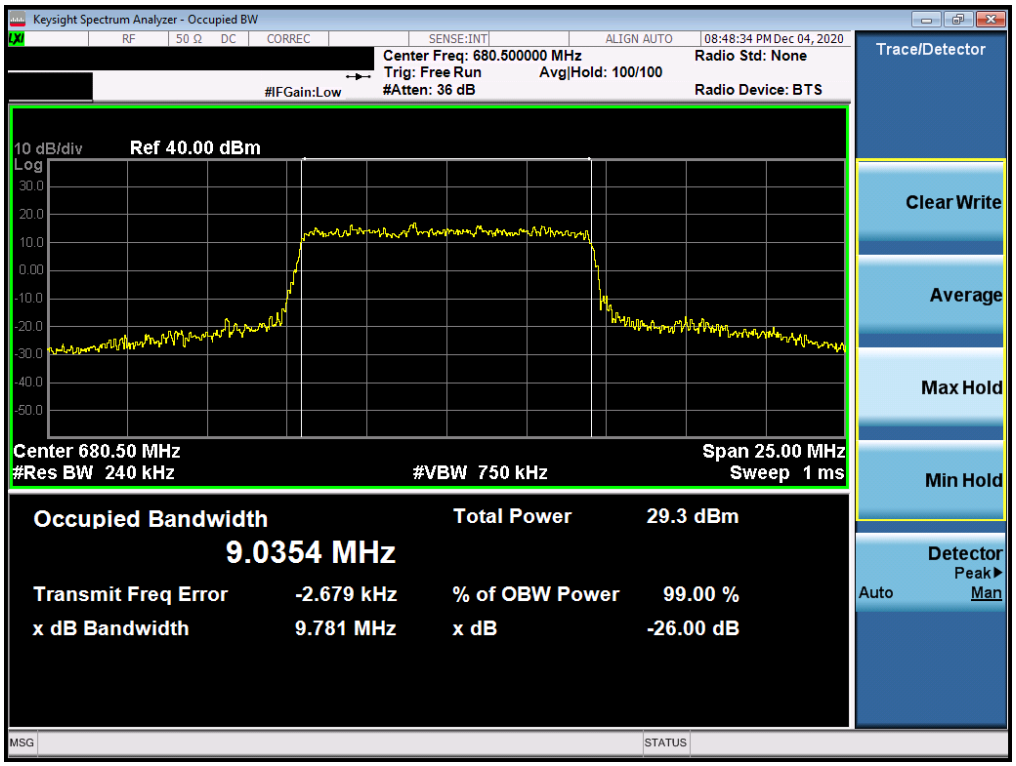
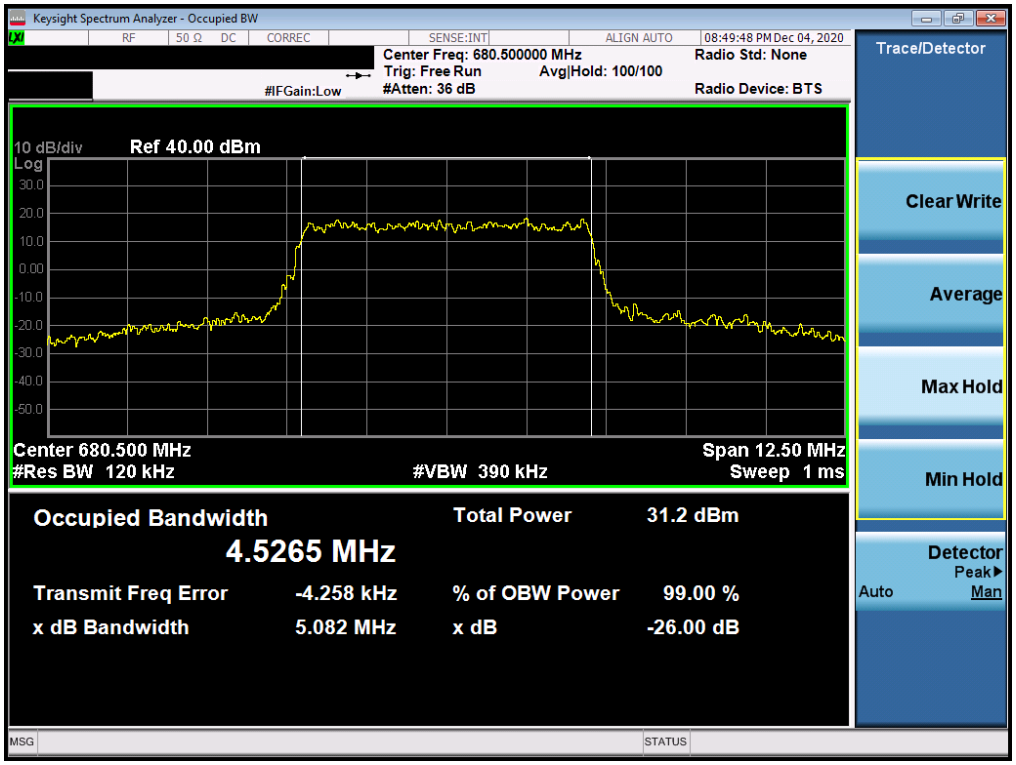


Plot 7-45. Occupied Bandwidth Plot (LTE Band 71 - 10MHz 64-QAM - Full RB Configuration)



Plot 7-46. Occupied Bandwidth Plot (LTE Band 71 - 5MHz QPSK - Full RB Configuration)

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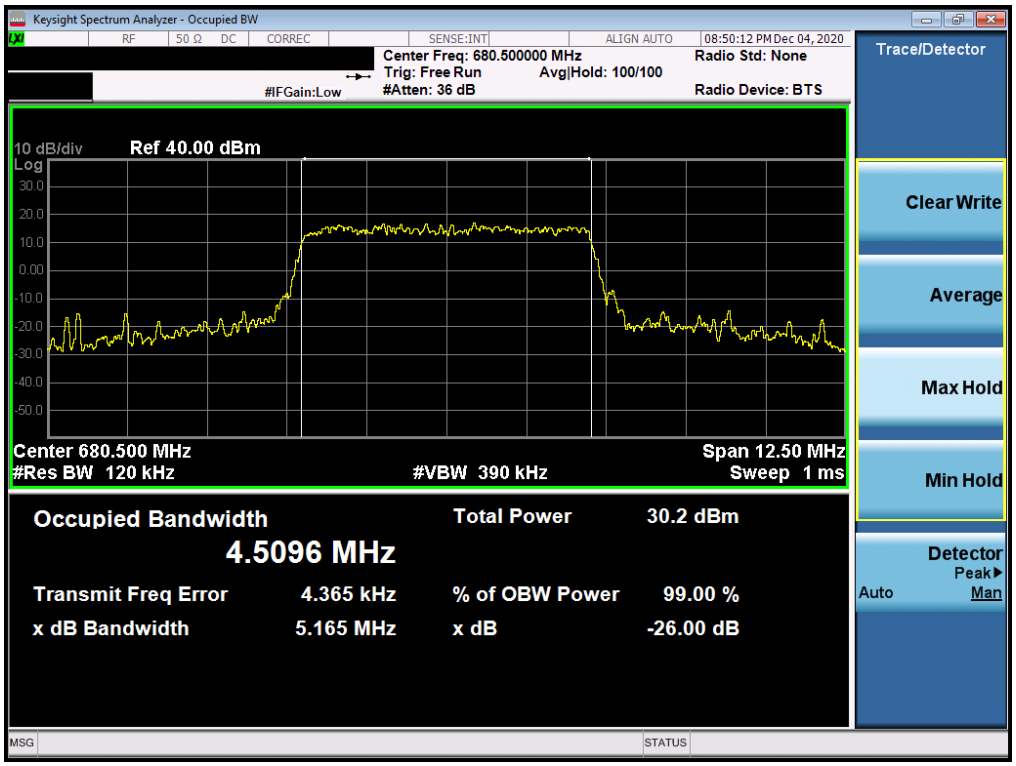

Plot 7-47. Occupied Bandwidth Plot (LTE Band 71 - 5MHz 16-QAM - Full RB Configuration)

Plot 7-48. Occupied Bandwidth Plot (LTE Band 71 - 5MHz 64-QAM - Full RB Configuration)

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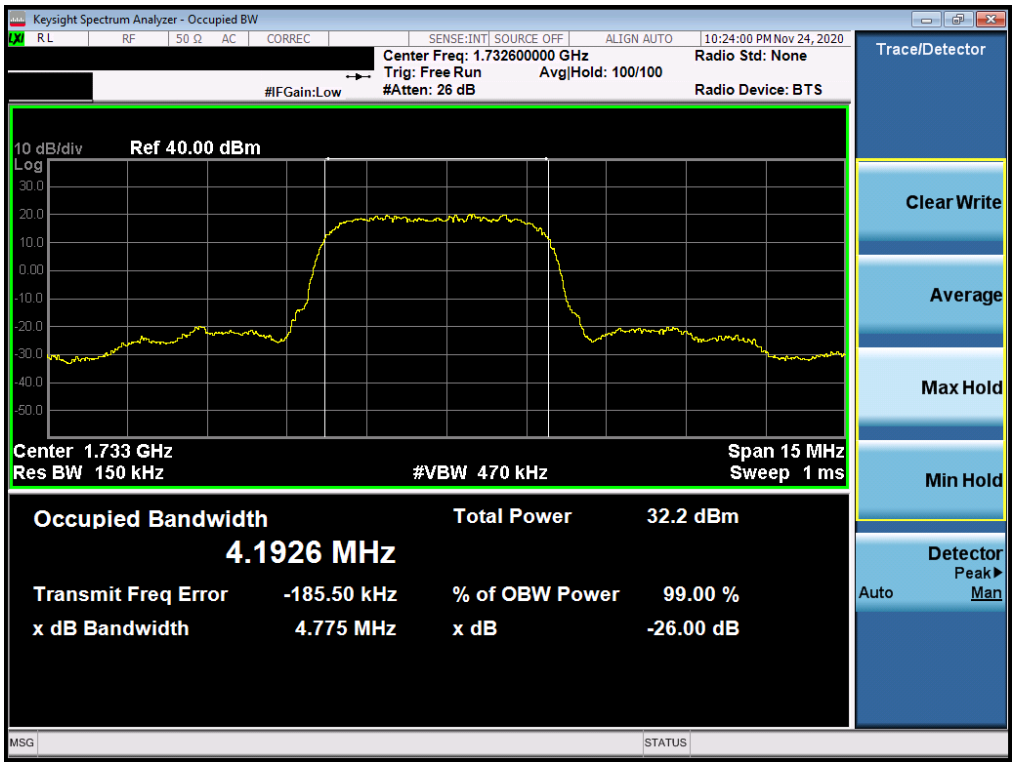
WCDMA AWS



Plot 7-49. Occupied Bandwidth Plot (WCDMA, Ch. 1413)

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7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 18GHz (separated into at least two plots per channel)
2. RBW ≥ 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

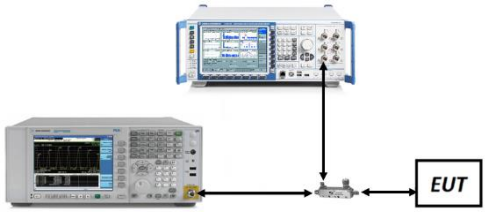

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

Per Part 27 and RSS-139, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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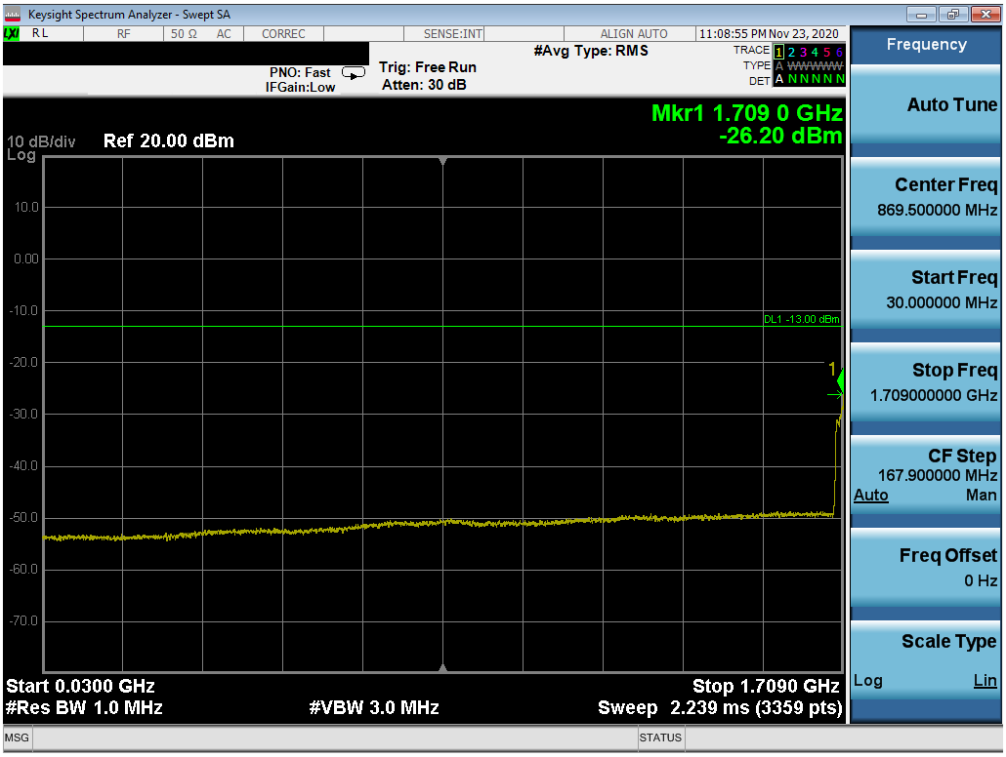
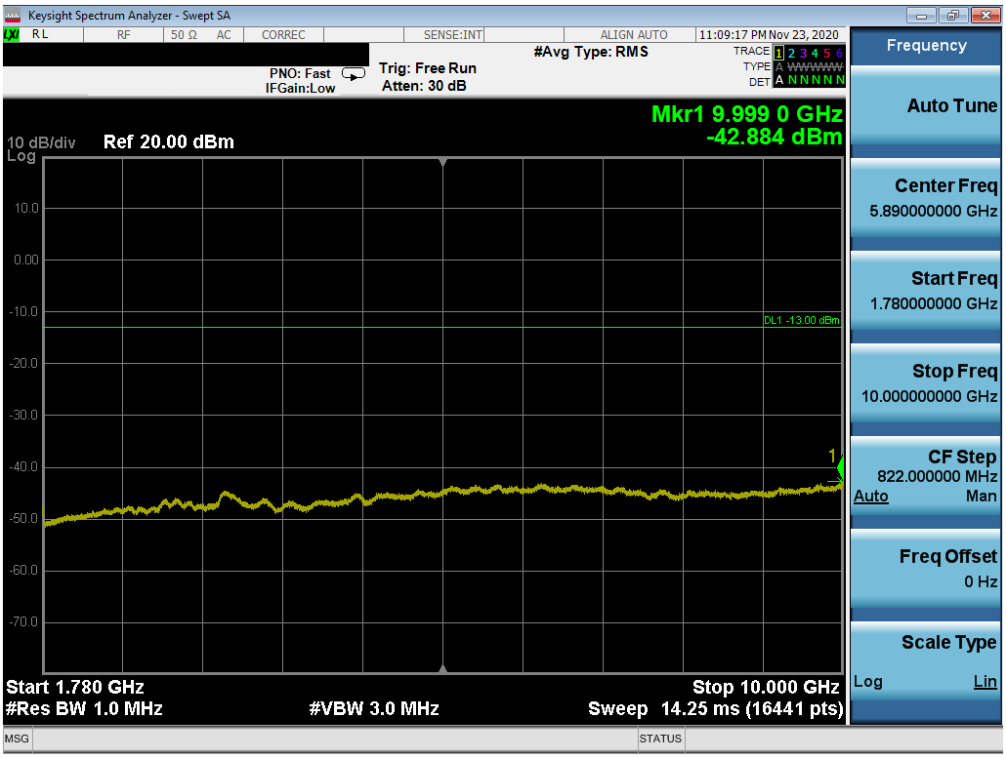
LTE Band 66/4



Plot 7-50. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0-Low Channel)



Plot 7-51. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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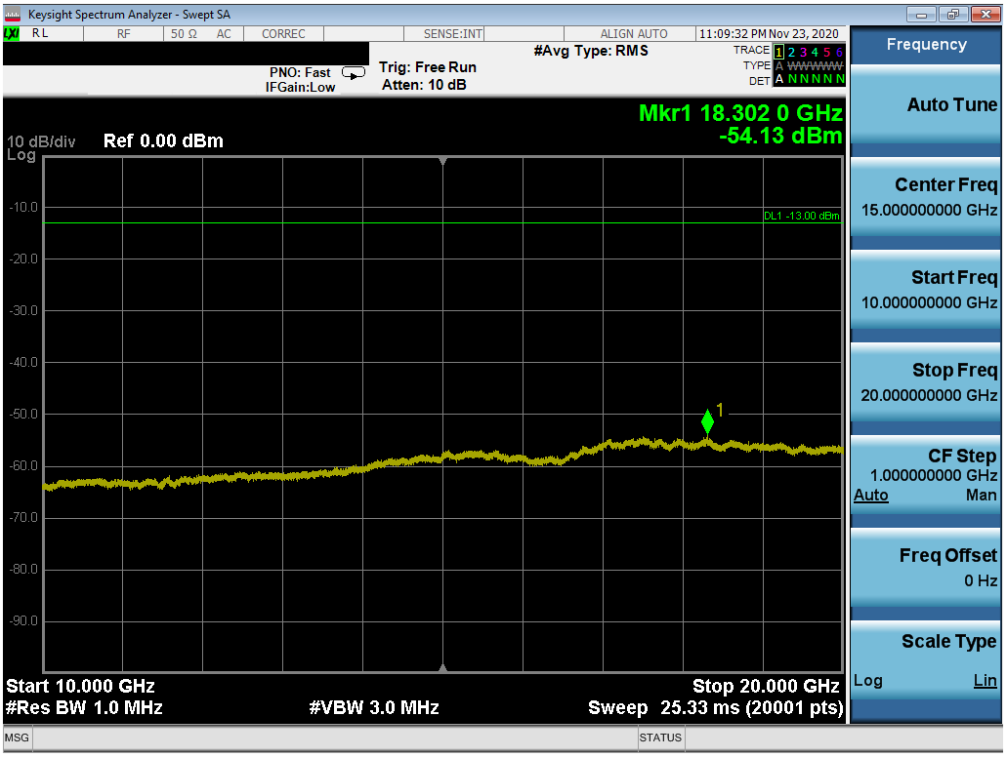
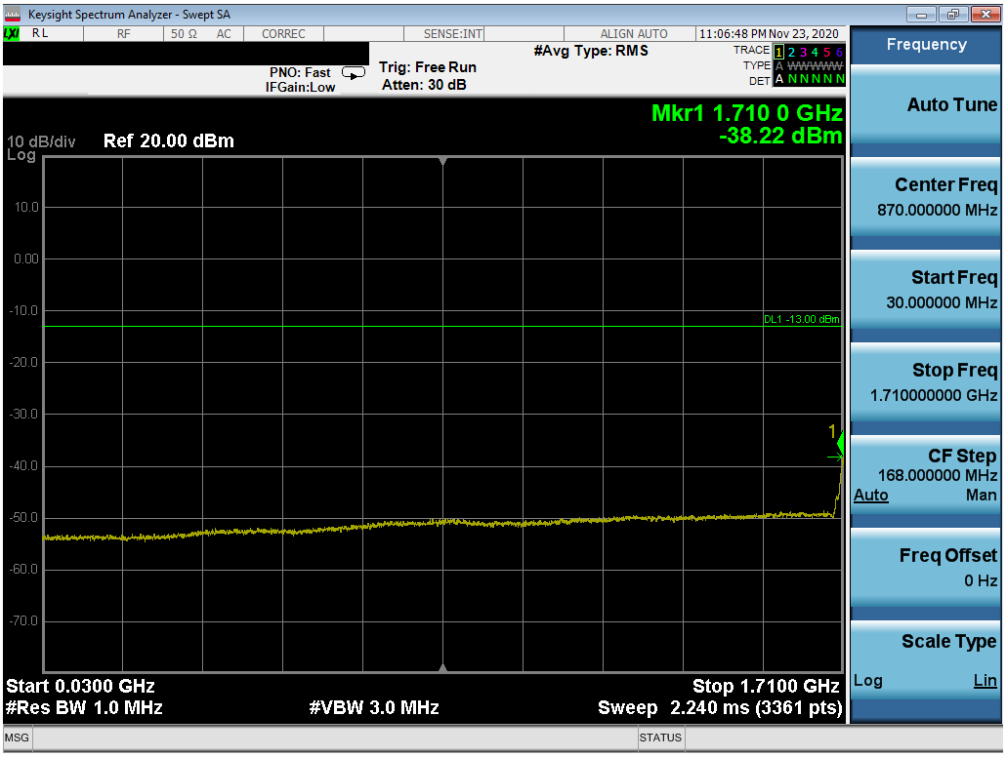


Plot 7-52. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-53. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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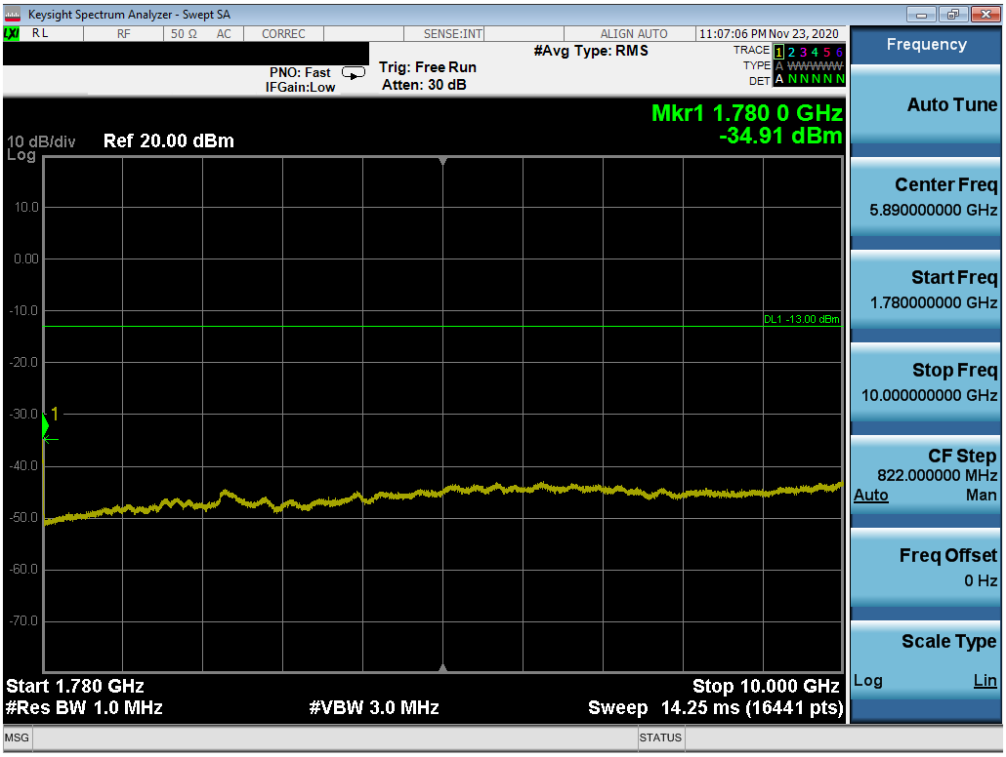
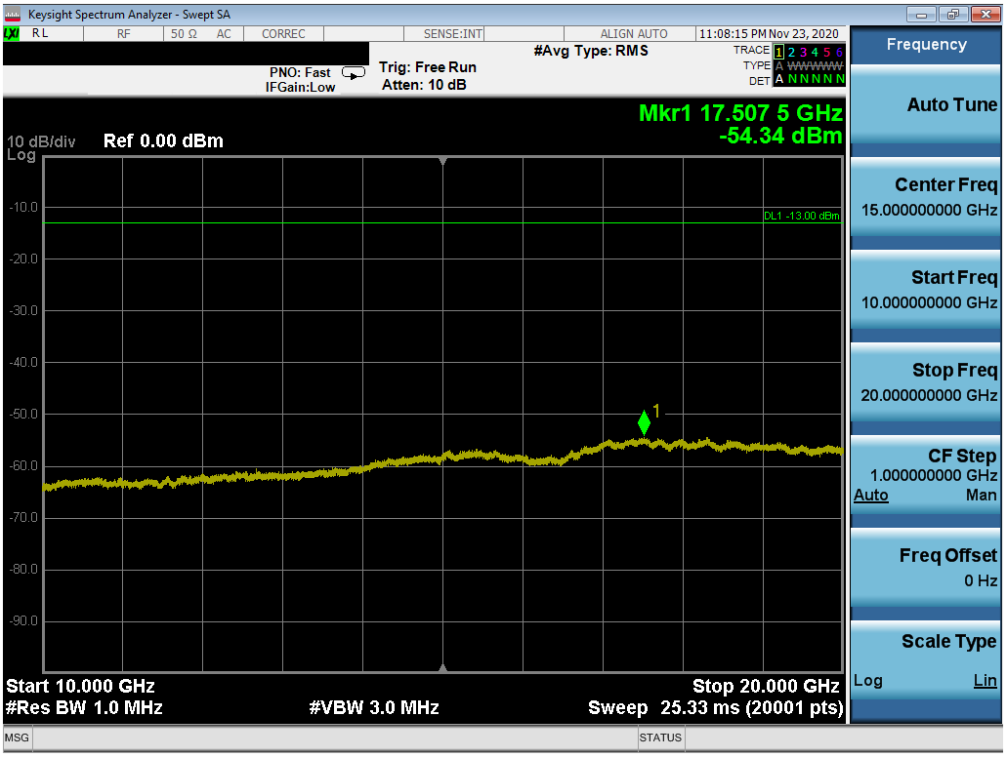


