PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com

MEASUREMENT REPORT
LTE

Applicant Name:
LG Electronics USA, Inc.
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
5/21 - 6/7/2019
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1905210082-03.ZNF

FCC ID:	**ZNFX320AA**
APPLICANT:	**LG Electronics USA, Inc.**

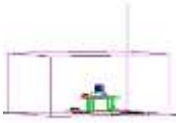
Application Type:	Certification
Model:	LM-X320AA
Additional Model(s):	LMX320AA, X320AA
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s):	22, 24, & 27
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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.

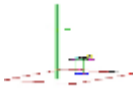
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking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

Randy Ortanez
President

TABLE OF CONTENTS



MEASUREMENT REPORT
FCC Part 22, 24, & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 12	27	699.7 - 715.3	0.043	16.31	1M10G7D	QPSK
LTE Band 12	27	699.7 - 715.3	0.033	15.13	1M11W7D	16QAM
LTE Band 12	27	700.5 - 714.5	0.042	16.28	2M71G7D	QPSK
LTE Band 12	27	700.5 - 714.5	0.033	15.15	2M71W7D	16QAM
LTE Band 12	27	701.5 - 713.5	0.042	16.28	4M58G7D	QPSK
LTE Band 12	27	701.5 - 713.5	0.032	15.00	4M52W7D	16QAM
LTE Band 12	27	704 - 711	0.047	16.74	9M01G7D	QPSK
LTE Band 12	27	704 - 711	0.036	15.53	9M04W7D	16QAM
LTE Band 5	22H	824.7 - 848.3	0.070	18.47	1M10G7D	QPSK
LTE Band 5	22H	824.7 - 848.3	0.043	16.34	1M11W7D	16QAM
LTE Band 5	22H	825.5 - 847.5	0.070	18.44	2