Plot 7-54. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-55. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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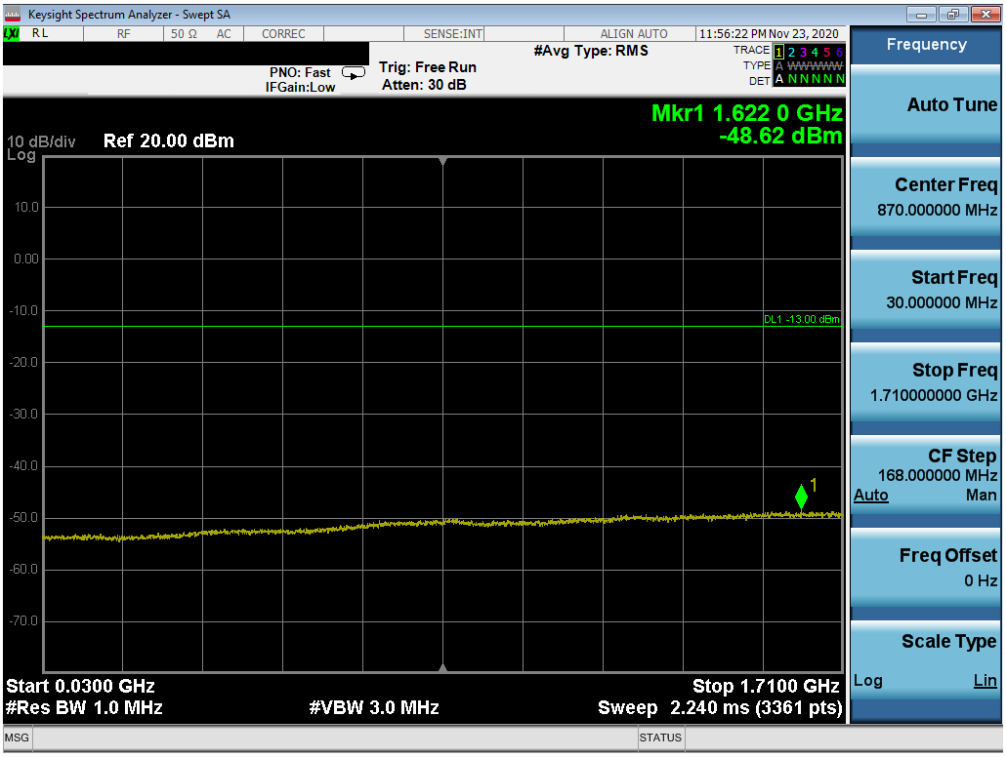
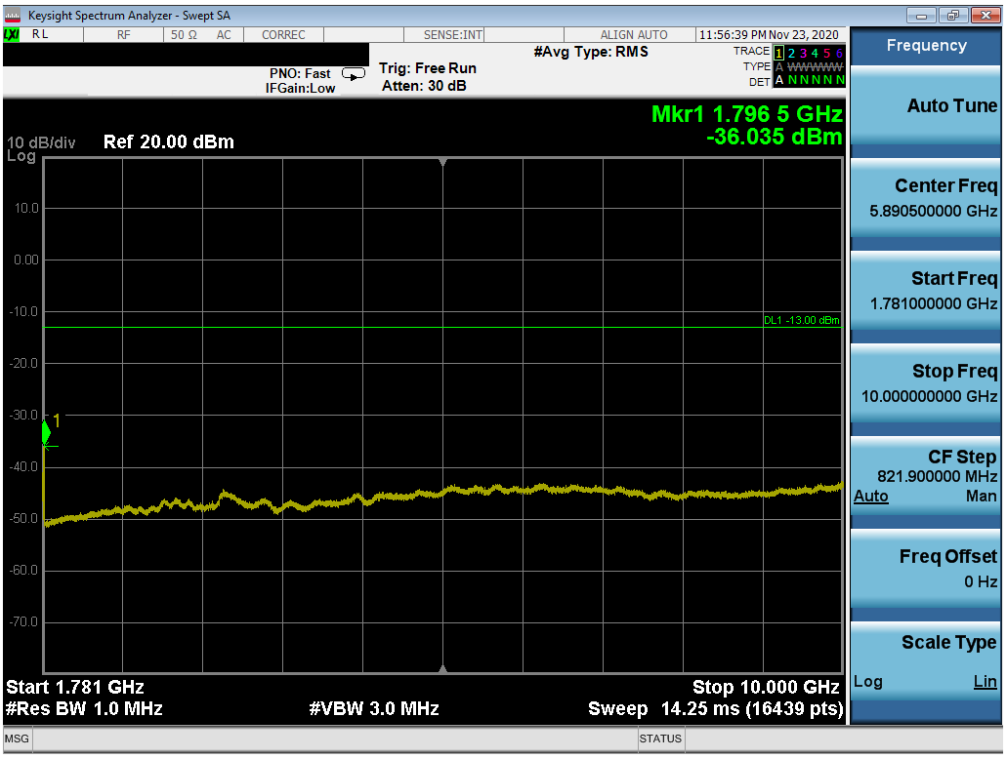


Plot 7-56. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-57. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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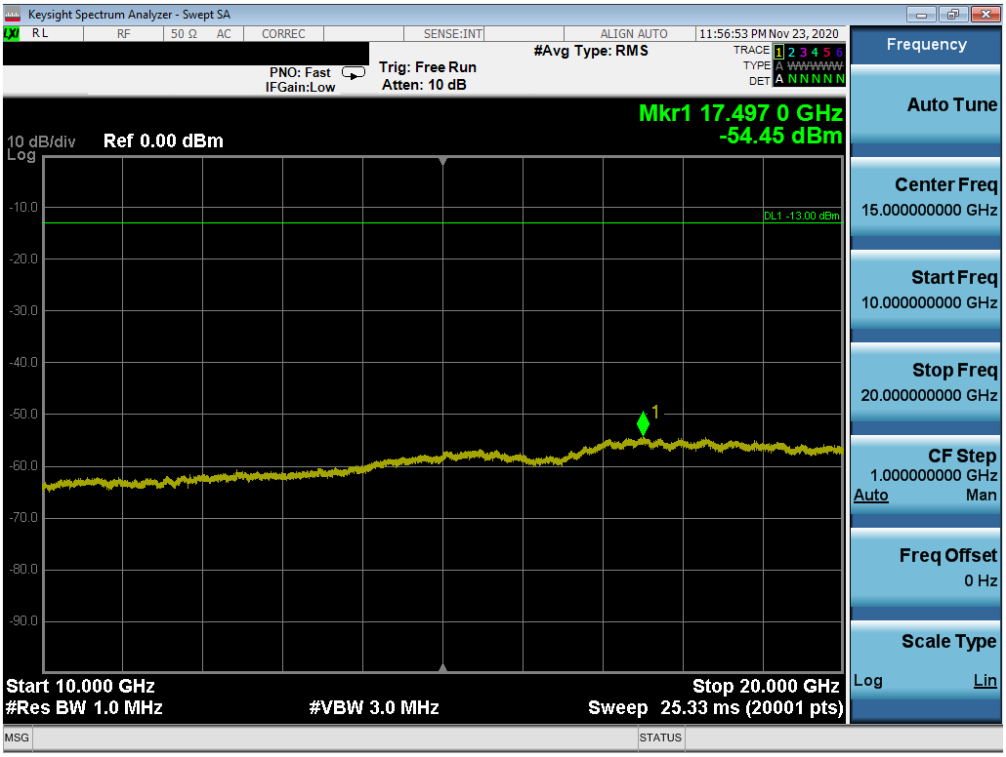

Plot 7-58. Conducted Spurious Plot (LTE Band 66/4 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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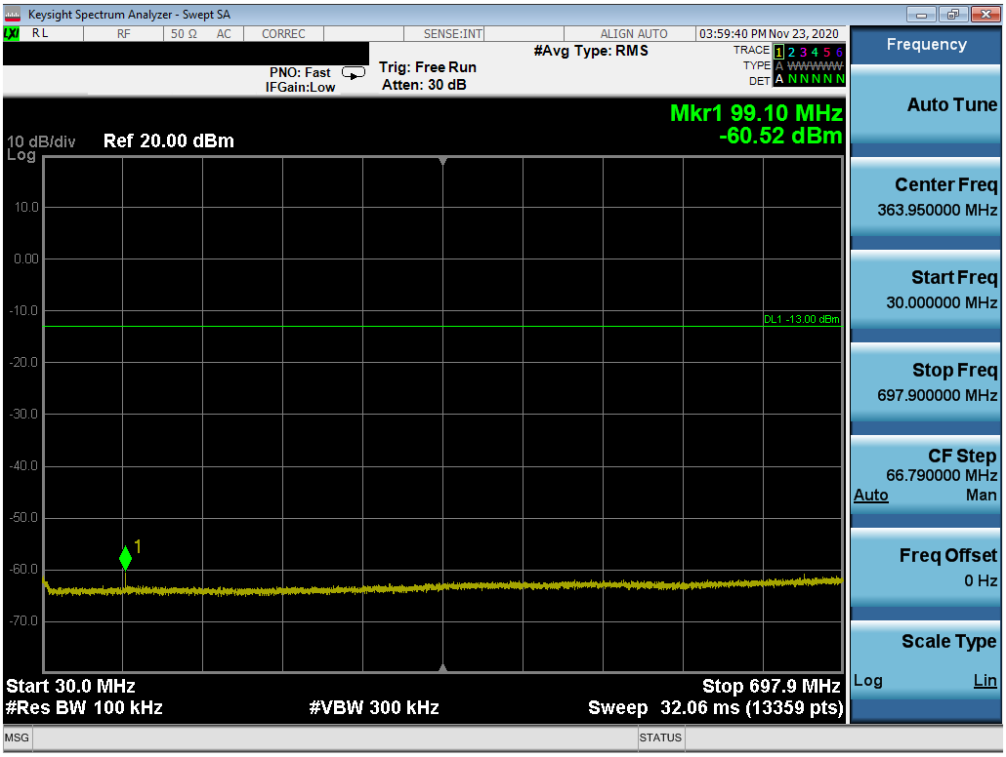
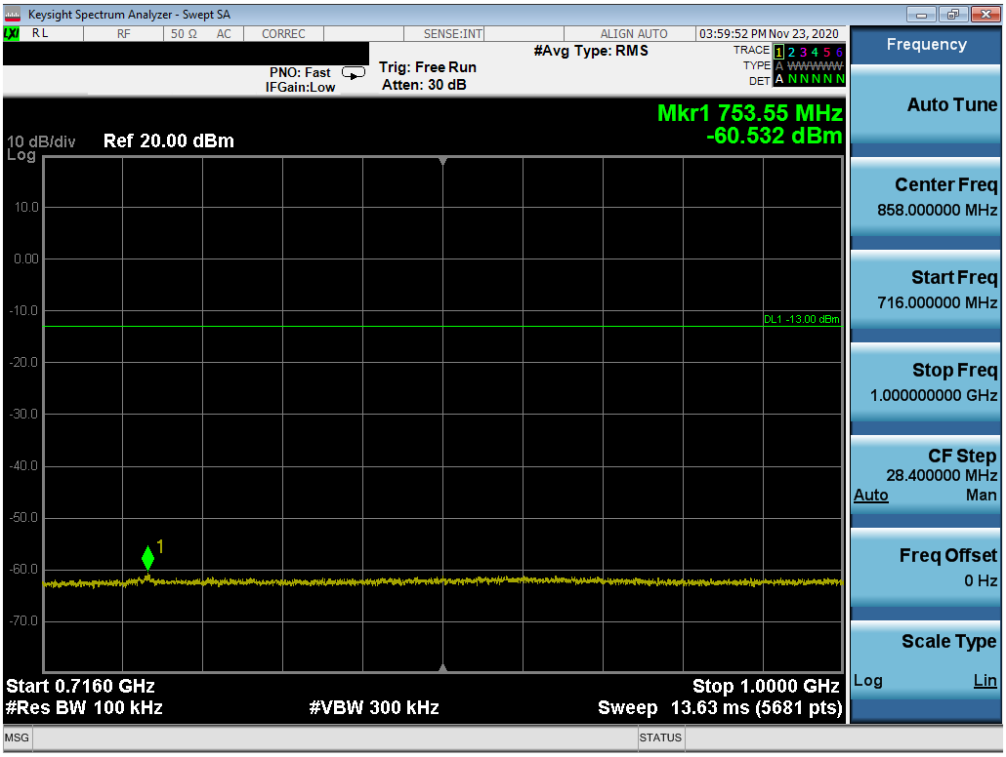


Plot 7-59. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-60. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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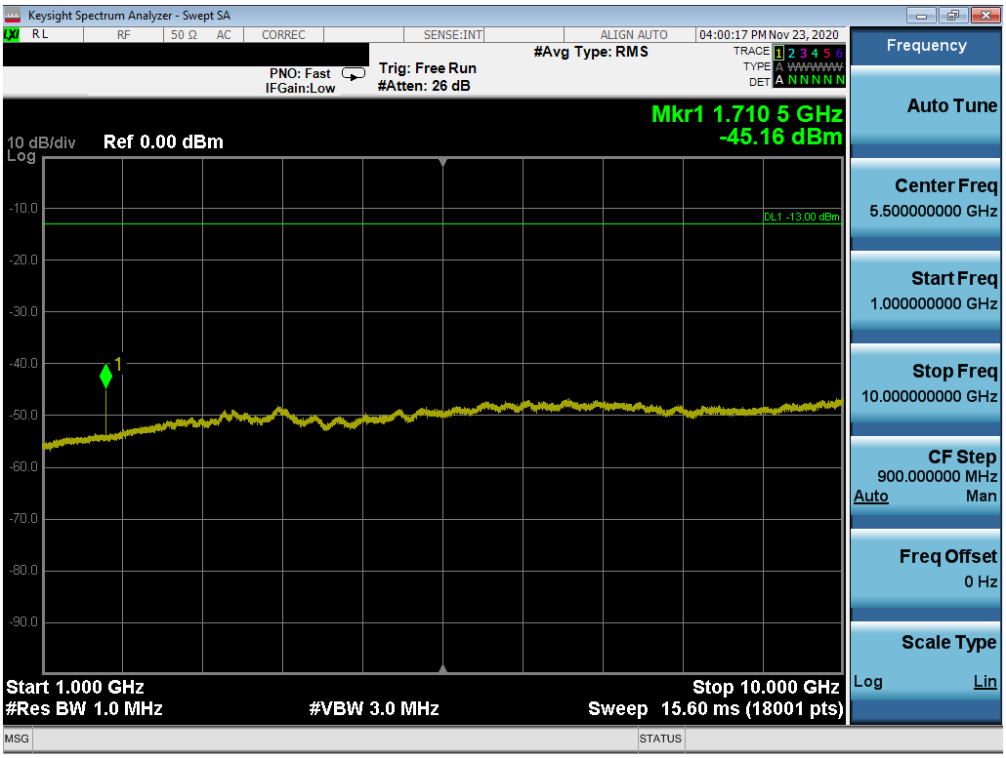
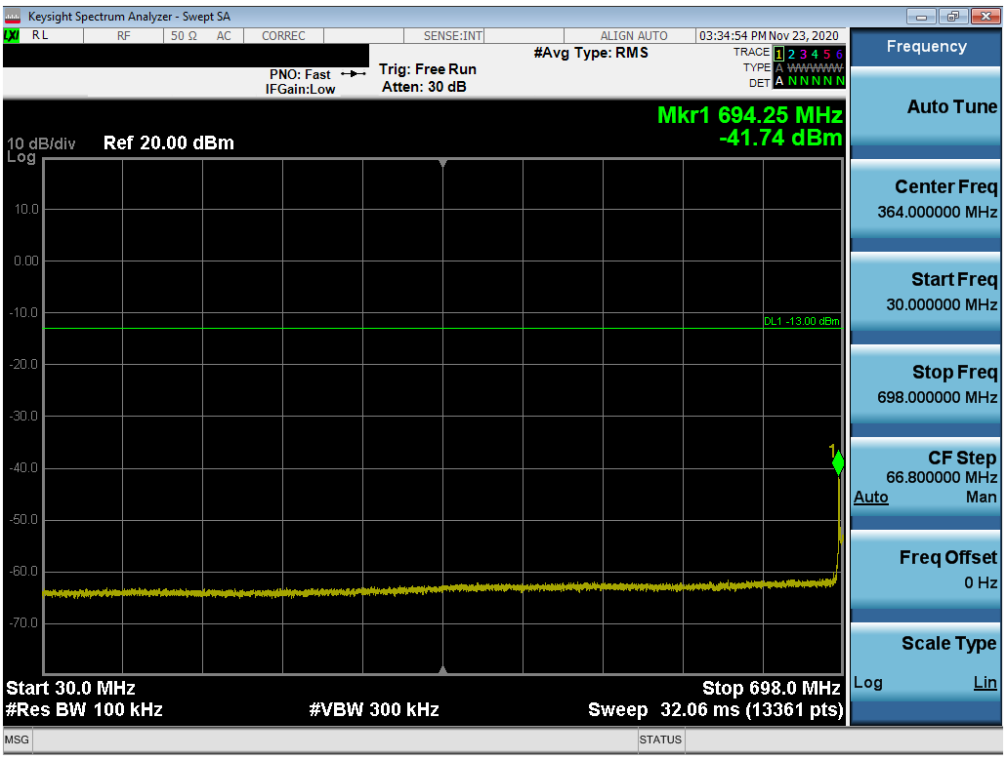


Plot 7-61. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-62. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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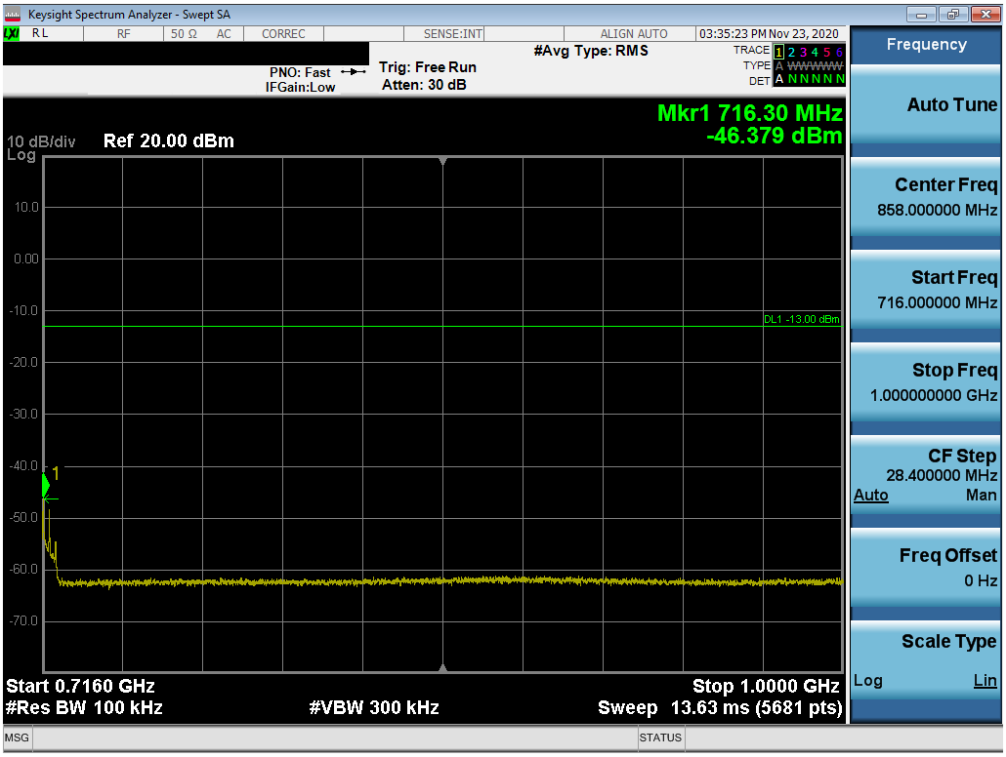
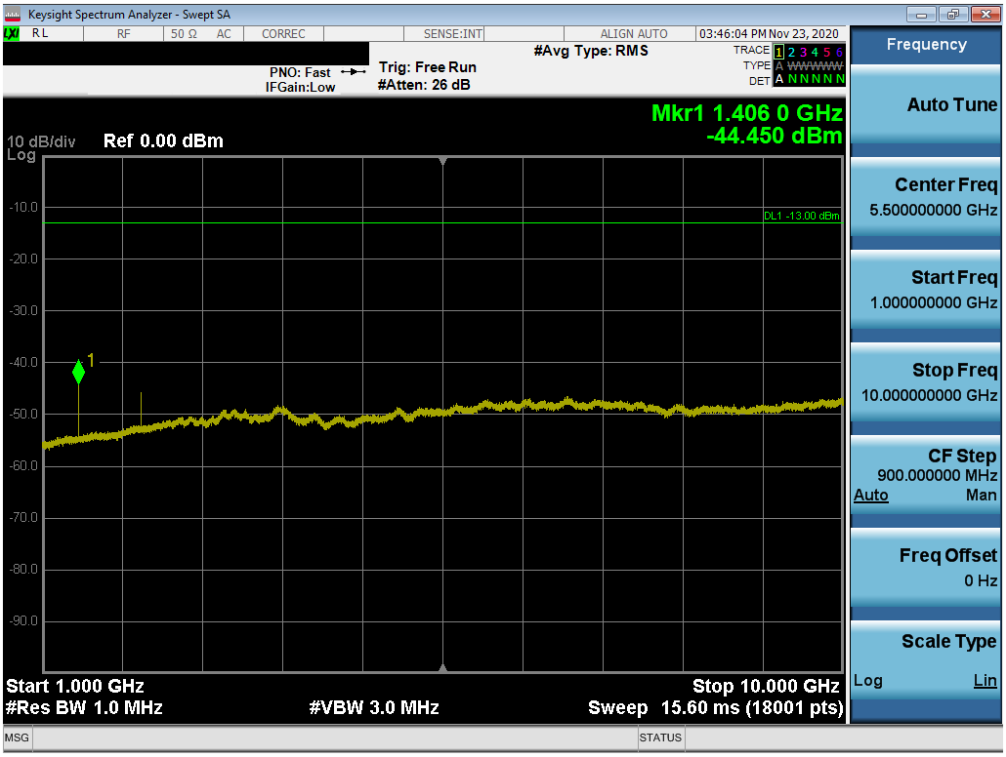


Plot 7-63. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-64. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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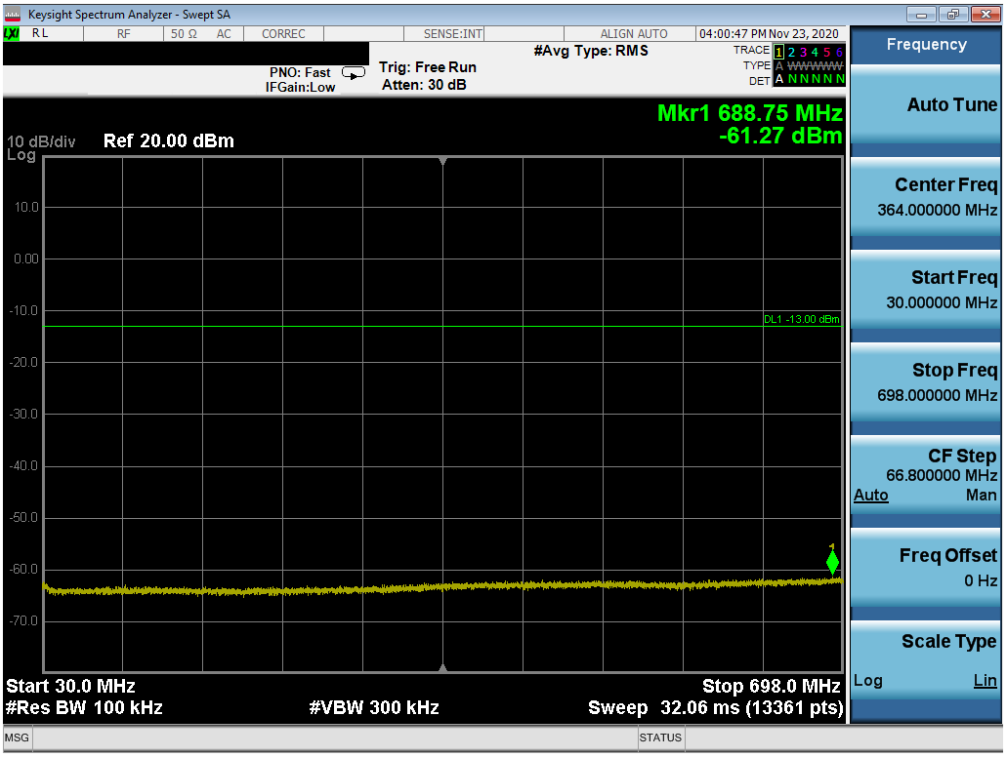
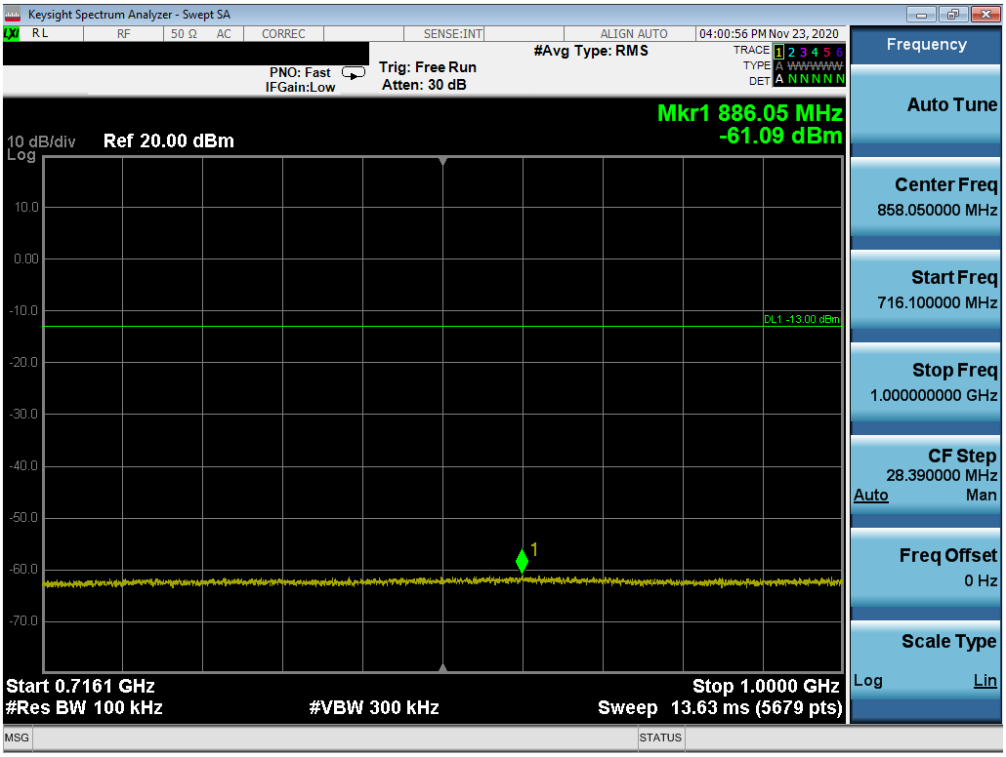


Plot 7-65. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-66. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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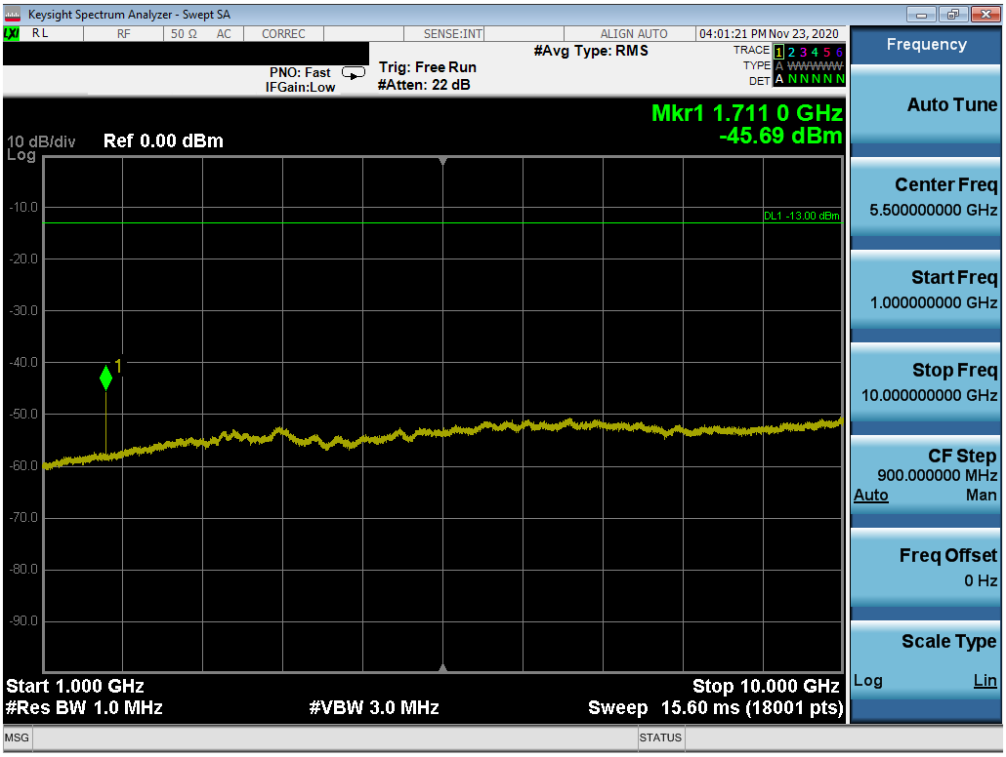

Plot 7-67. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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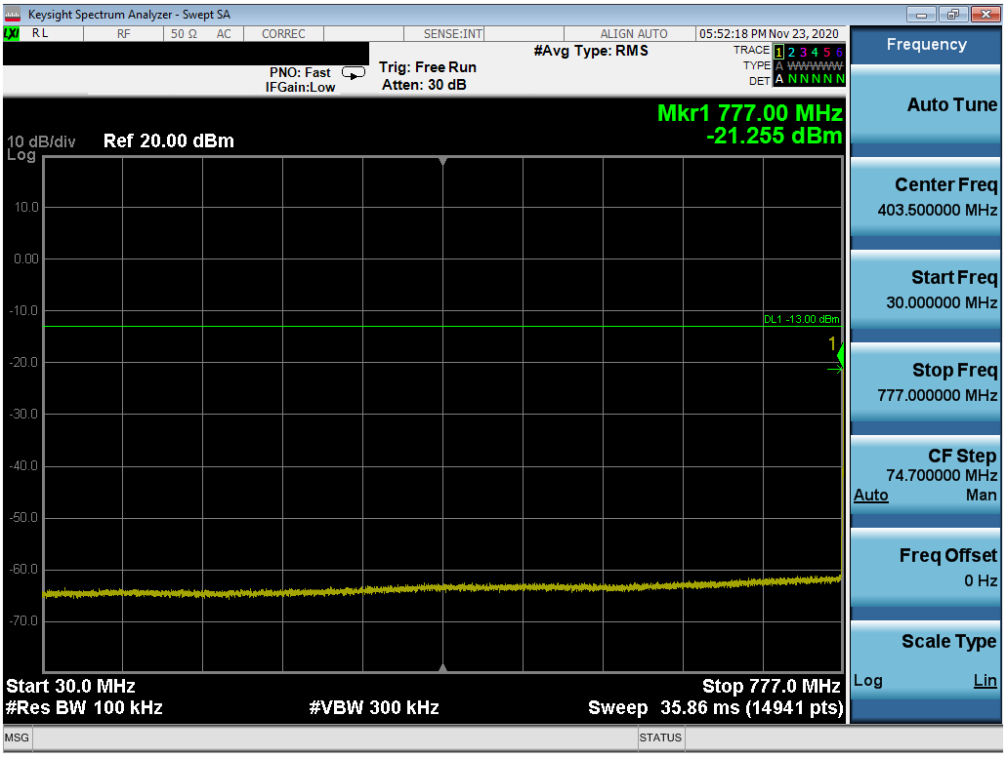
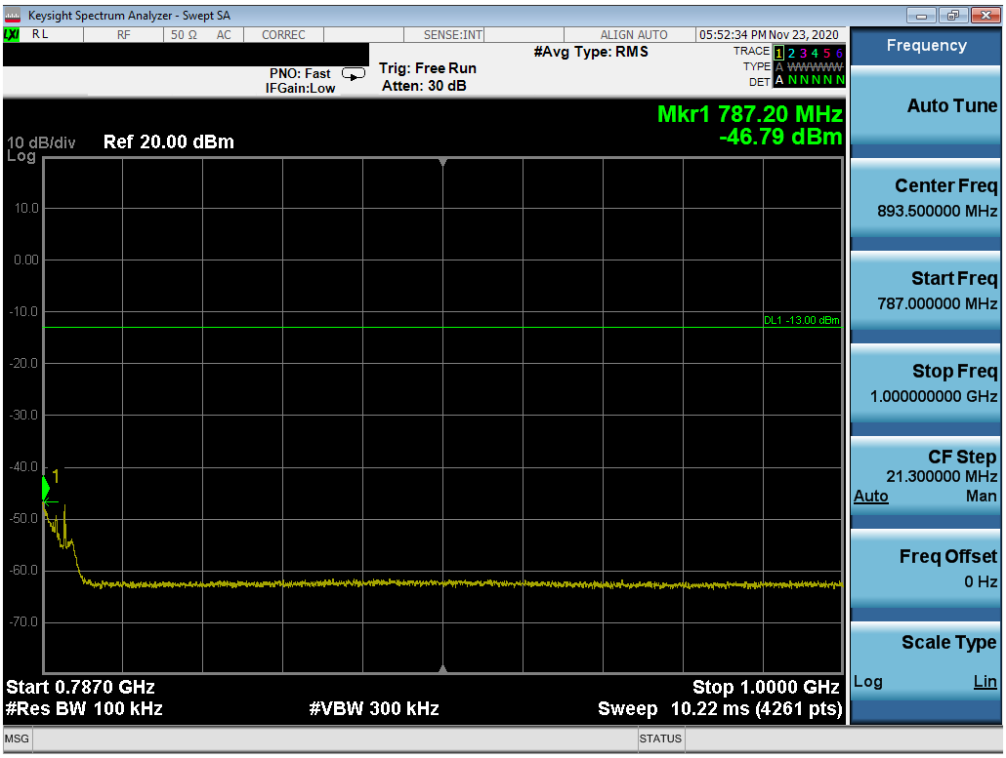
LTE Band 13



Plot 7-68. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - RB Size 1, RB Offset 0)



Plot 7-69. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - RB Size 1, RB Offset 0)

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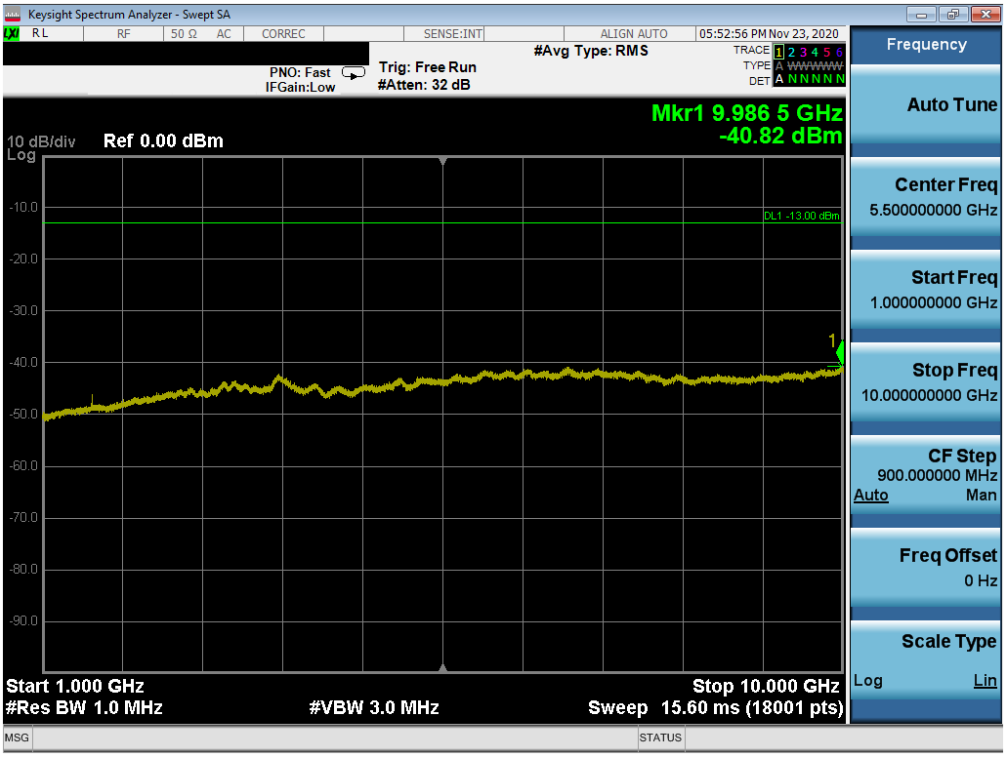

Plot 7-70. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - RB Size 1, RB Offset 0)

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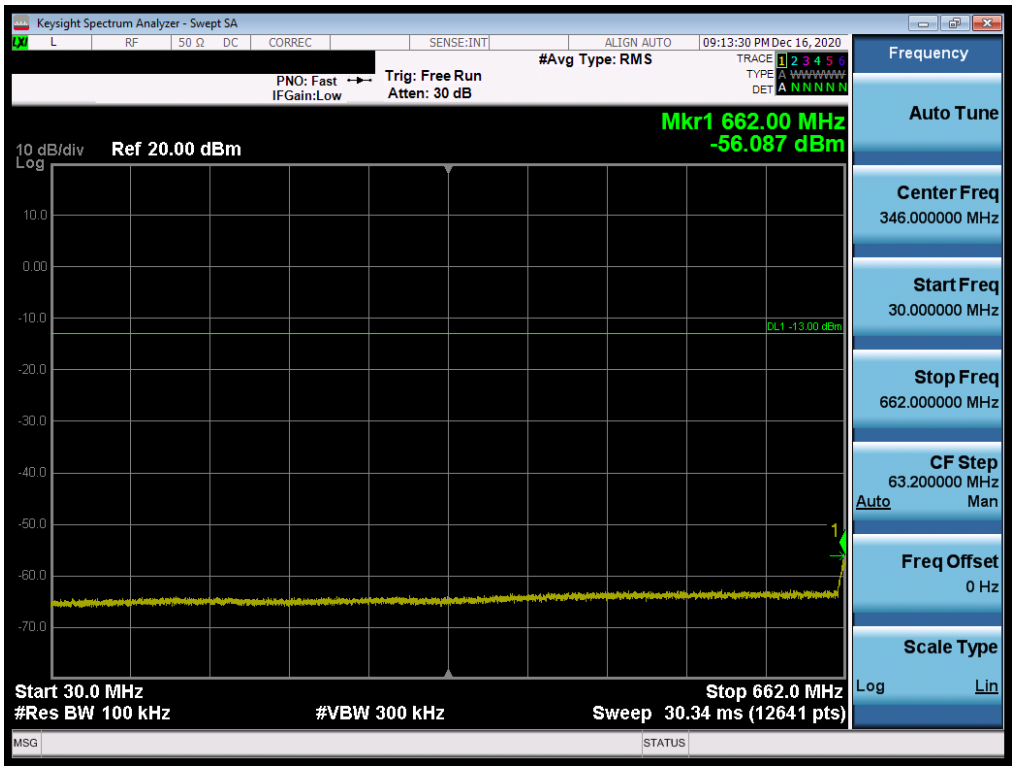
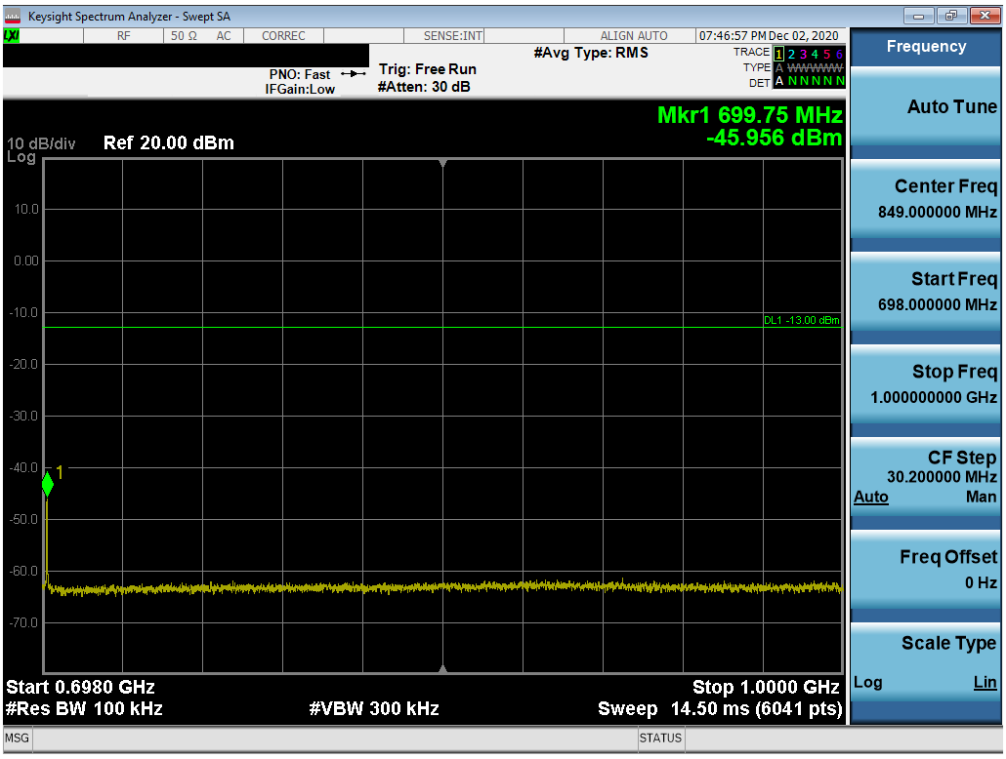
LTE Band 71



Plot 7-71. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-72. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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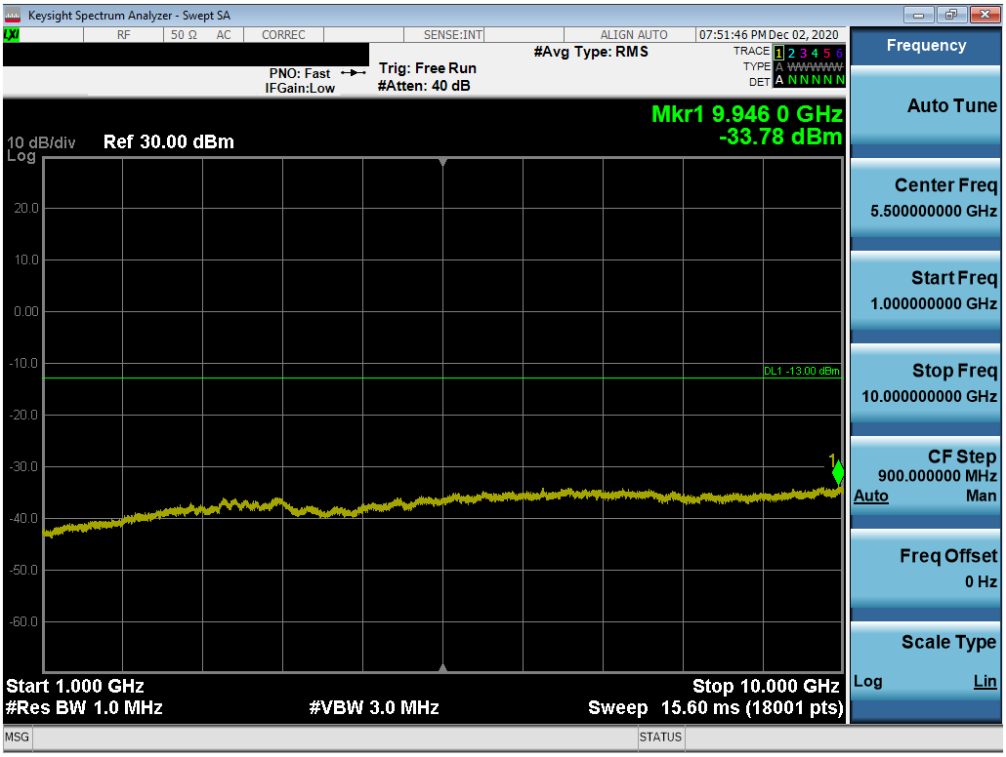
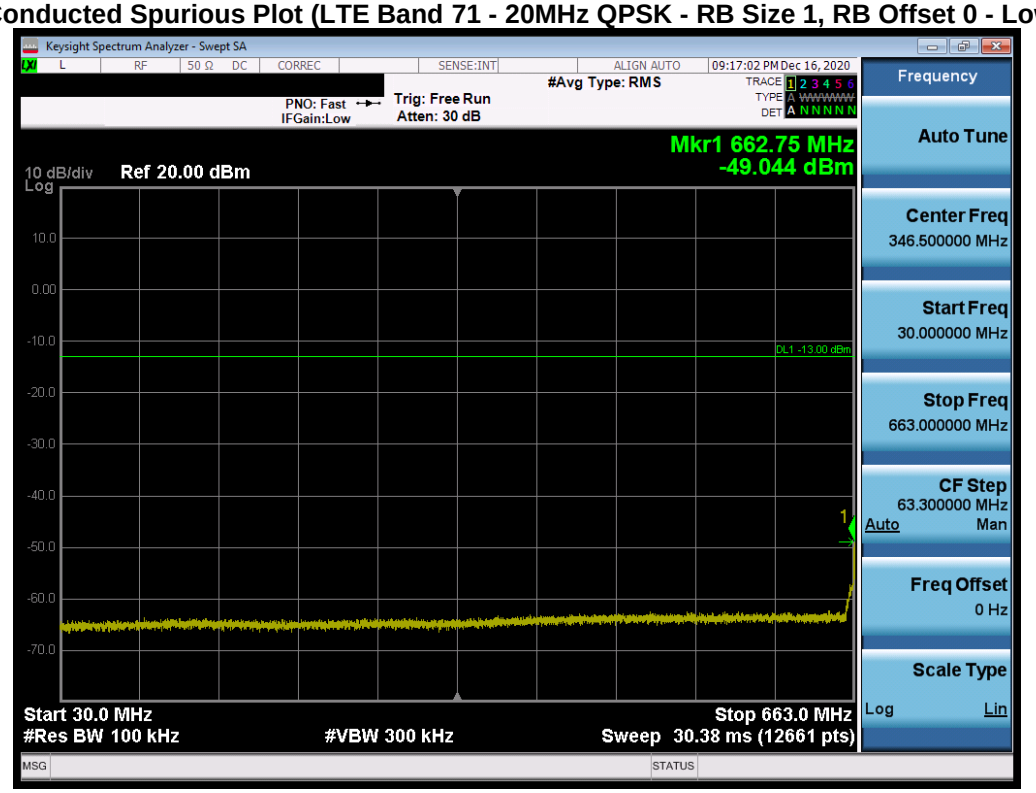


Plot 7-73. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-74. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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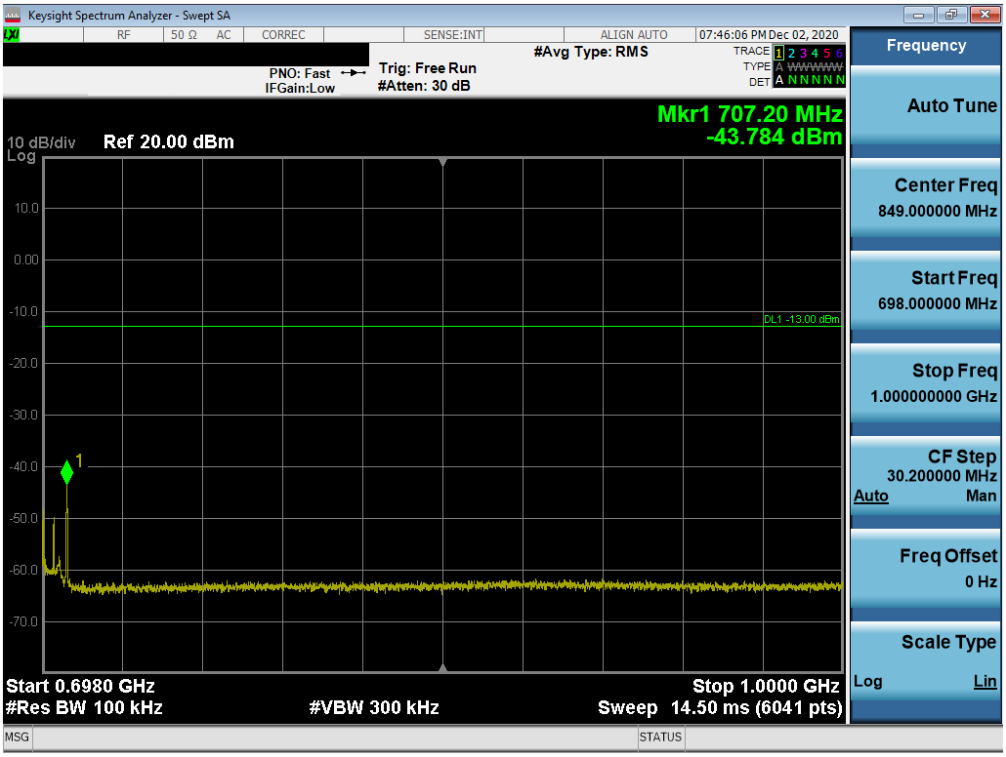
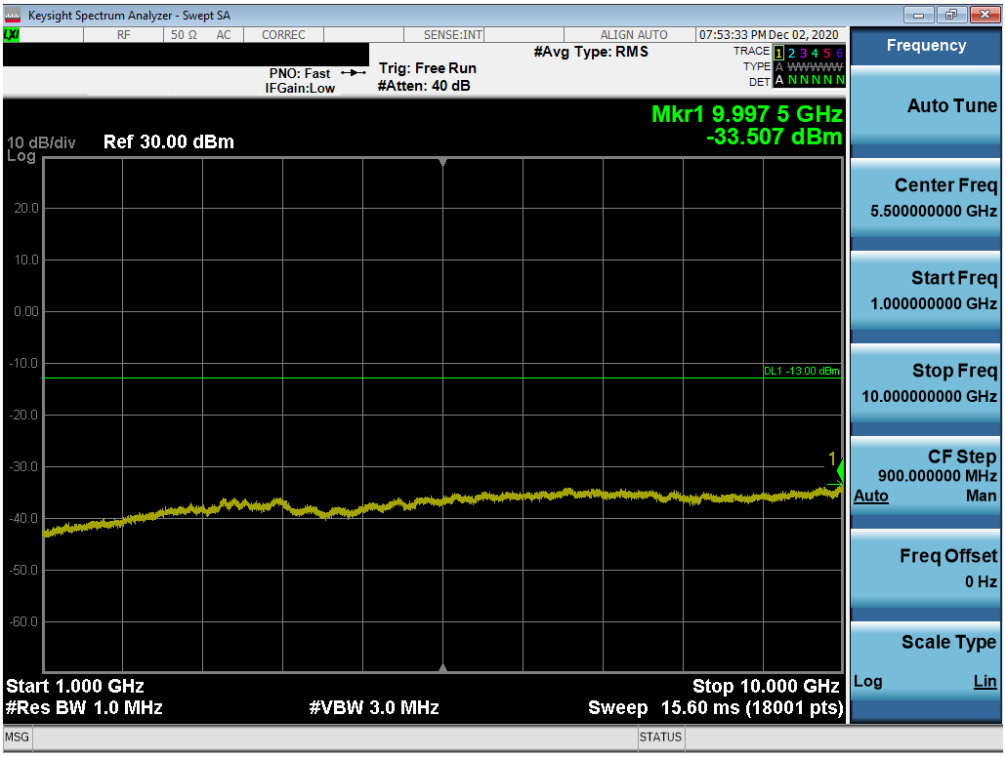


Plot 7-75. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-76. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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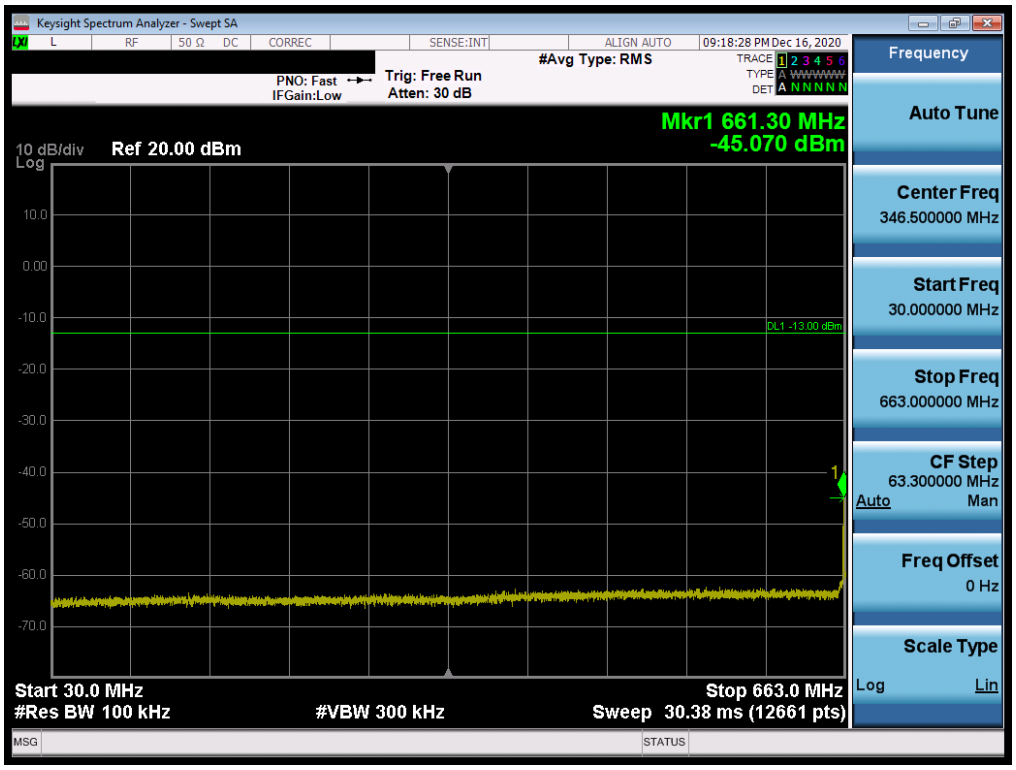
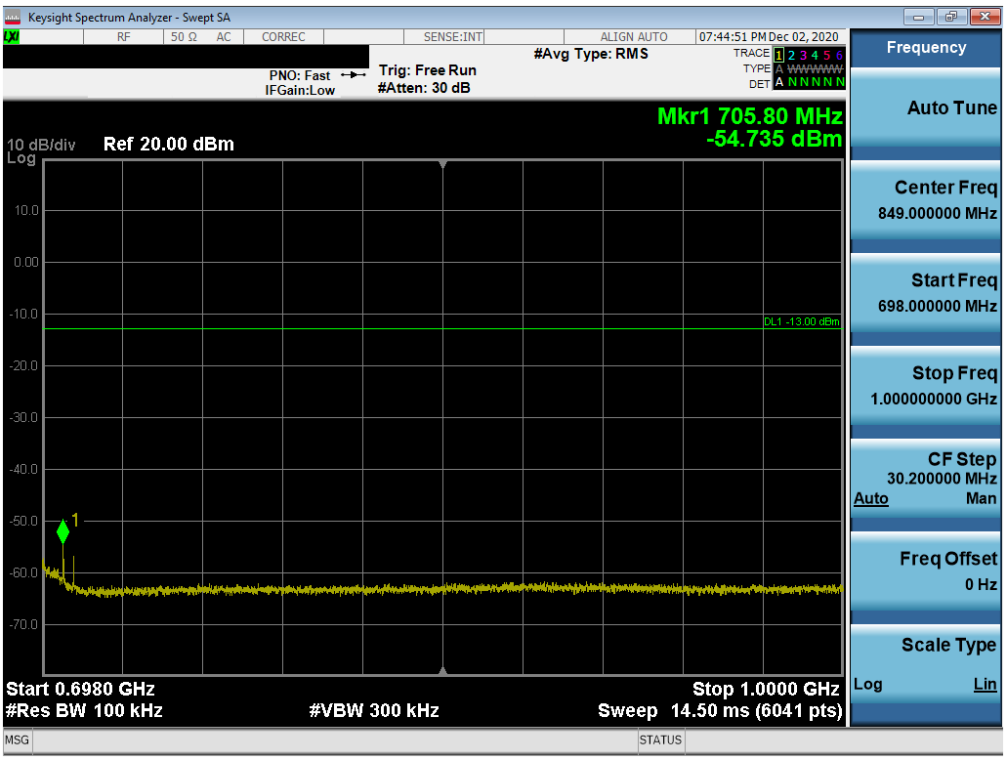


Plot 7-77. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-78. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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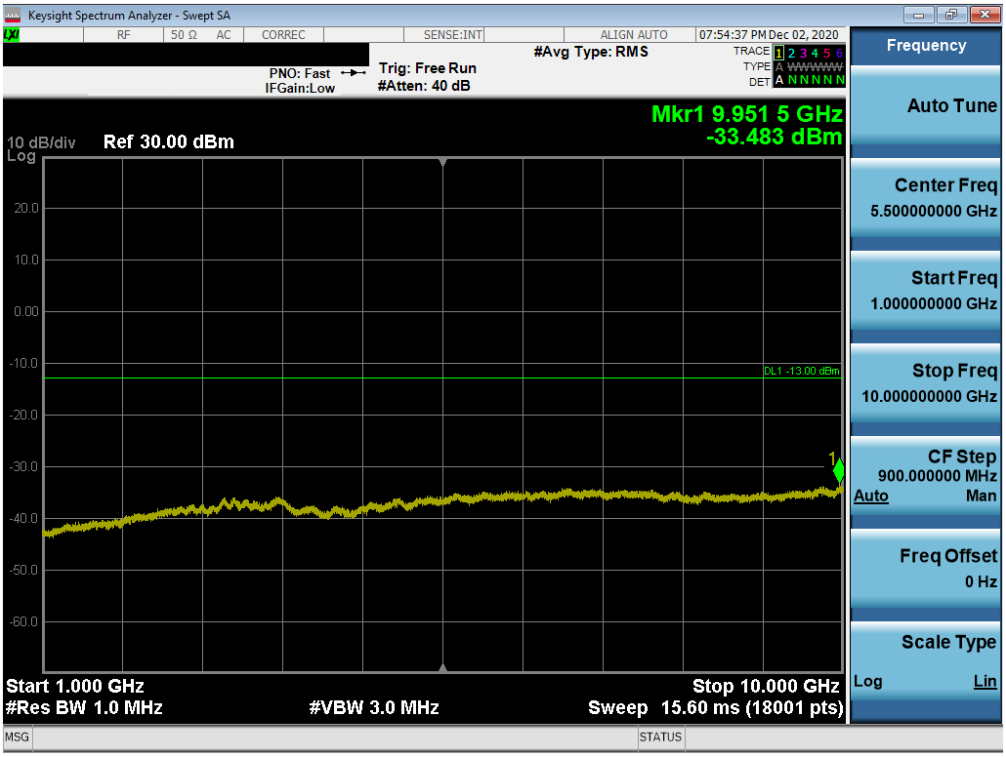

Plot 7-79. Conducted Spurious Plot (LTE Band 71 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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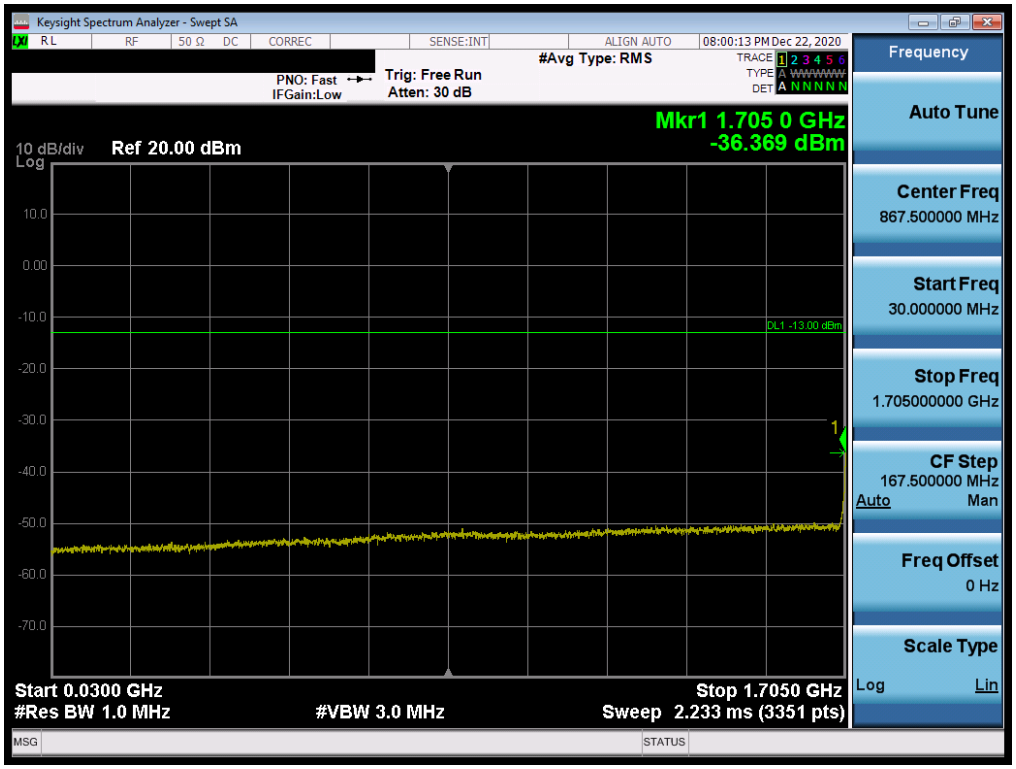
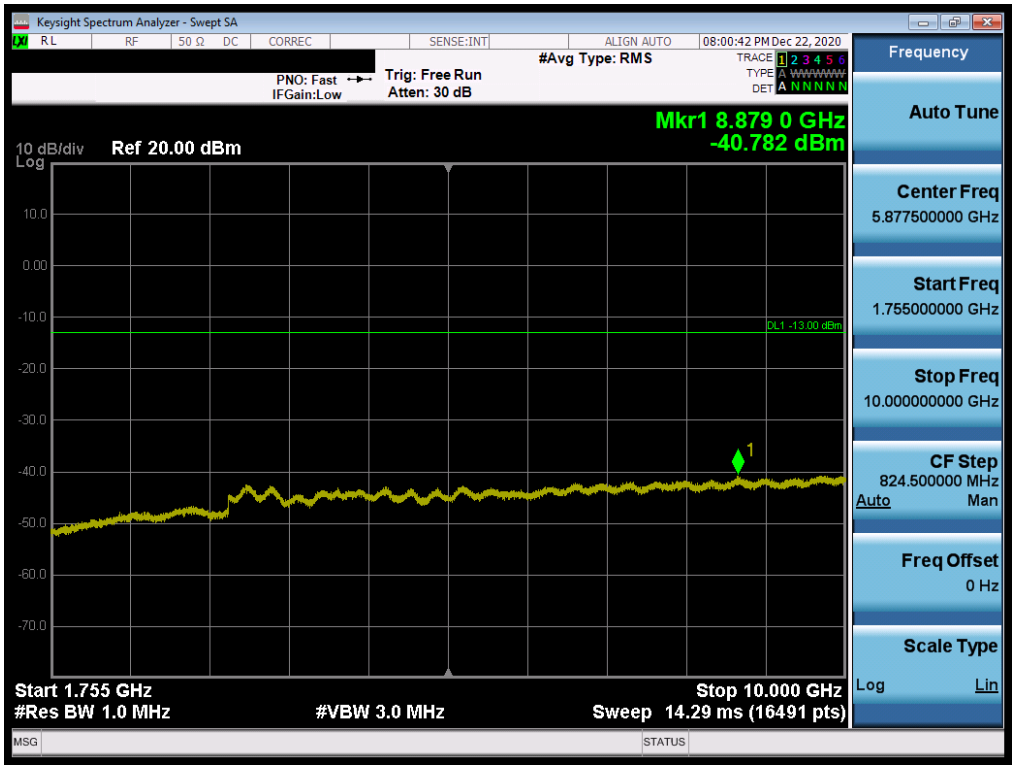
WCDMA AWS



Plot 7-80. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel)



Plot 7-81. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel)

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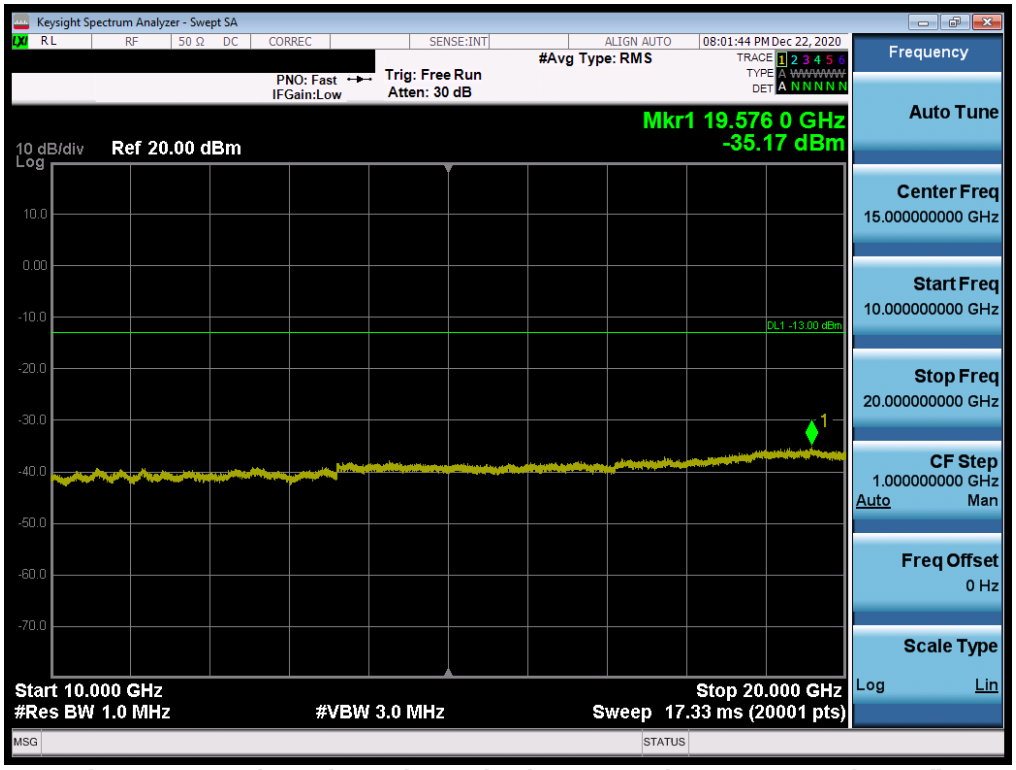
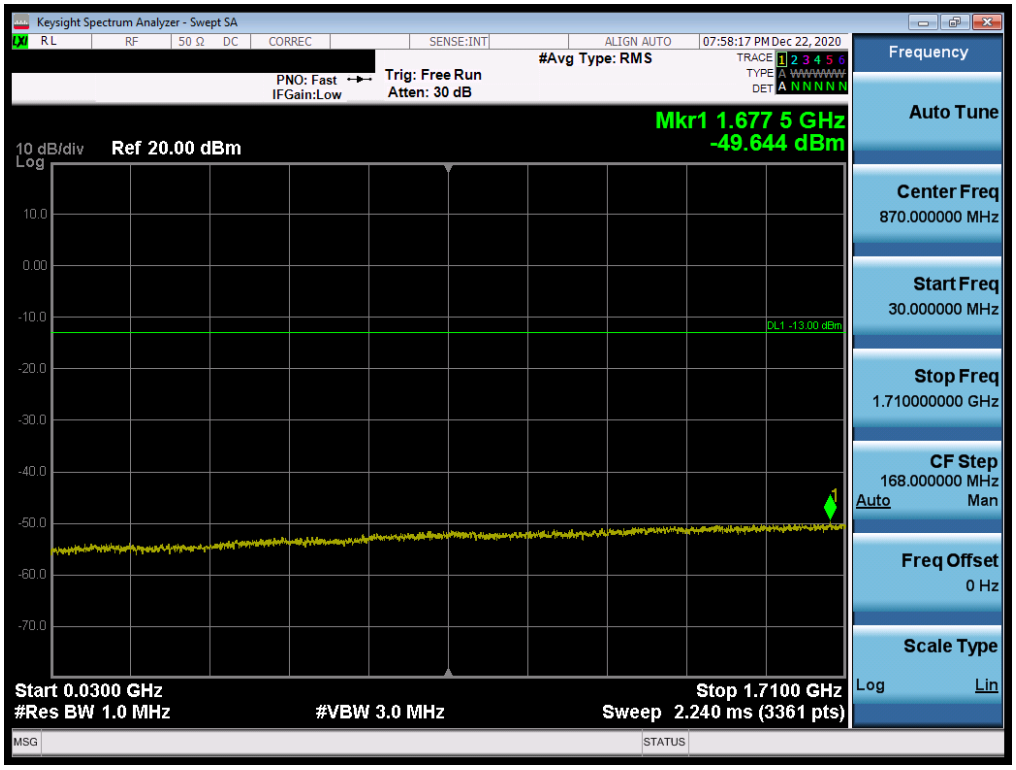


Plot 7-82. Conducted Spurious Plot (WCDMA Ch. 1312- Low Channel)



Plot 7-83. Conducted Spurious Plot (WCDMA Ch. 1413- Mid Channel)

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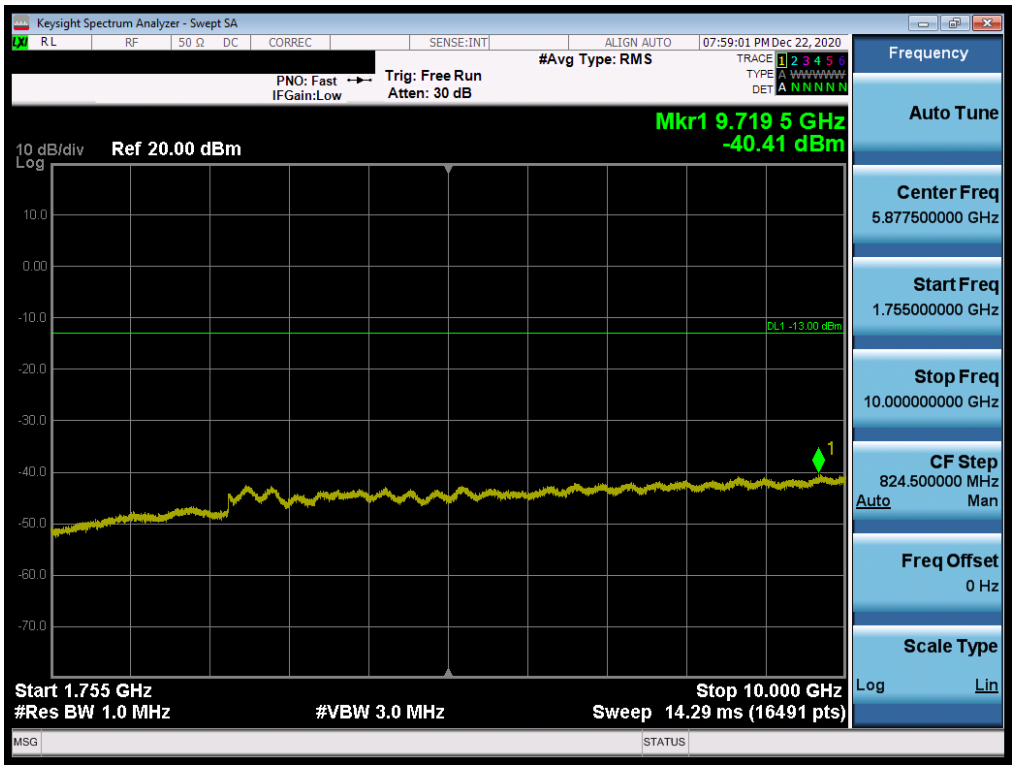

Plot 7-84. Conducted Spurious Plot (WCDMA Ch. 1413- Mid Channel)

Plot 7-85. Conducted Spurious Plot (WCDMA Ch. 1413- Mid Channel)

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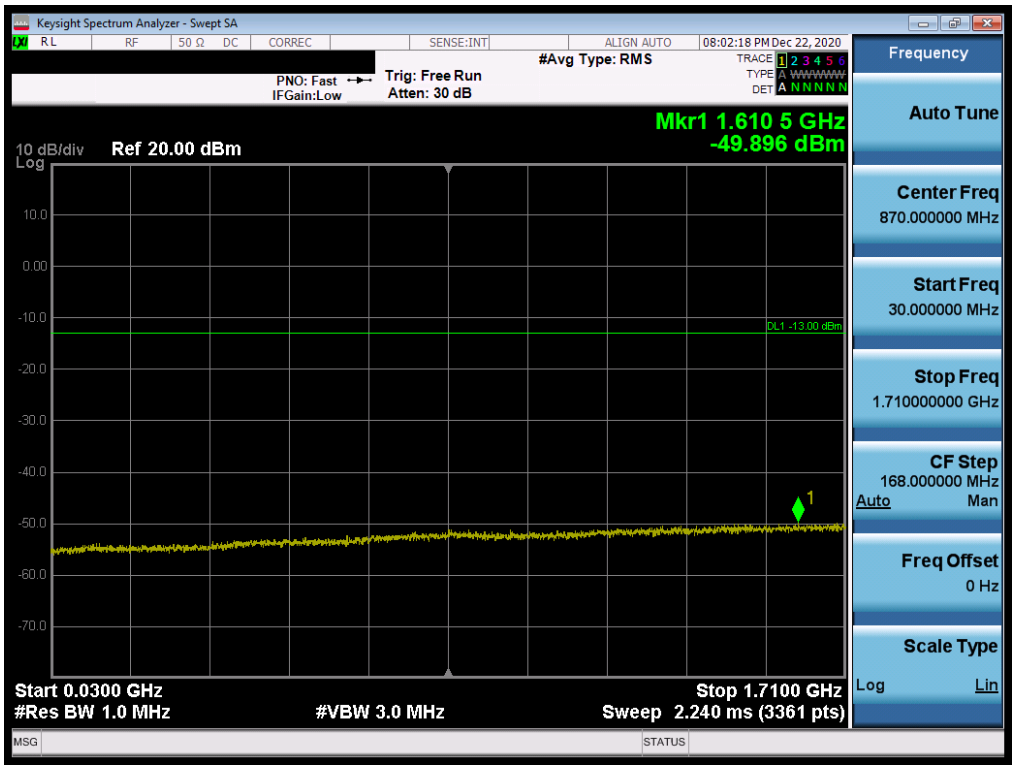
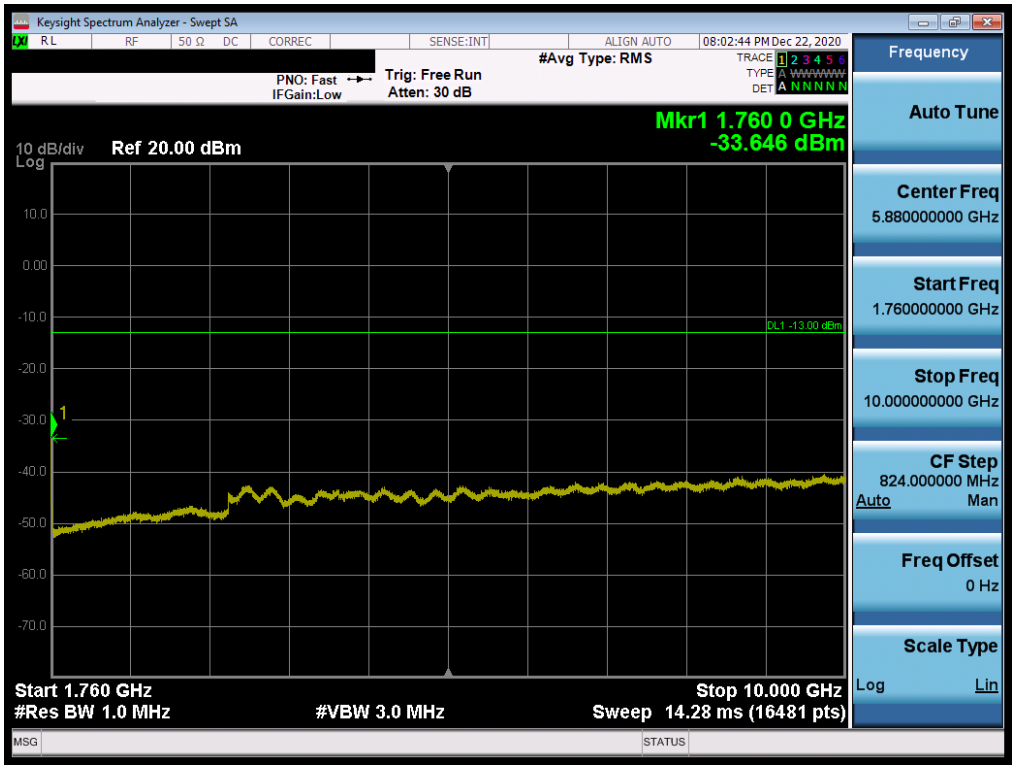


Plot 7-86. Conducted Spurious Plot (WCDMA Ch. 1513- High Channel)



Plot 7-87. Conducted Spurious Plot (WCDMA Ch. 1513- High Channel)

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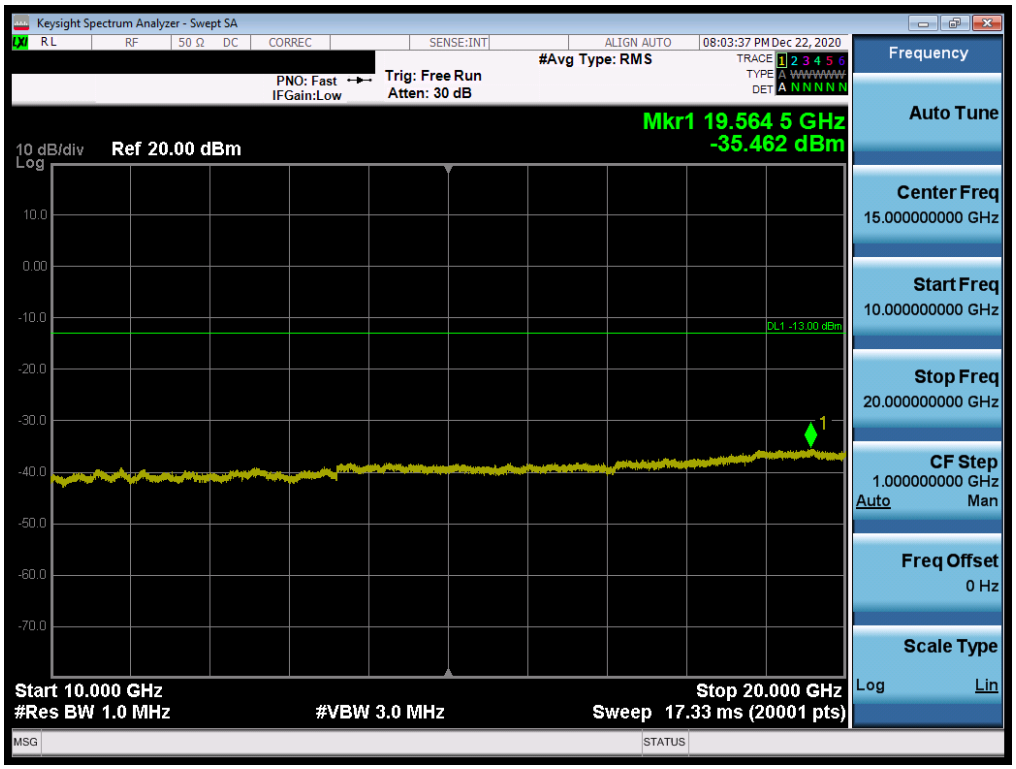

Plot 7-88. Conducted Spurious Plot (WCDMA Ch. 1513- High Channel)

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7.4 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

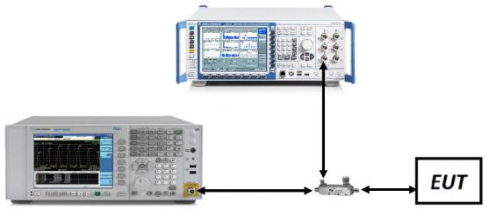

Figure 7-3. Test Instrument & Measurement Setup

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Test Notes

Per 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Per 27.53(g) for operations in the 663 - 698 MHz and 698 – 746MHz bands, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is $65 + 10 \log_{10}(P) = -35$dBm in a 6.25kHz bandwidth.

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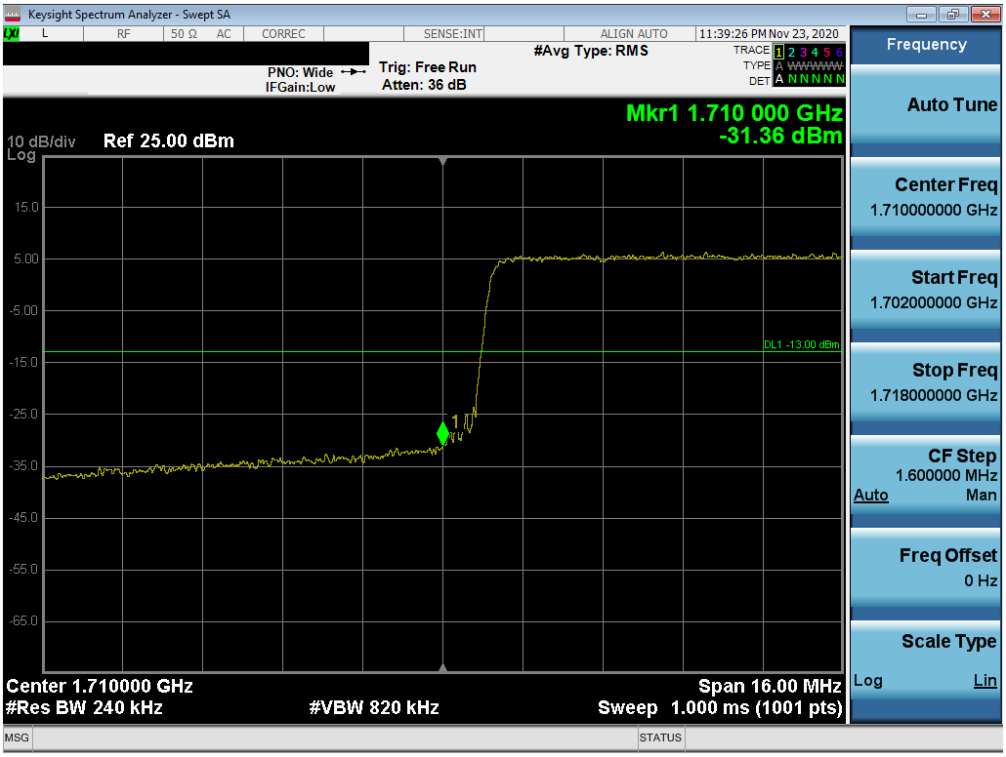
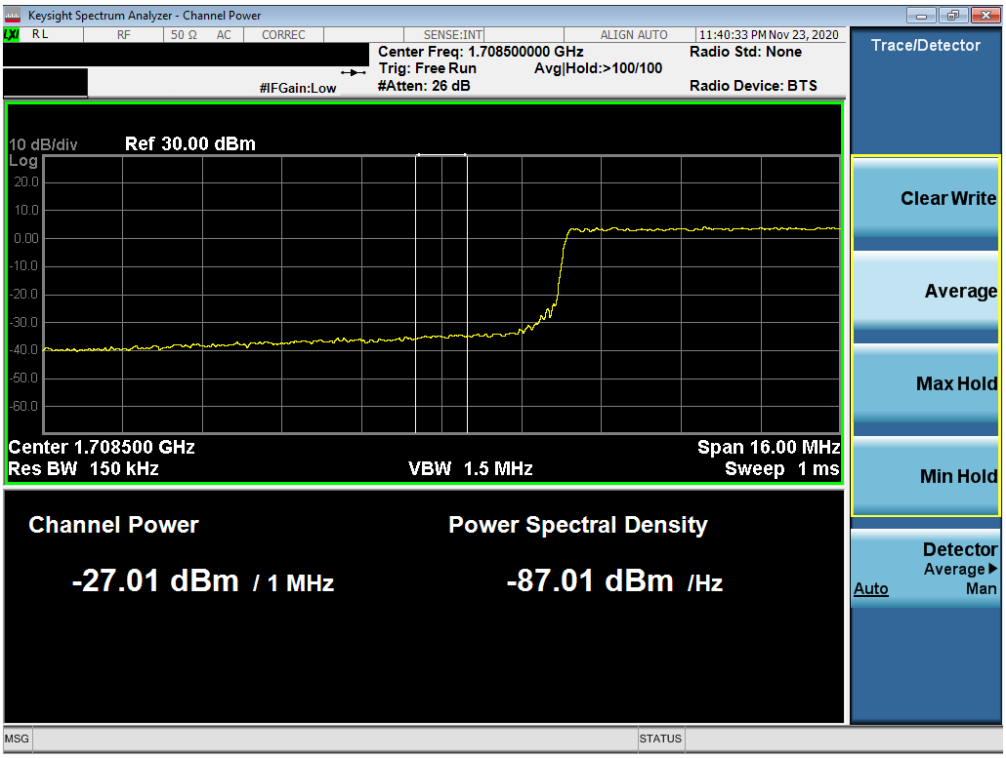
LTE Band 66/4



Plot 7-89. Lower Band Edge Plot (LTE Band 66/4 - 20MHz QPSK – Full RB Configuration)



Plot 7-90. Lower Extended Band Edge Plot (LTE Band 66/4 - 20MHz QPSK – Full RB Configuration)

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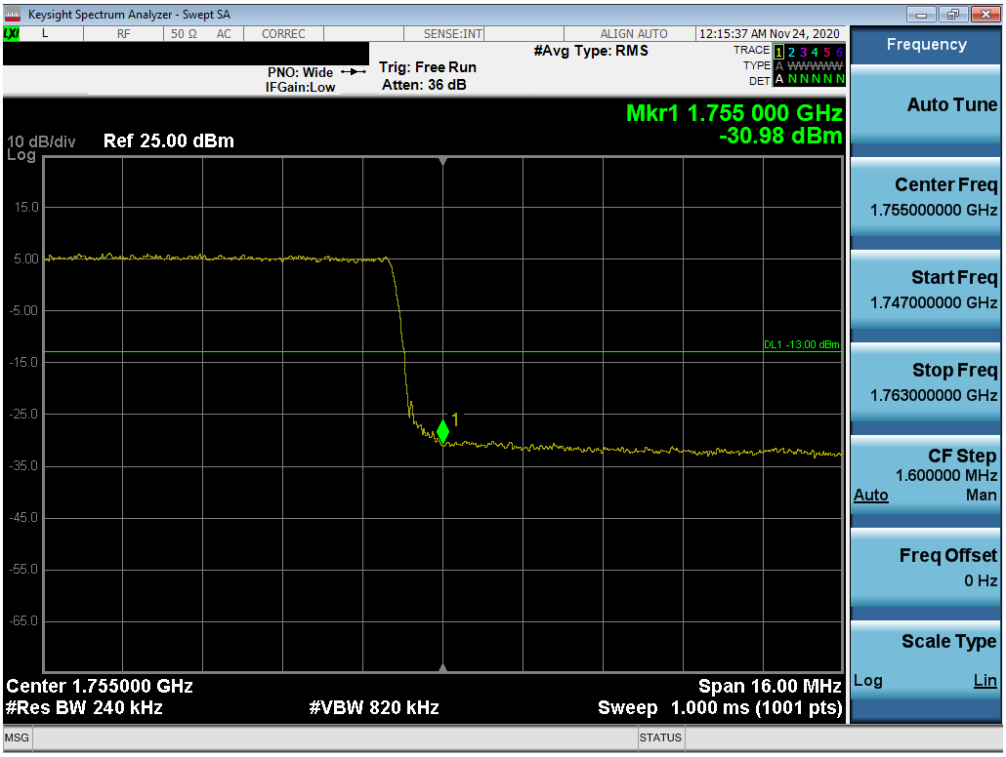
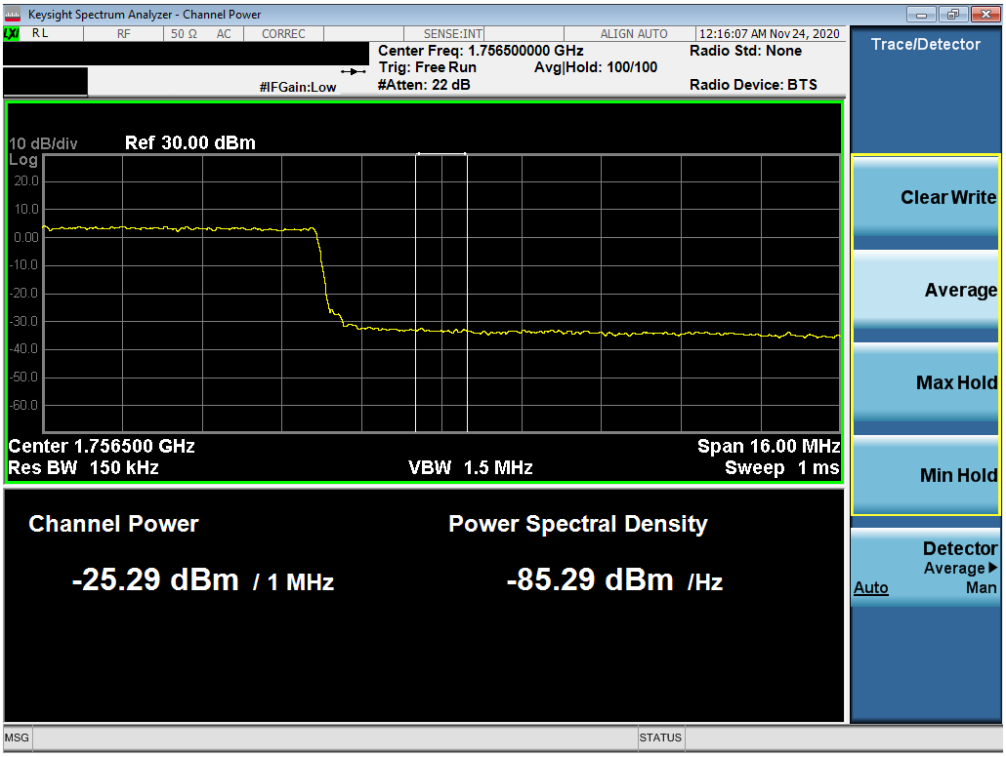


Plot 7-91. Upper Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB Configuration)



Plot 7-92. Upper Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB Configuration)

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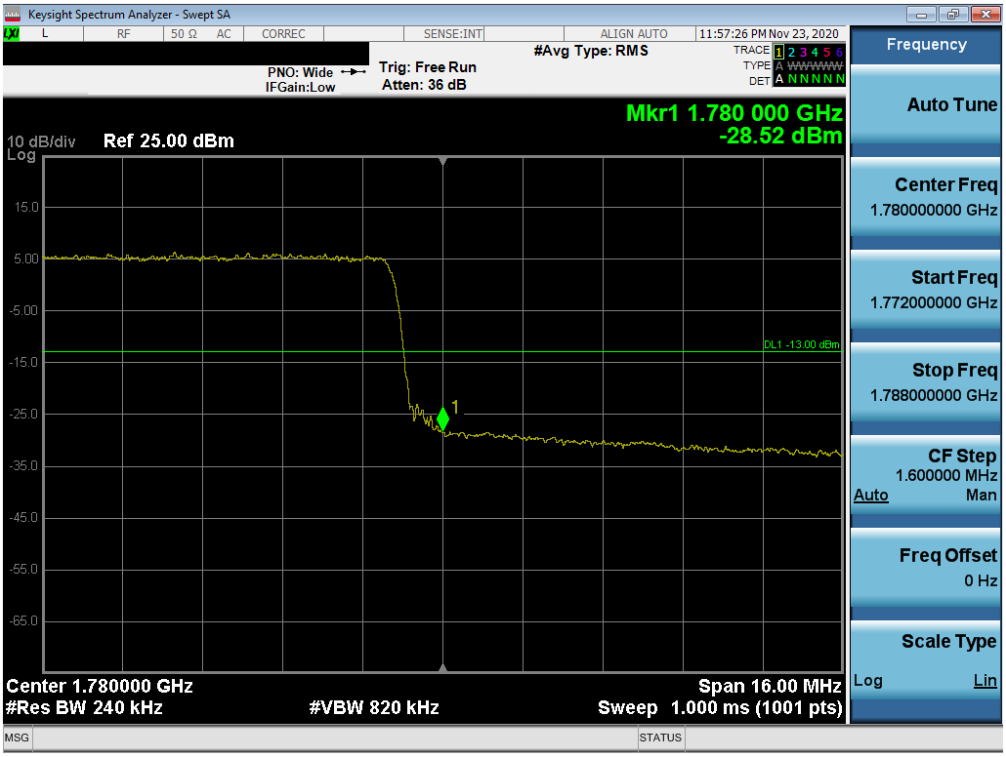
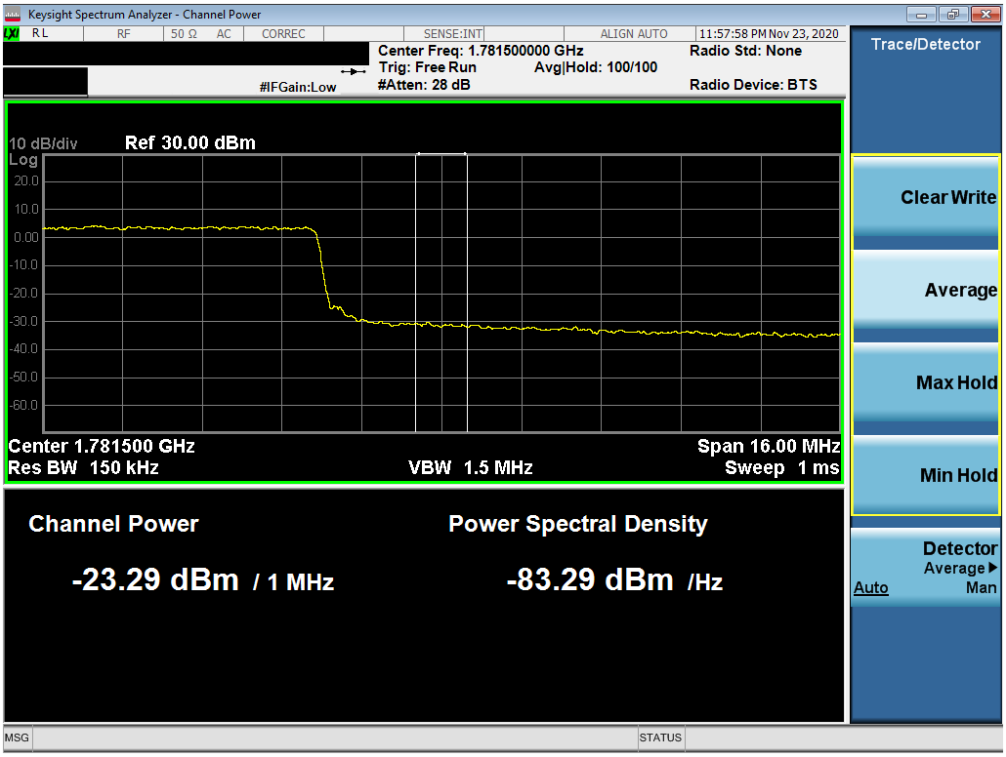


Plot 7-93. Upper Band Edge Plot (LTE Band 66 - 20MHz QPSK – Full RB Configuration)



Plot 7-94. Channel Edge Plot (LTE Band 66 - 20MHz QPSK – Full RB Configuration)

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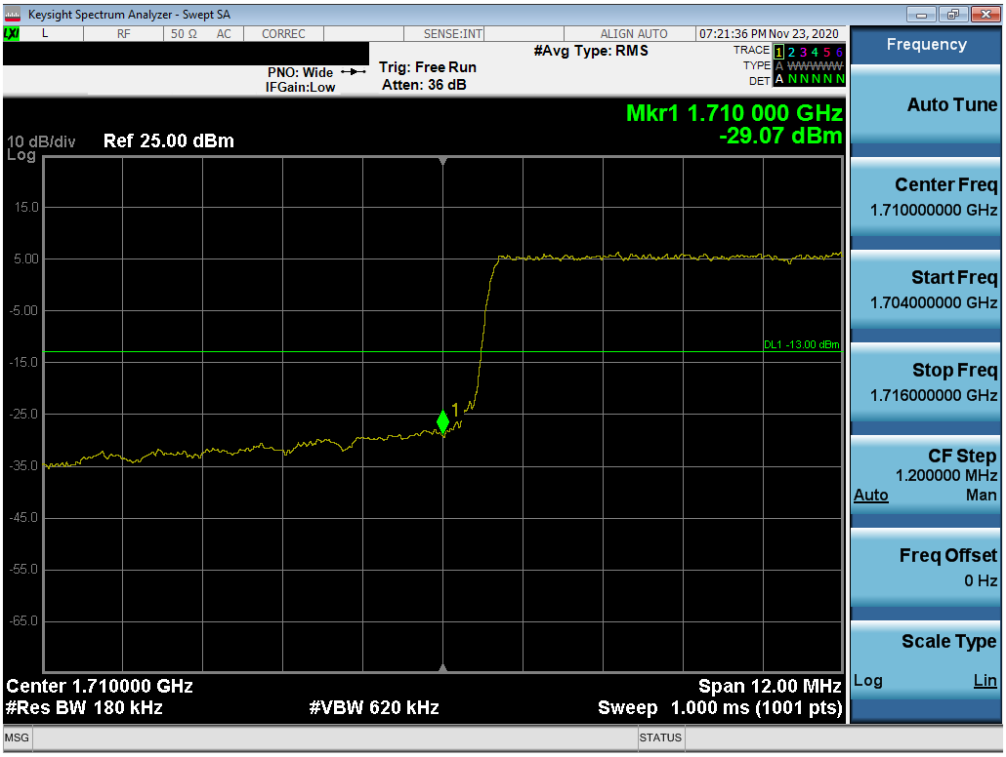
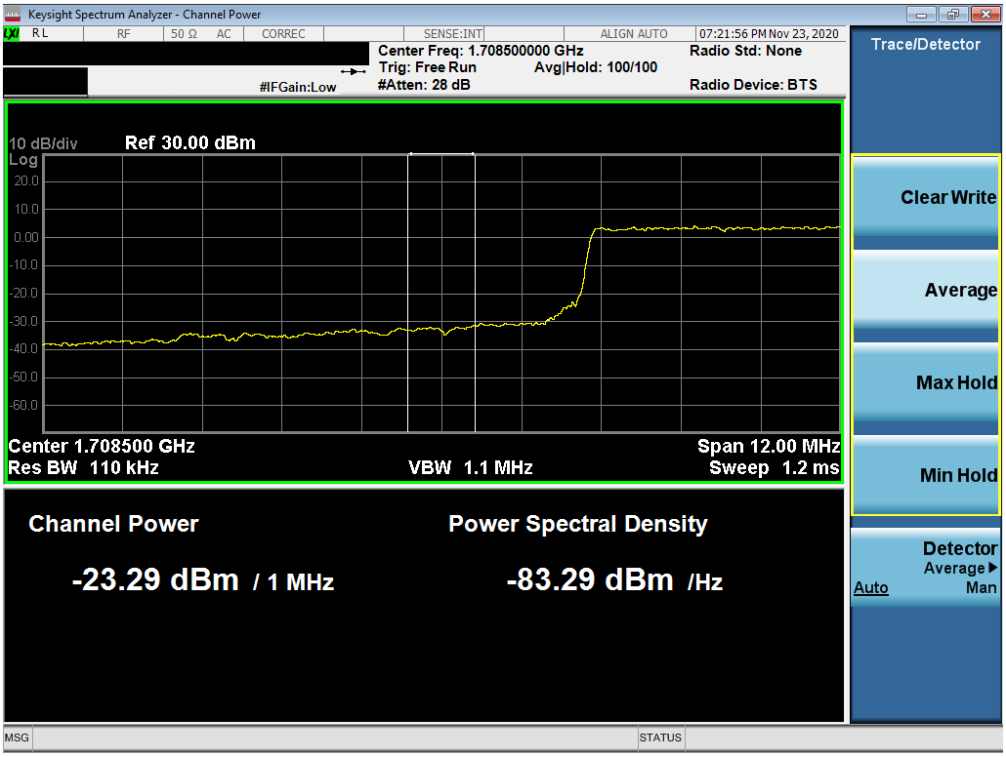


Plot 7-95. Lower Band Edge Plot (LTE Band 66/4 - 15MHz QPSK – Full RB Configuration)



Plot 7-96. Lower Extended Band Edge Plot (LTE Band 66/4 - 15MHz QPSK – Full RB Configuration)

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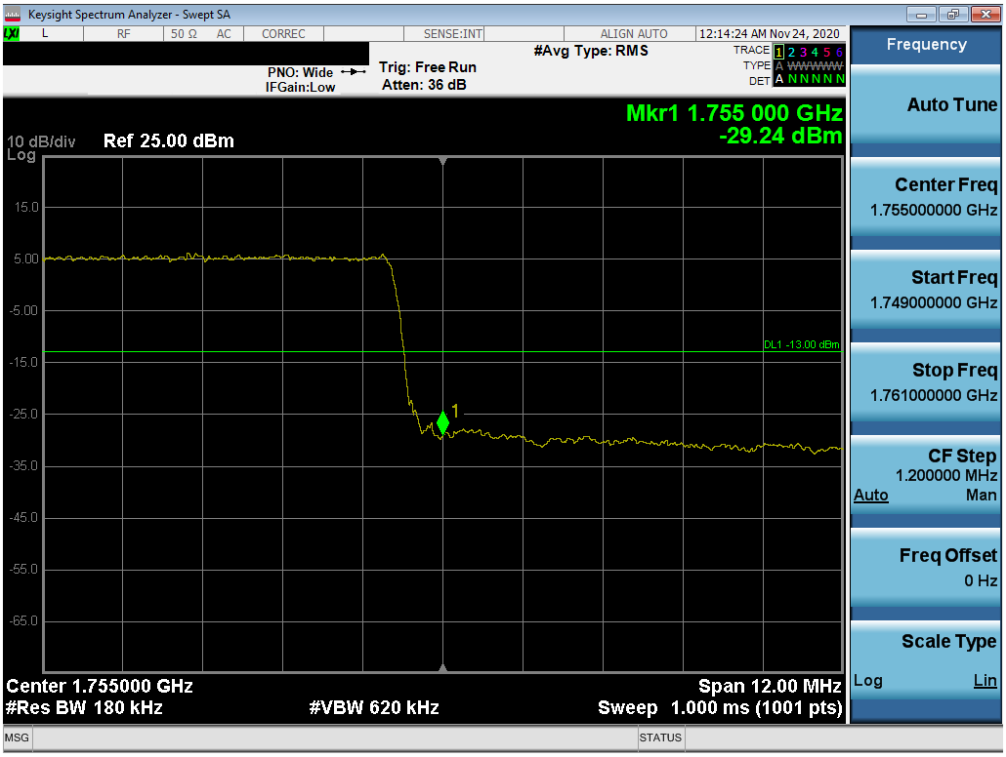
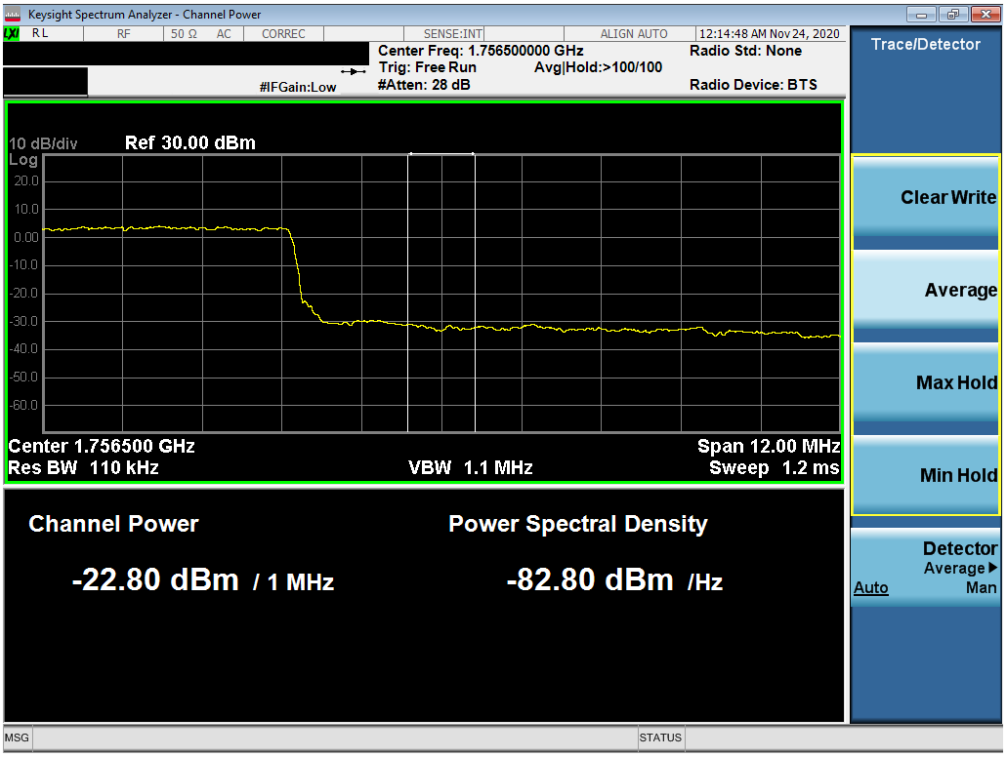


Plot 7-97. Upper Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB Configuration)



Plot 7-98. Upper Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB Configuration)

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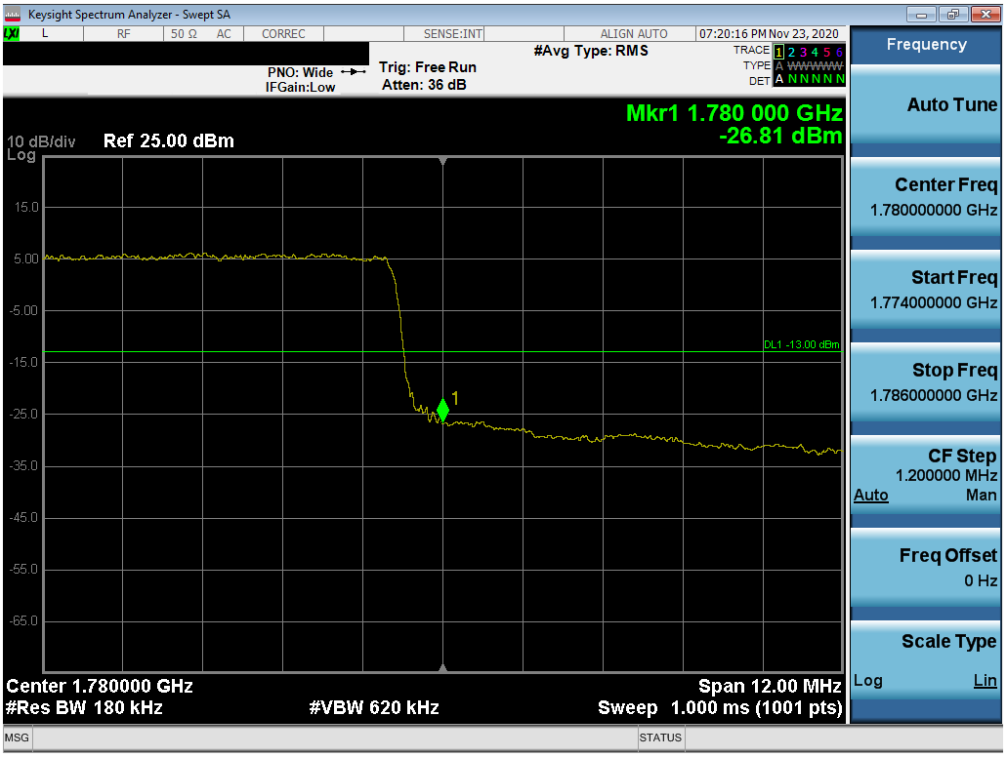
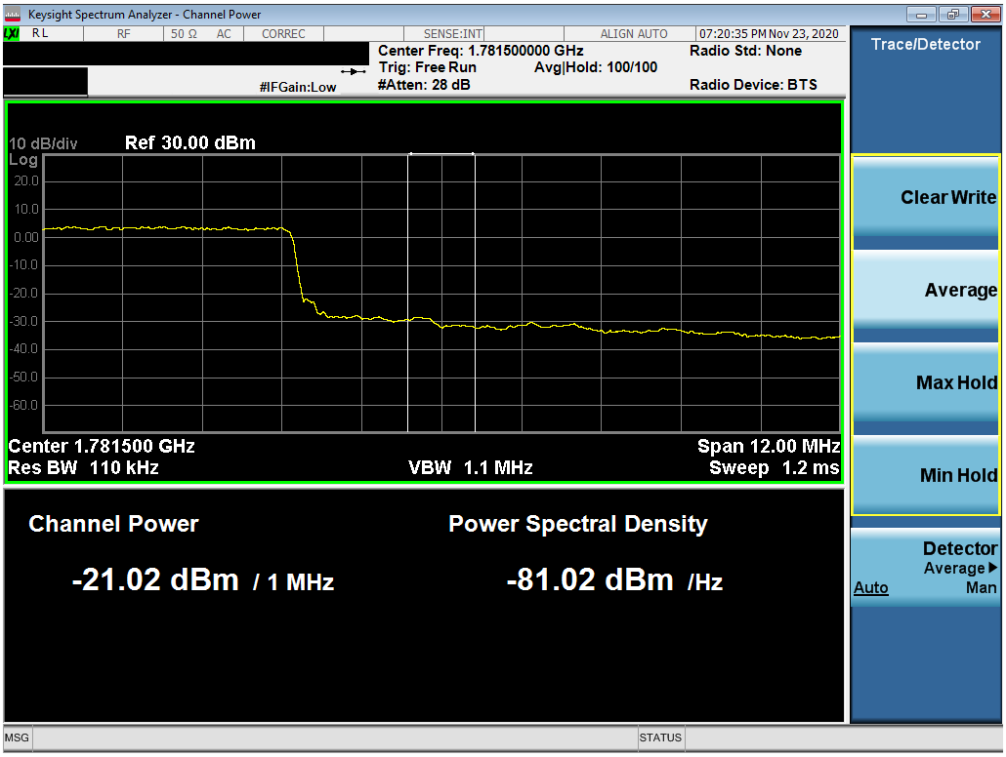


Plot 7-99. Upper Band Edge Plot (LTE Band 66 - 15MHz QPSK – Full RB Configuration)



Plot 7-100. Upper Extended Band Edge Plot (LTE Band 66 - 15MHz QPSK – Full RB Configuration)

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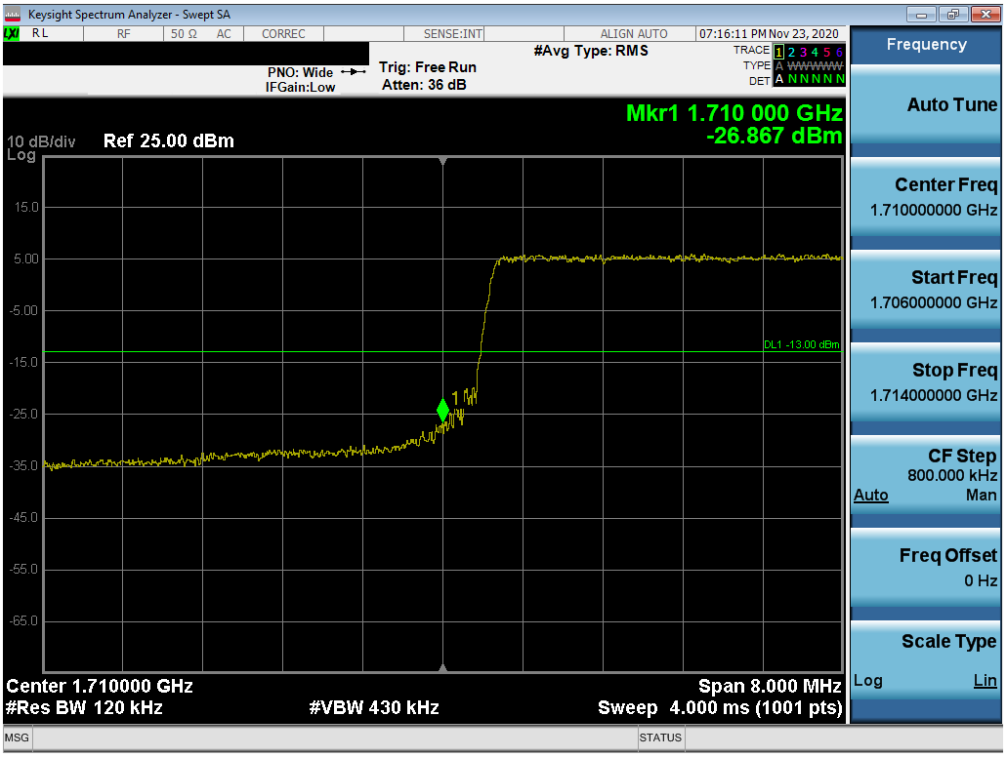
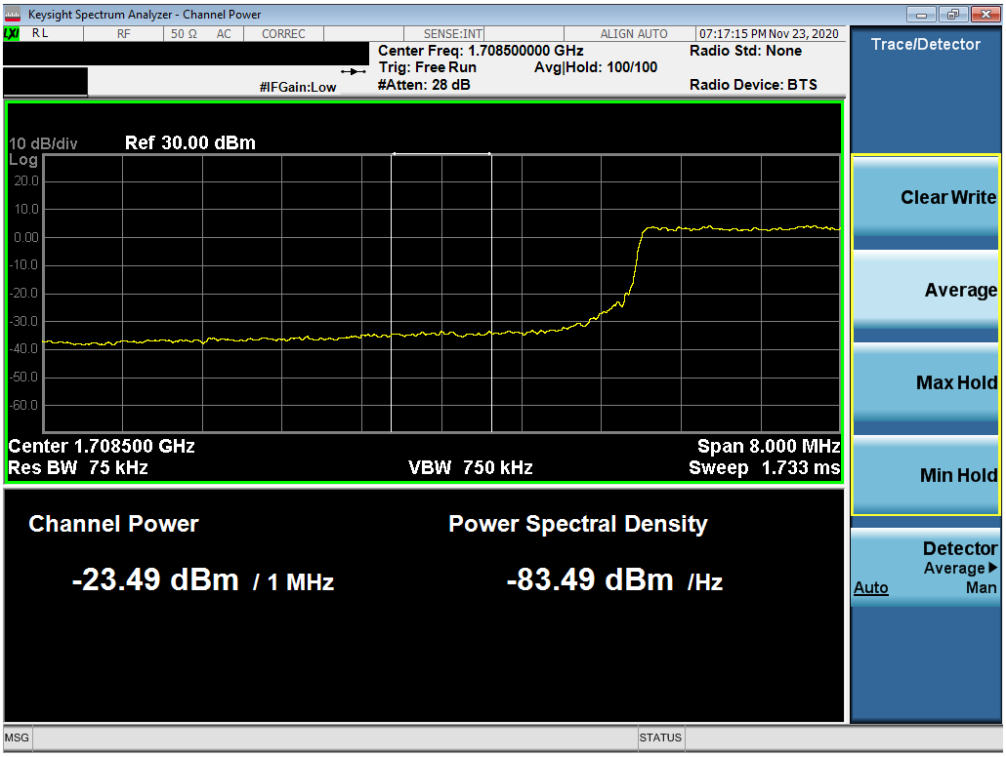


Plot 7-101. Lower Band Edge Plot (LTE Band 66/4 - 10MHz QPSK – Full RB Configuration)



Plot 7-102. Lower Extended Band Edge Plot (LTE Band 66/4 - 10MHz QPSK – Full RB Configuration)

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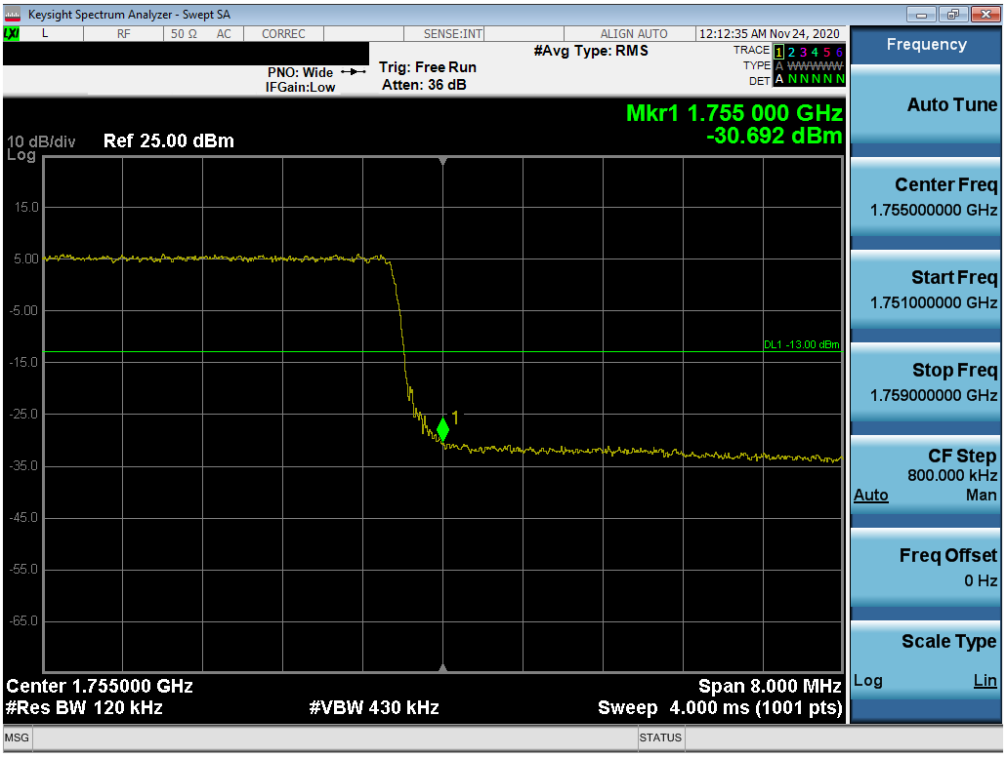
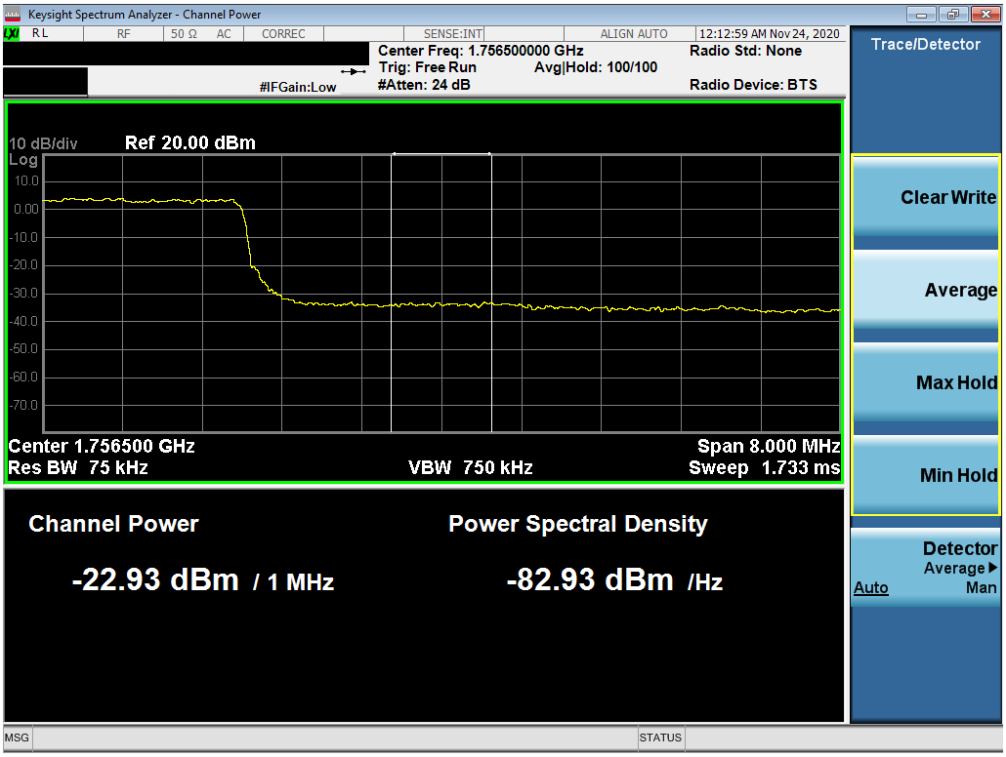


Plot 7-103. Upper Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB Configuration)



Plot 7-104. Upper Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB Configuration)

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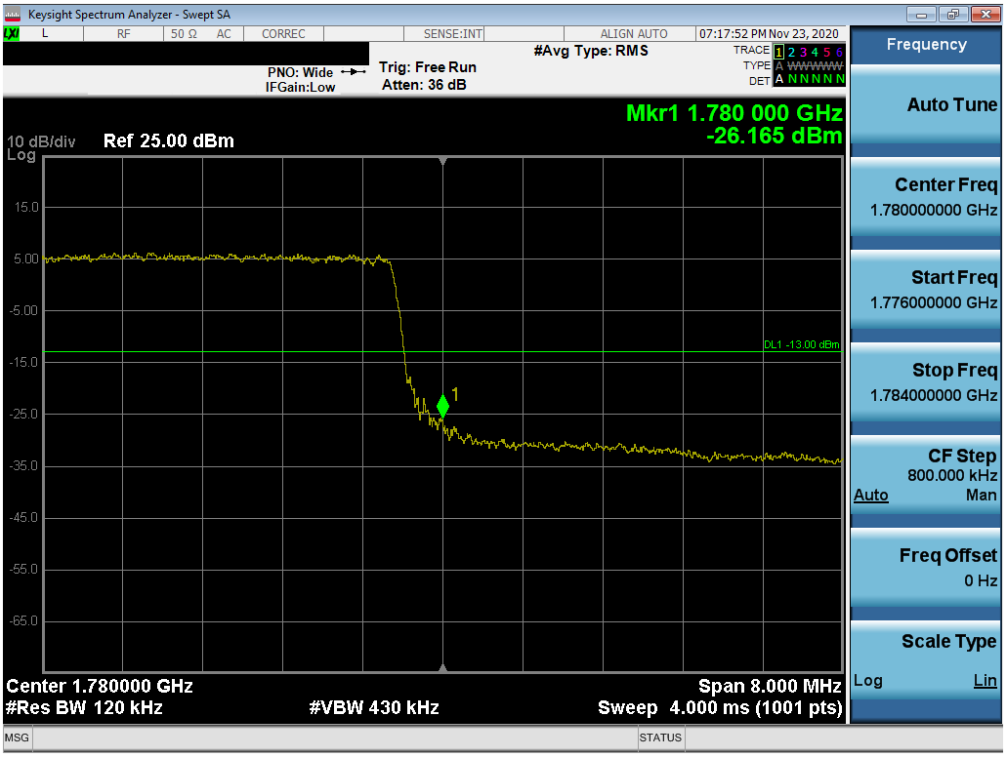
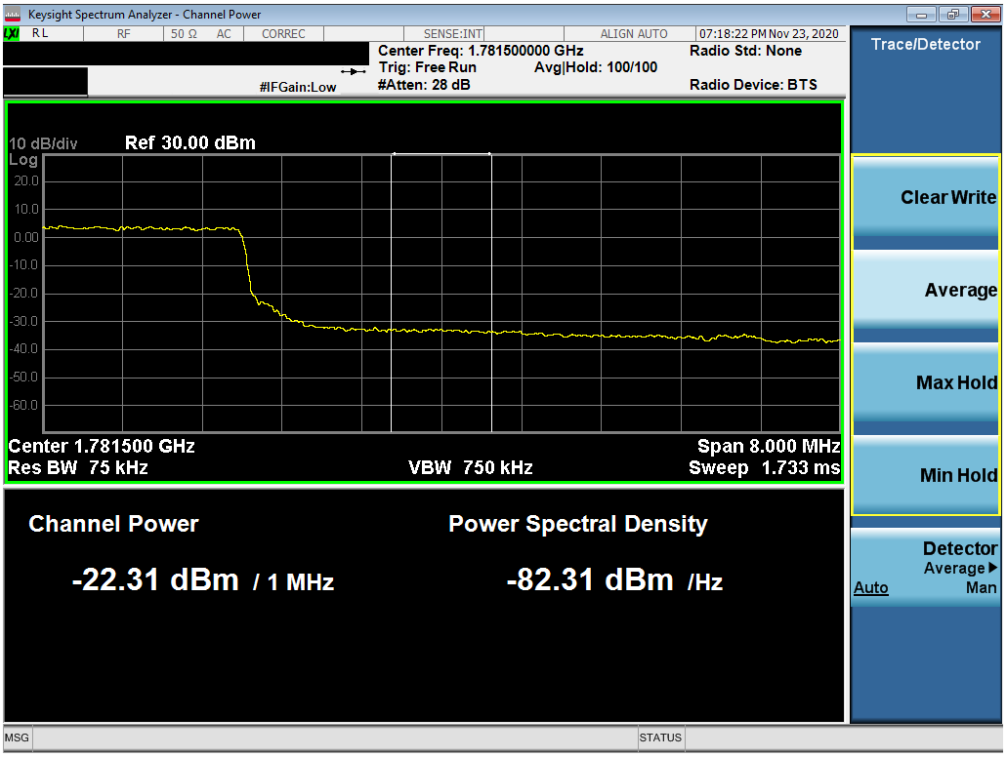


Plot 7-105. Upper Band Edge Plot (LTE Band 66 - 10MHz QPSK – Full RB Configuration)



Plot 7-106. Upper Extended Band Edge Plot (LTE Band 66 - 10MHz QPSK – Full RB Configuration)

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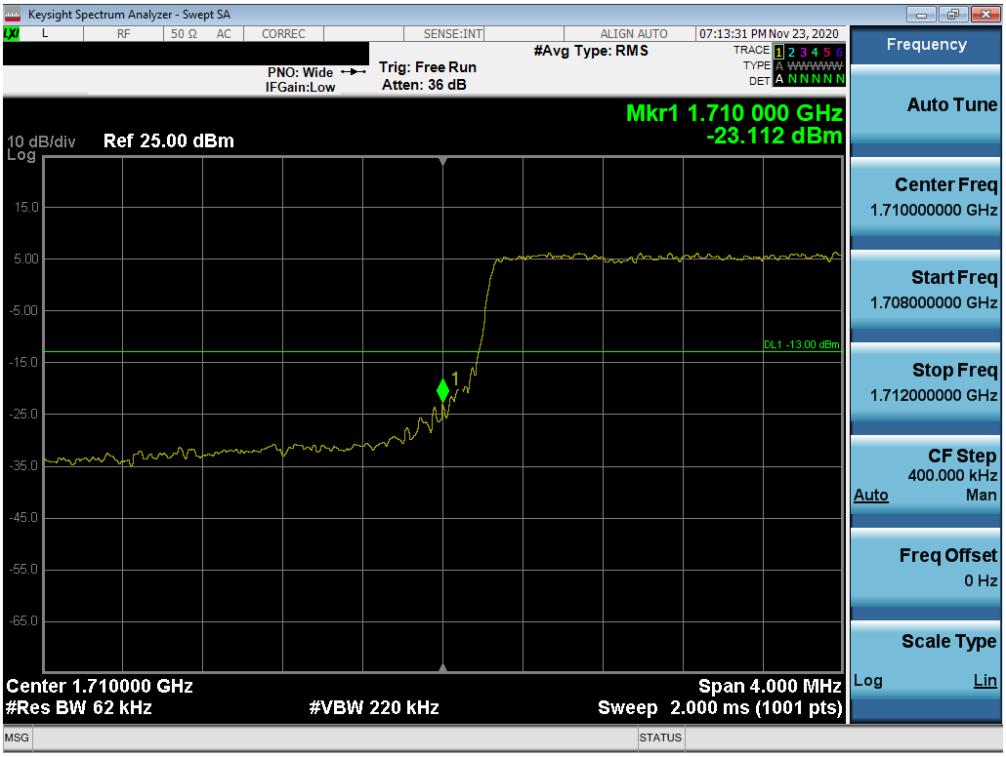
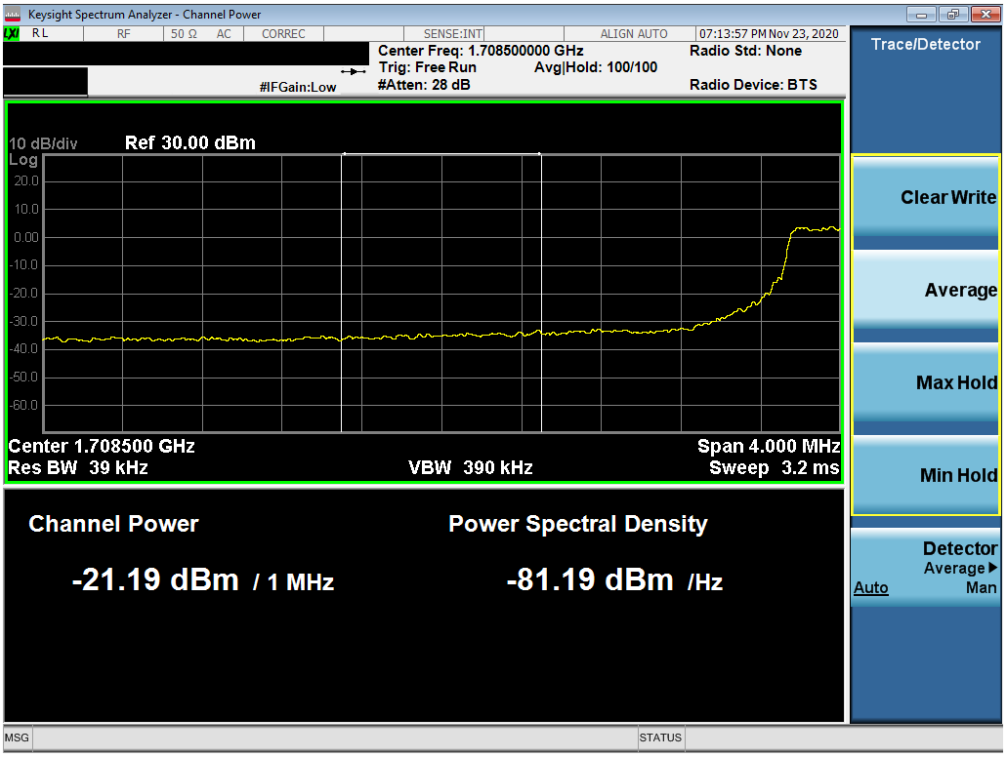


Plot 7-107. Lower Band Edge Plot (LTE Band 66/4 - 5MHz QPSK – Full RB Configuration)



Plot 7-108. Lower Extended Band Edge Plot (LTE Band 66/4 - 5MHz QPSK – Full RB Configuration)

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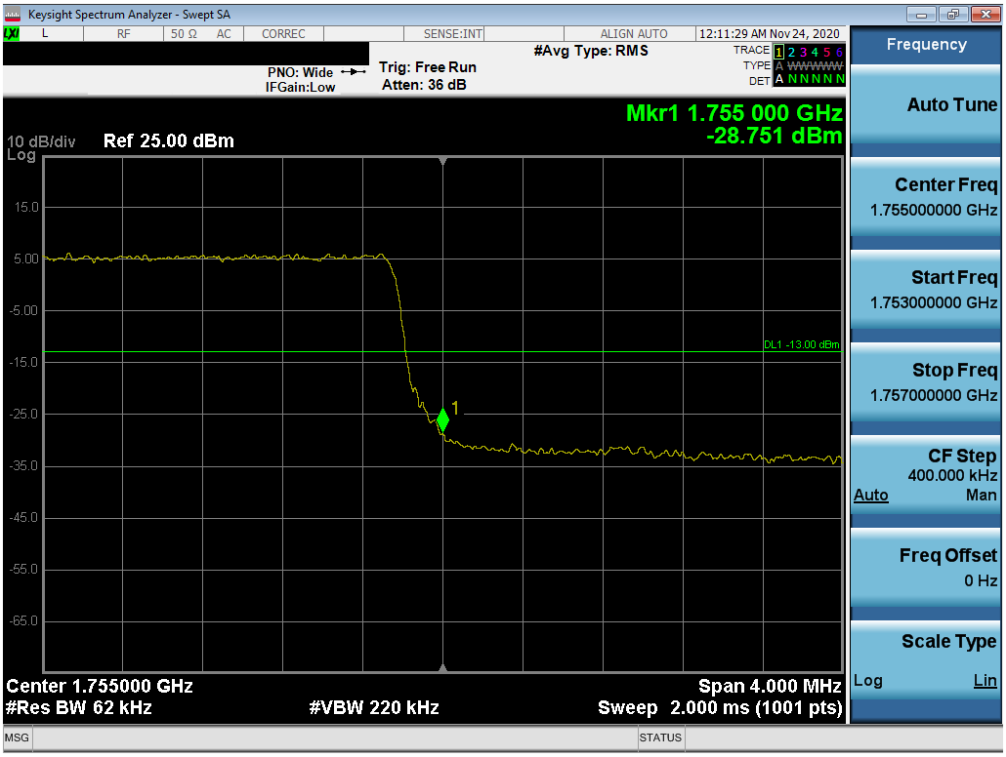
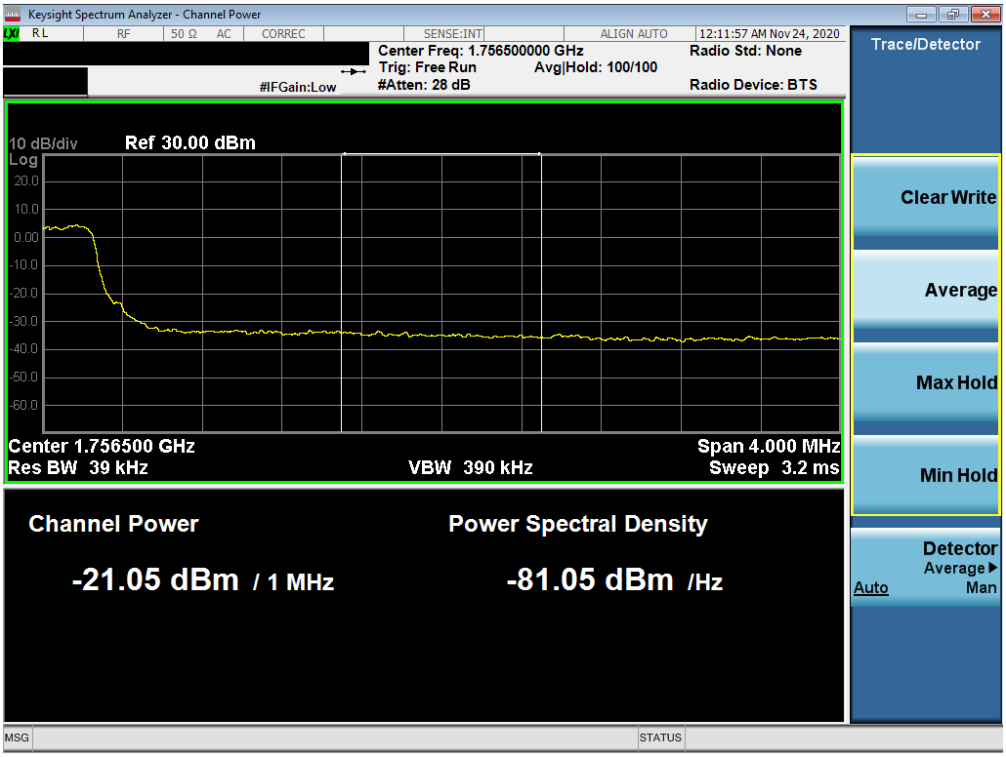


Plot 7-109. Upper Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB Configuration)



Plot 7-110. Upper Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB Configuration)

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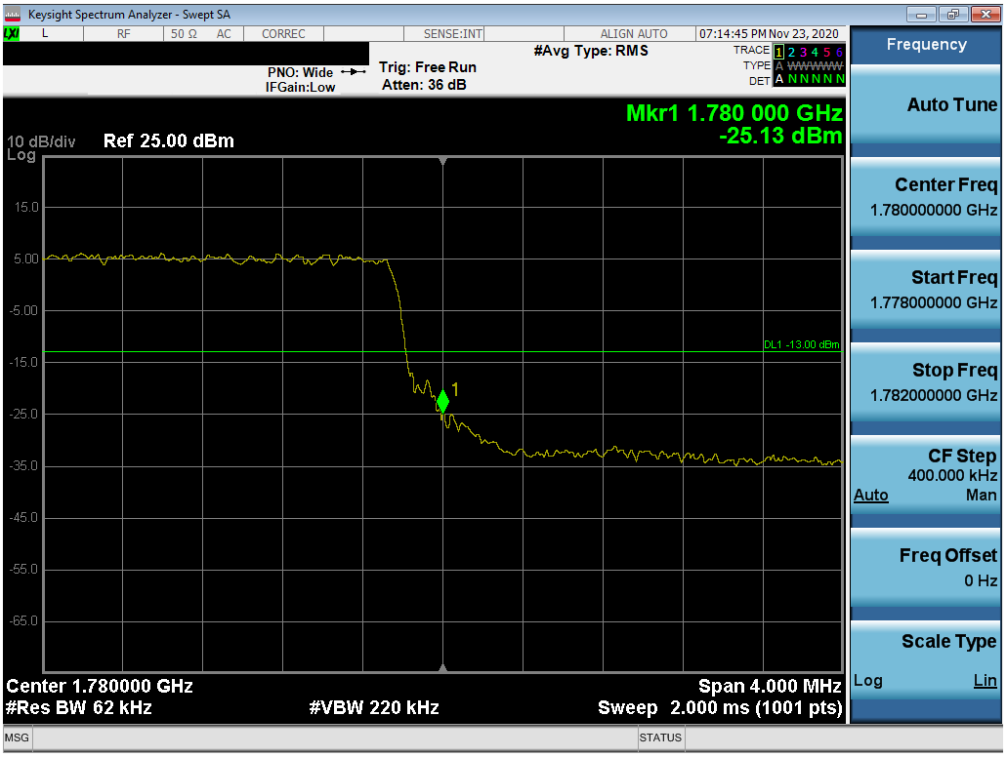
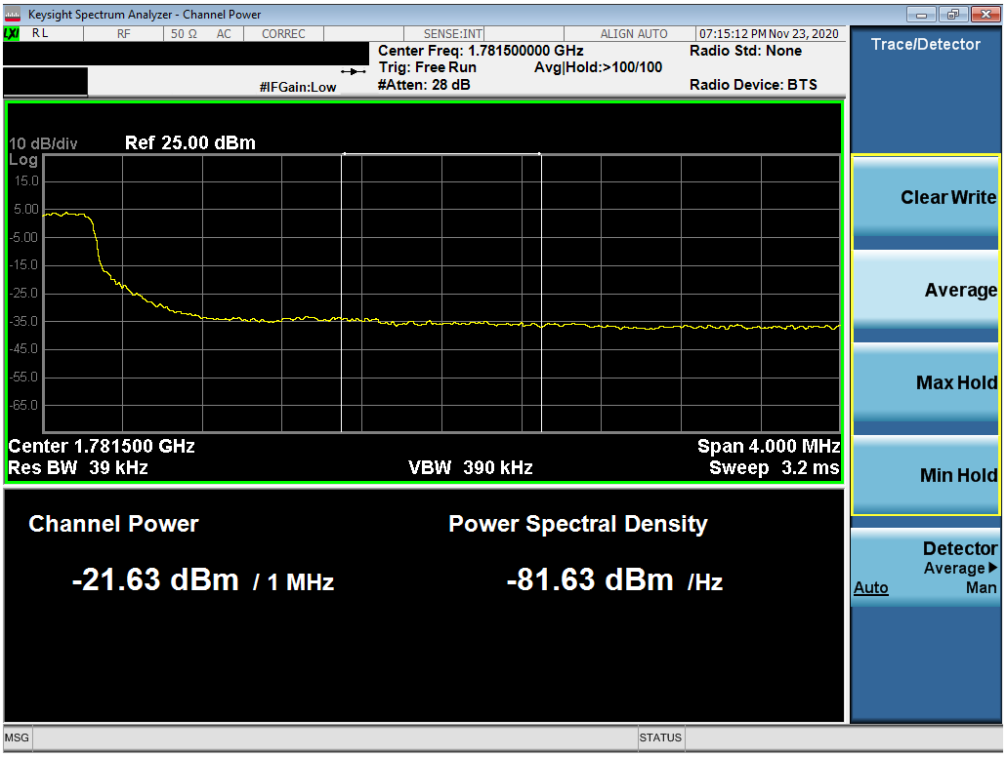


Plot 7-111. Upper Band Edge Plot (LTE Band 66 - 5MHz QPSK – Full RB Configuration)



Plot 7-112. Upper Extended Band Edge Plot (LTE Band 66 - 5MHz QPSK – Full RB Configuration)

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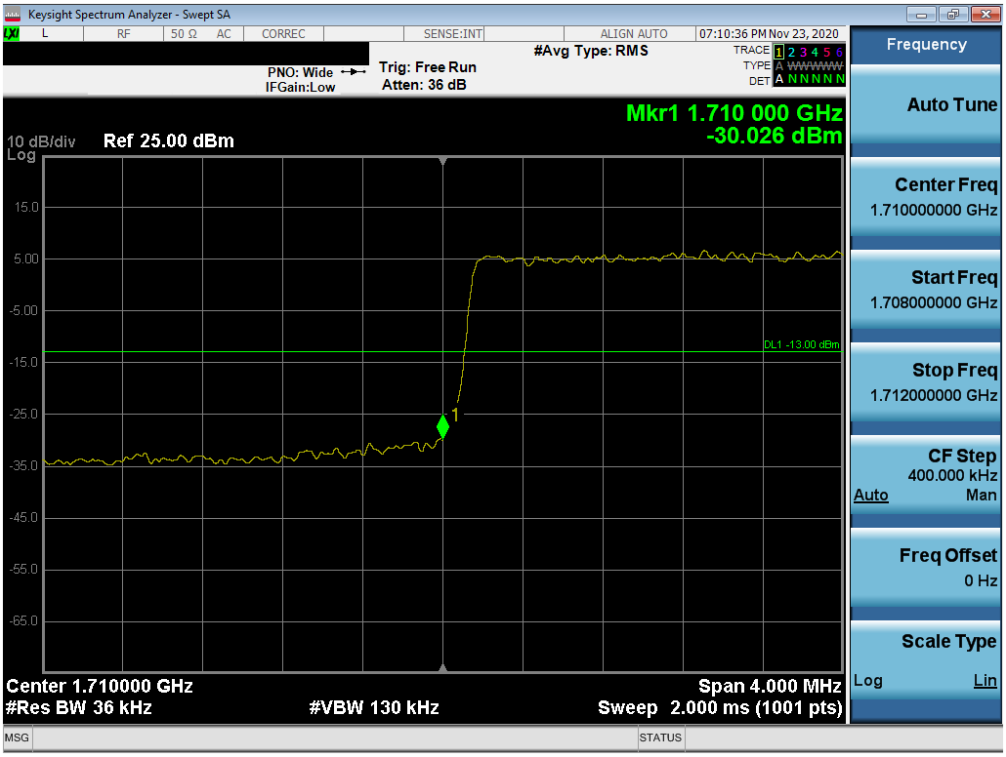
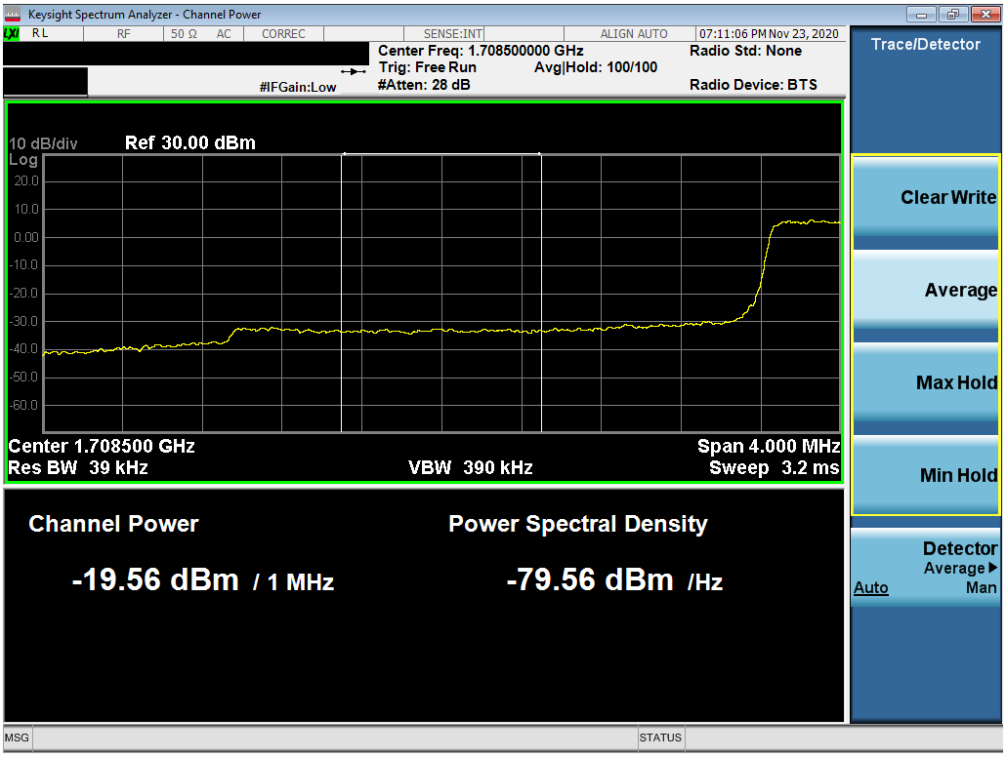


Plot 7-113. Lower Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB Configuration)



Plot 7-114. Lower Extended Band Edge Plot (LTE Band 66/4 - 3MHz QPSK – Full RB Configuration)

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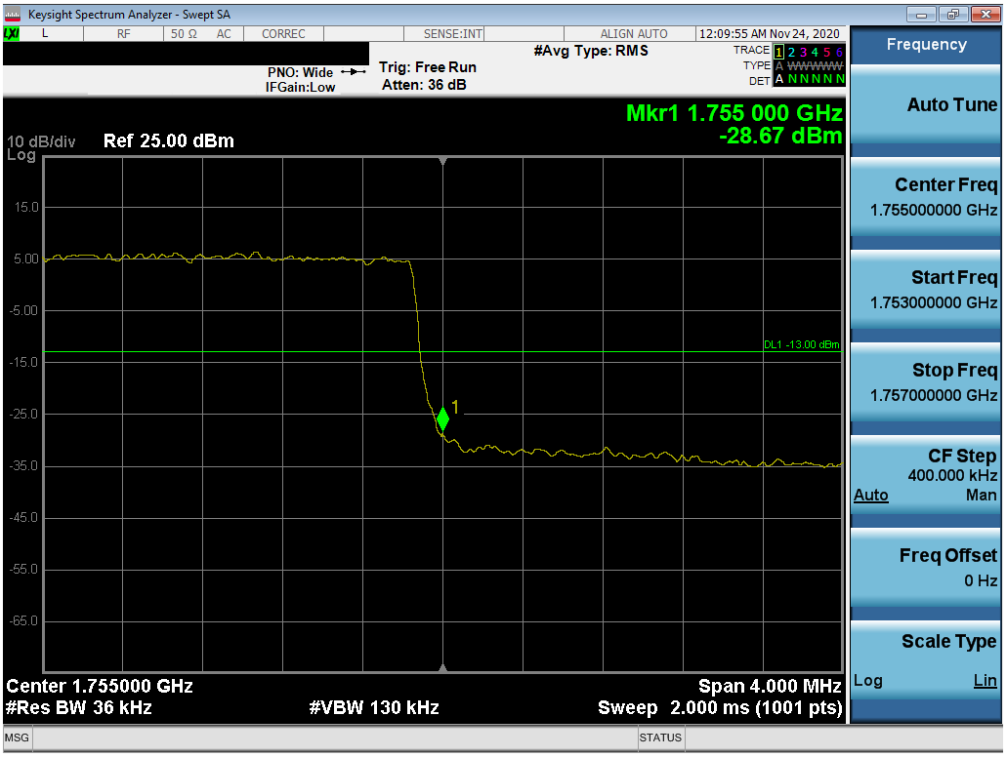
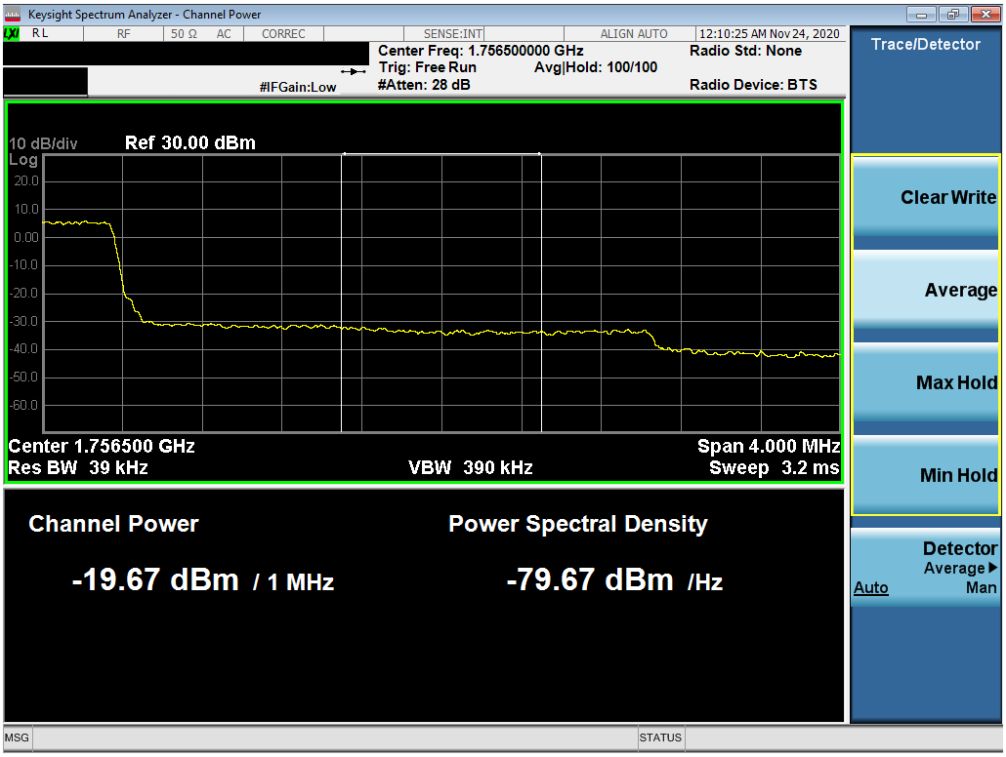


Plot 7-115. Upper Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB Configuration)



Plot 7-116. Upper Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB Configuration)

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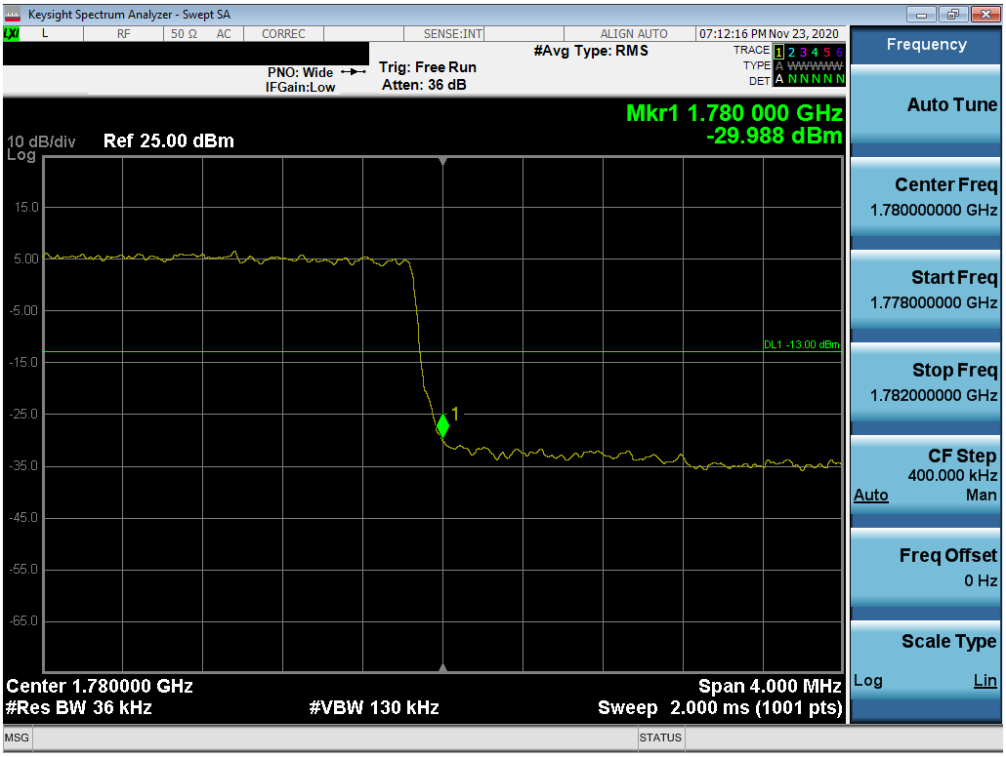
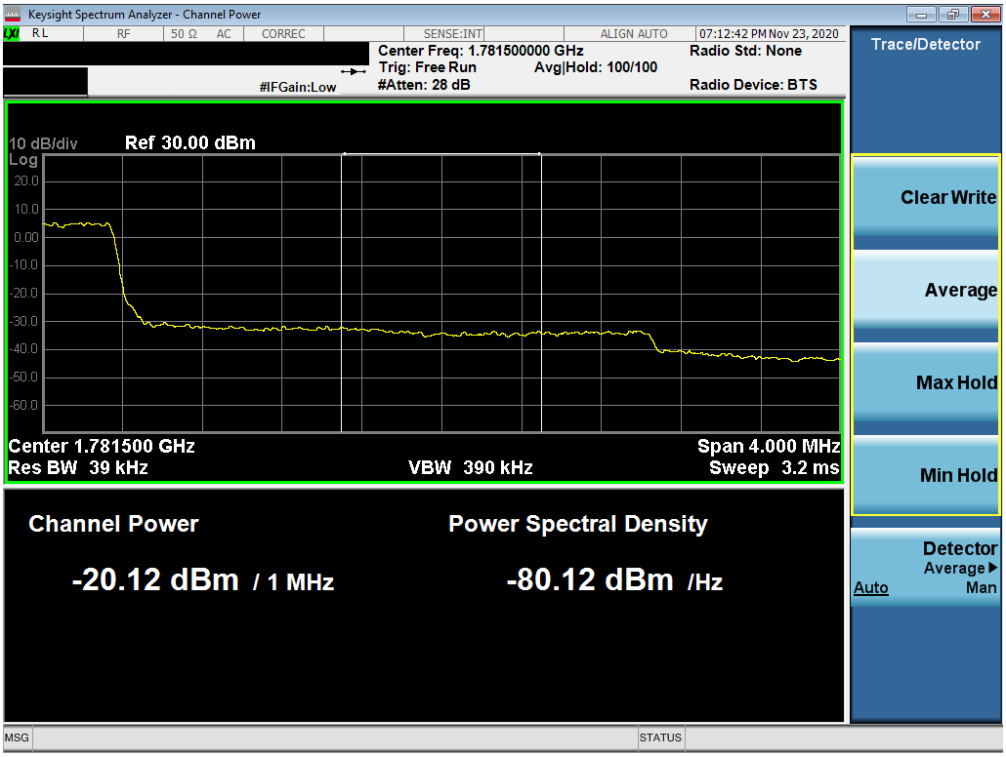


Plot 7-117. Upper Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB Configuration)



Plot 7-118. Upper Extended Band Edge Plot (LTE Band 66 - 3MHz QPSK – Full RB Configuration)

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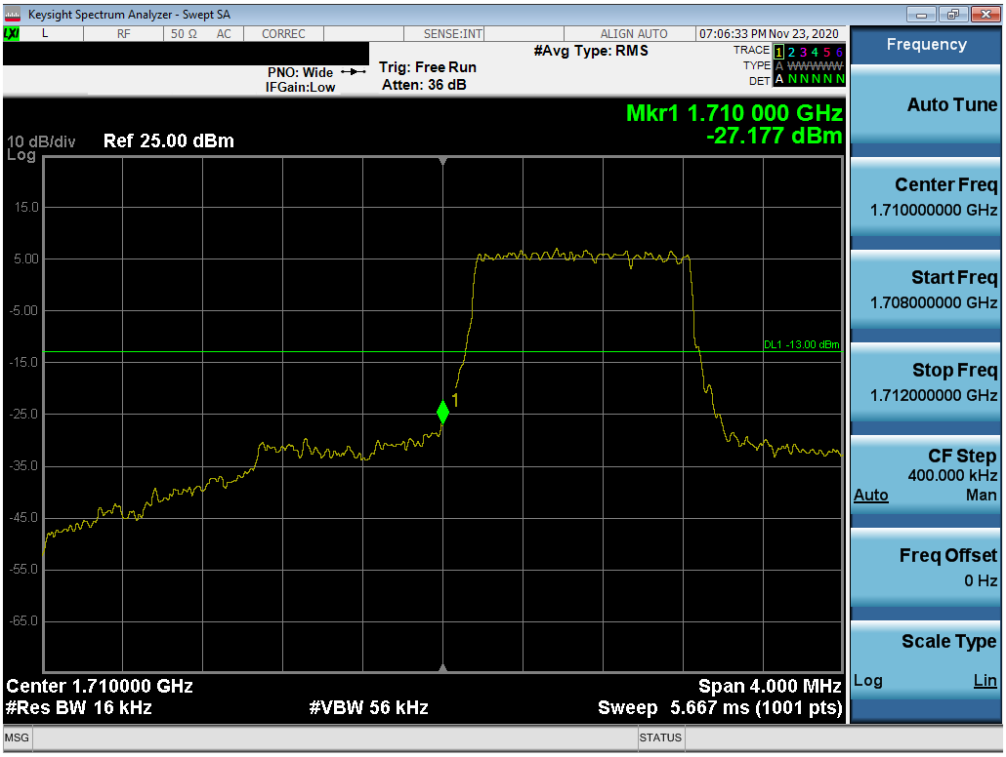
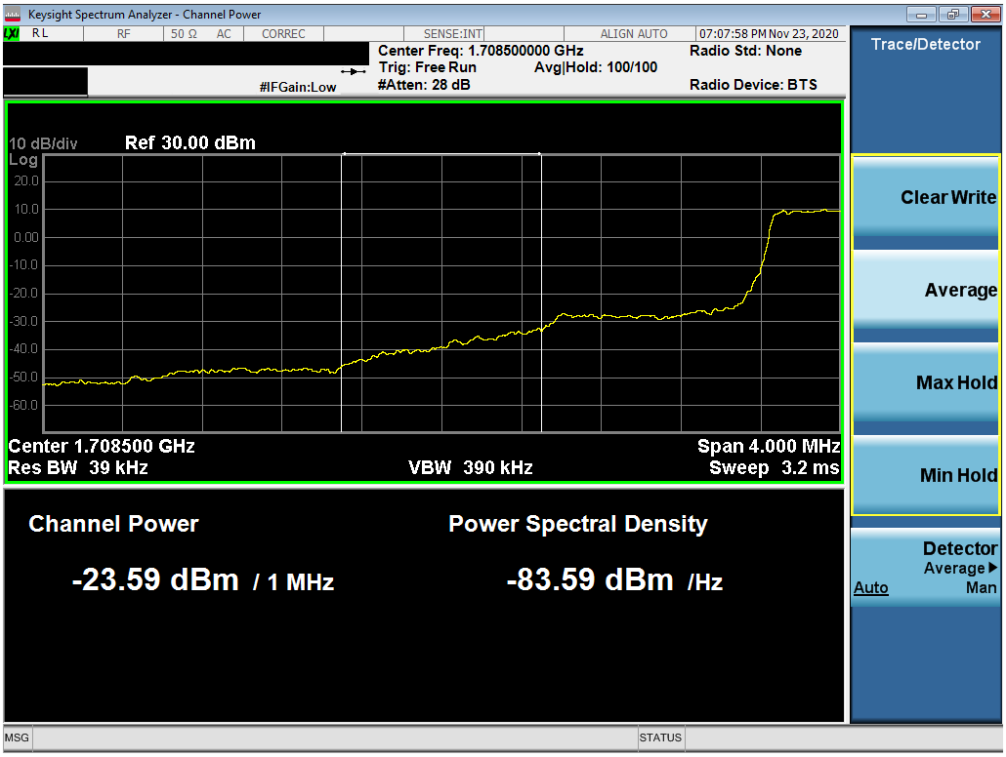


Plot 7-119. Lower Band Edge Plot (LTE Band 66/4 – 1.4MHz QPSK – Full RB Configuration)



Plot 7-120. Lower Extended Band Edge Plot (LTE Band 66/4 – 1.4MHz QPSK – Full RB Configuration)

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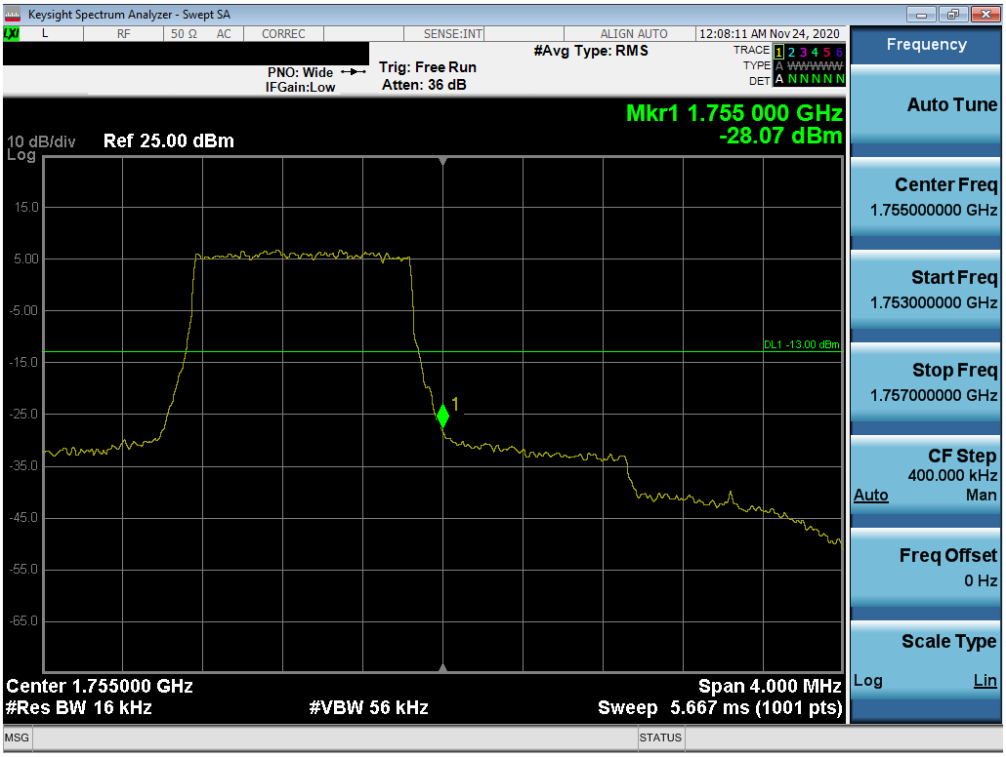
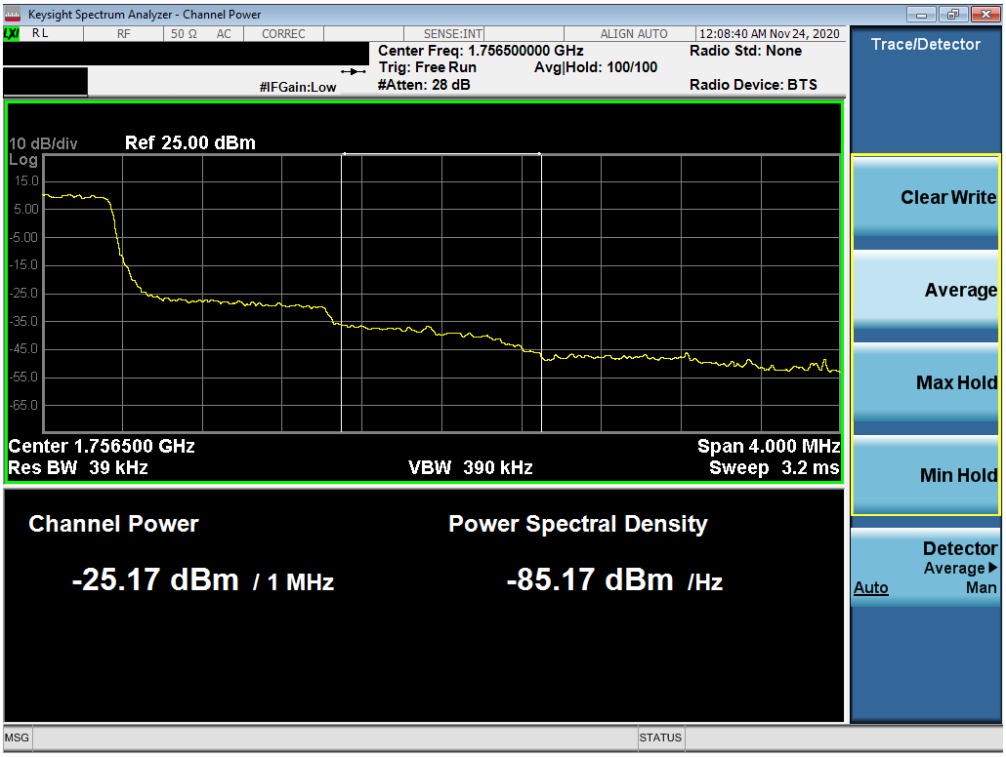


Plot 7-121. Upper Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB Configuration)



Plot 7-122. Upper Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB Configuration)

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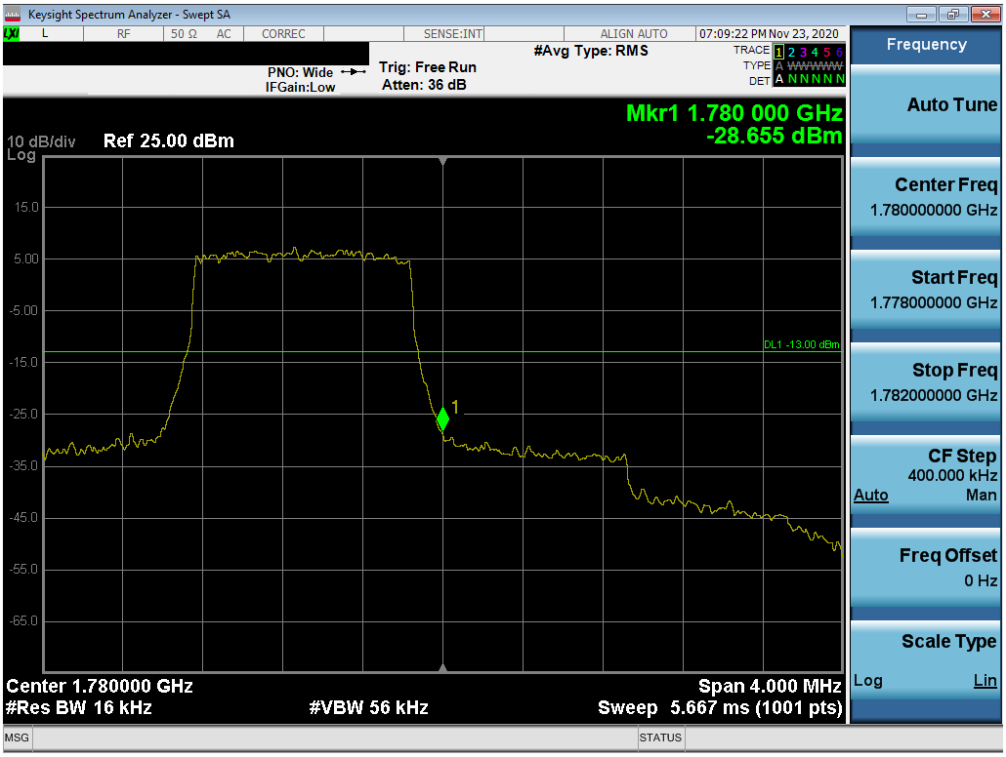
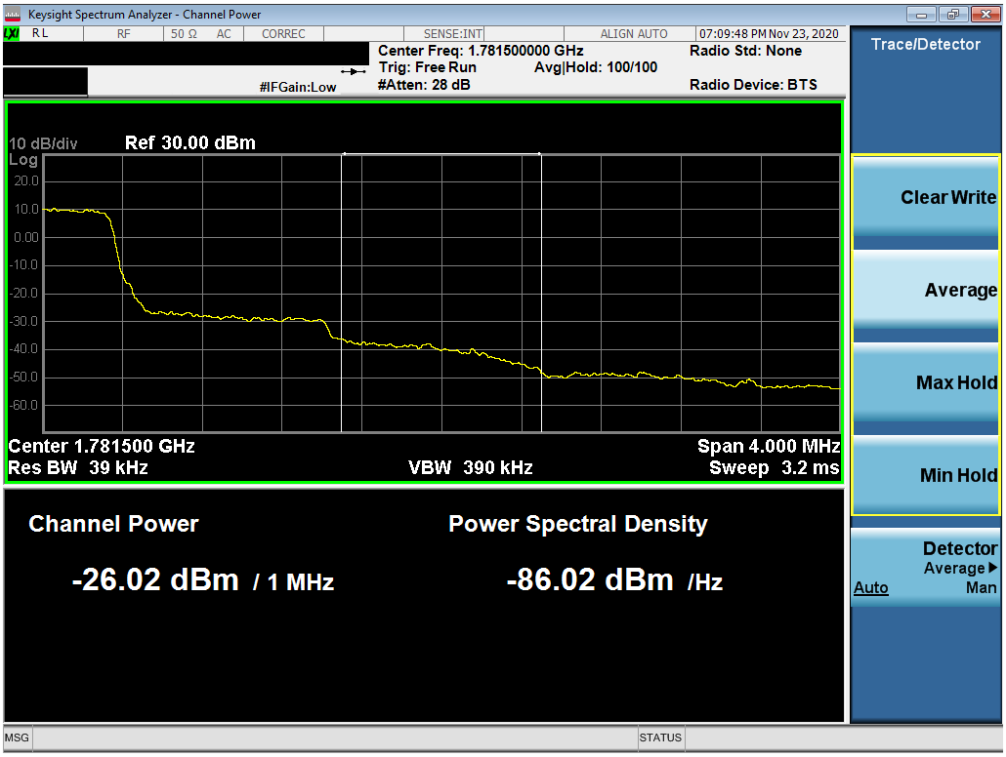


Plot 7-123. Upper Band Edge Plot (LTE Band 66 – 1.4MHz QPSK – Full RB Configuration)



Plot 7-124. Upper Extended Band Edge Plot (LTE Band 66 – 1.4MHz QPSK – Full RB Configuration)

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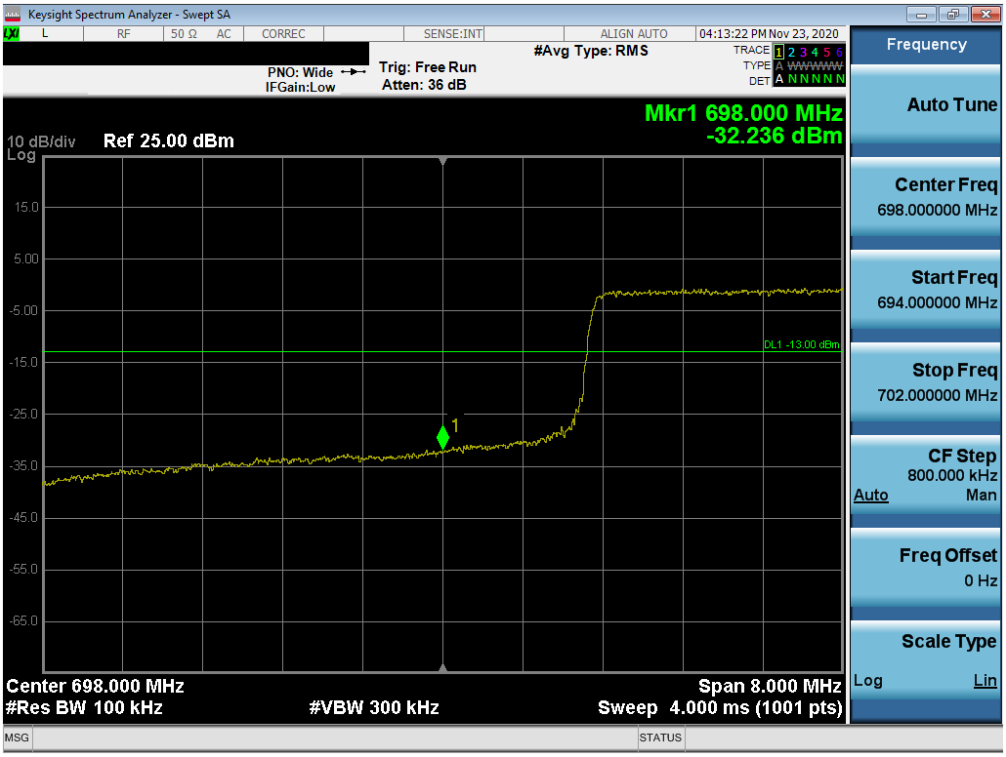
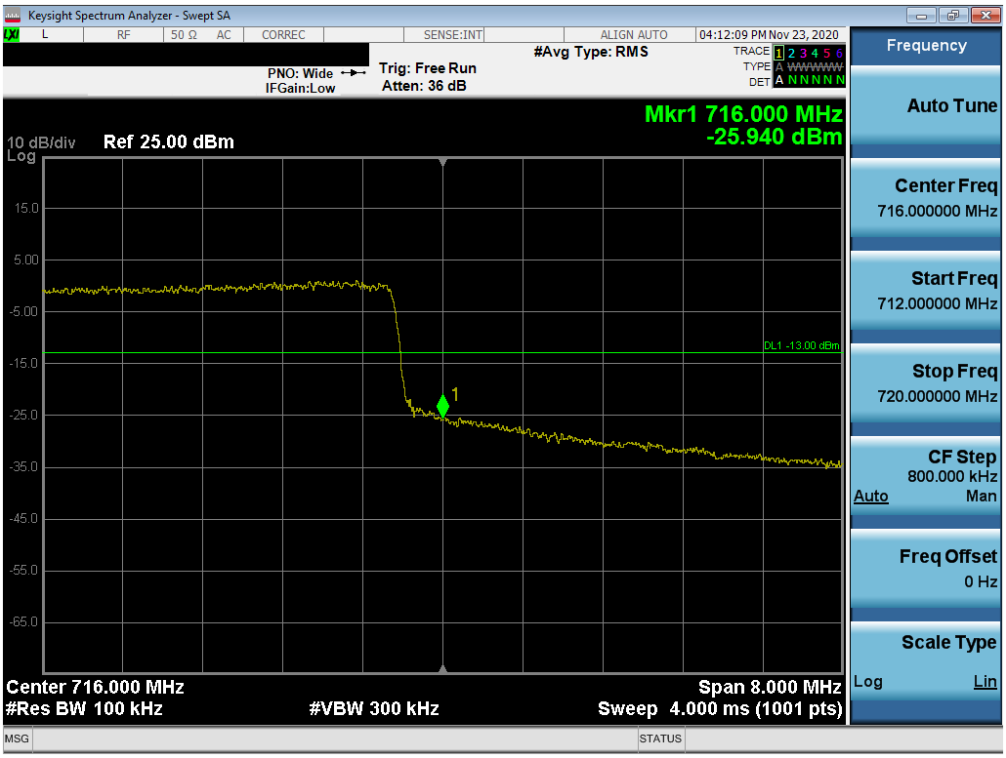
LTE Band 12



Plot 7-125. Lower Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB Configuration)



Plot 7-126. Upper Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB Configuration)

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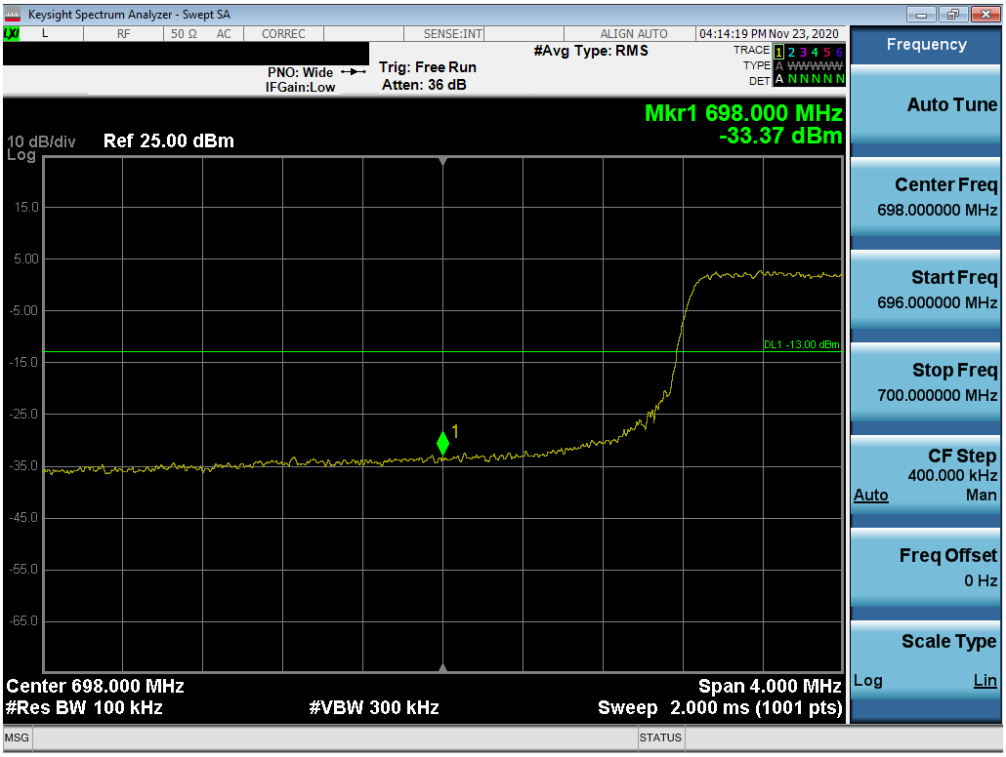
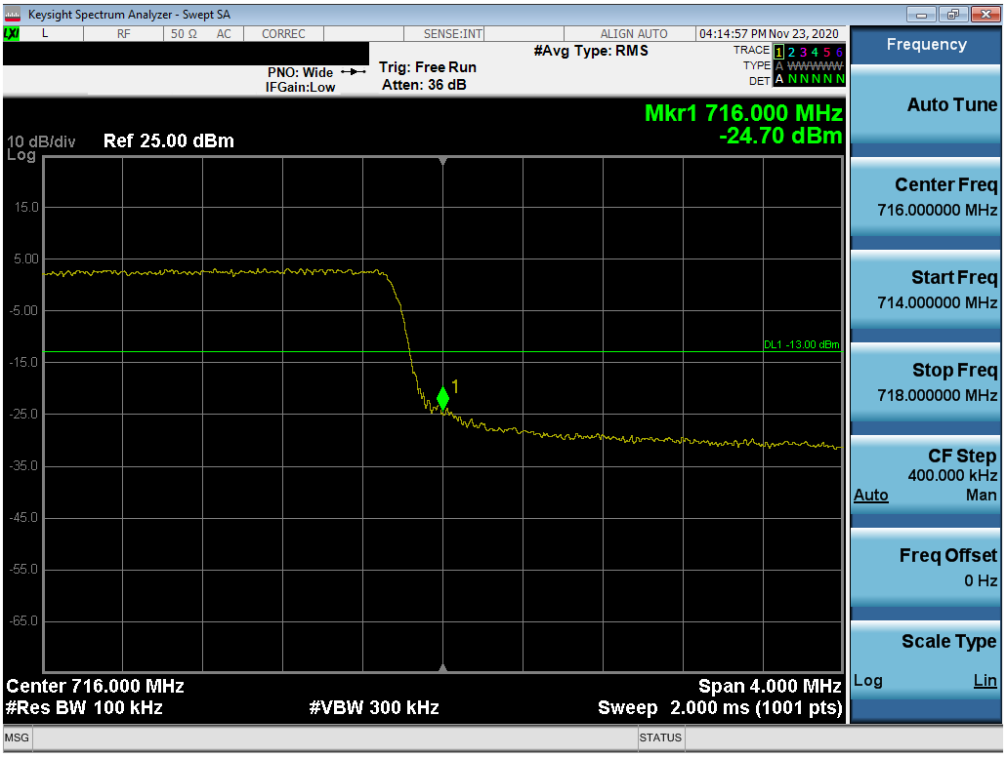


Plot 7-127. Lower Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB Configuration)



Plot 7-128. Upper Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB Configuration)

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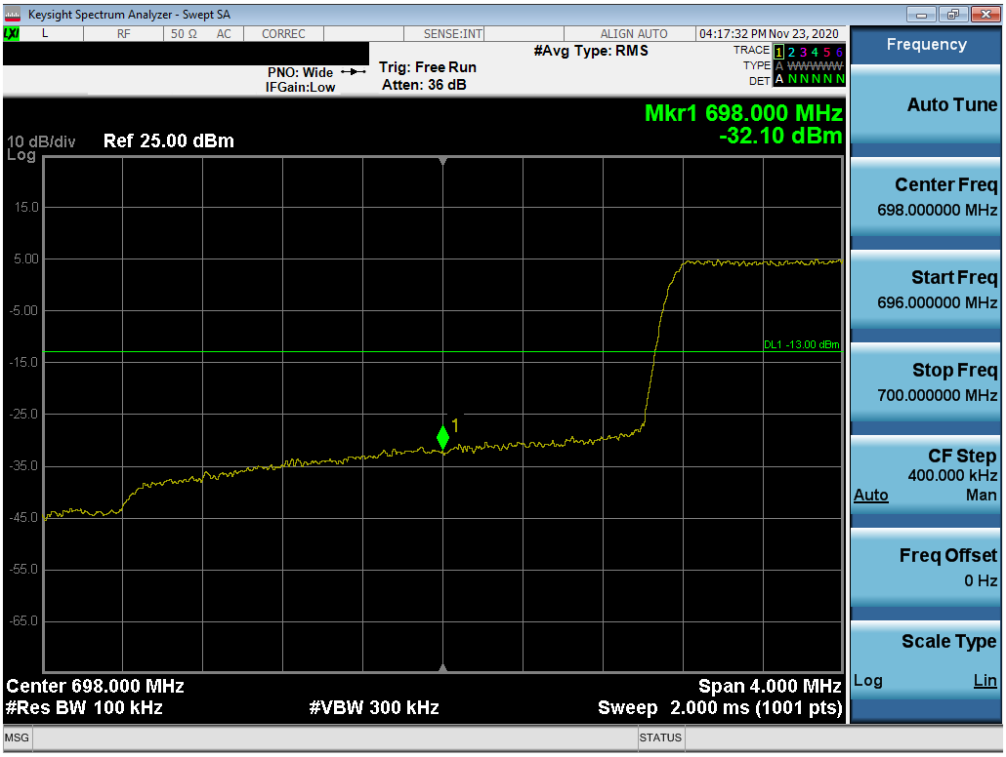
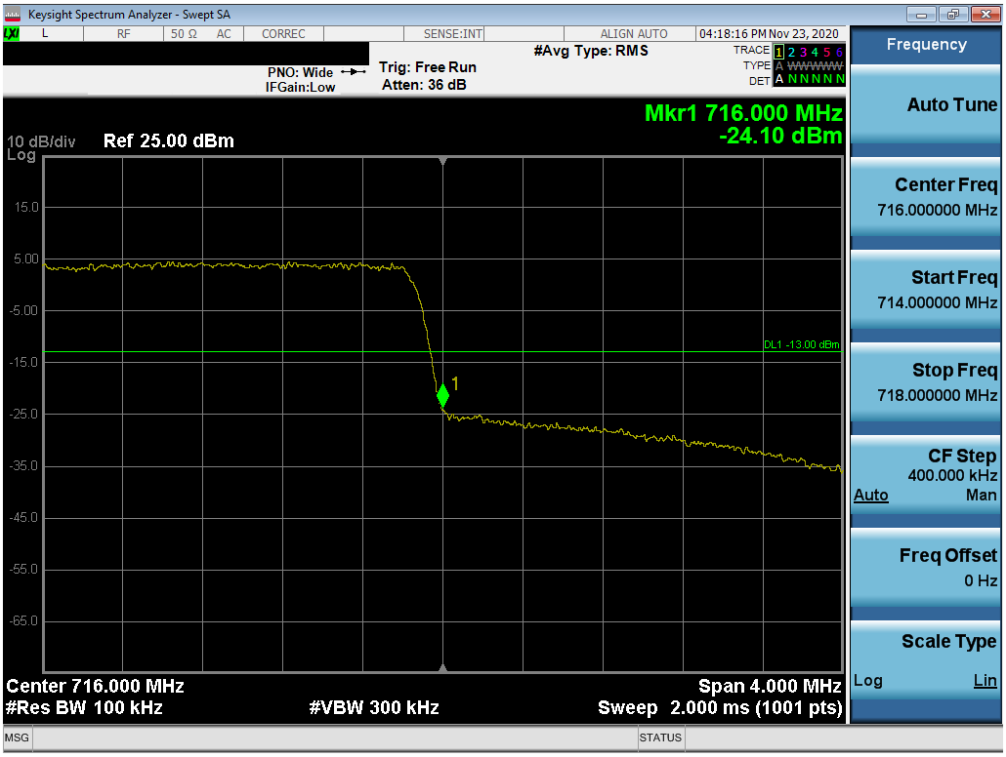


Plot 7-129. Lower Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB Configuration)



Plot 7-130. Upper Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB Configuration)

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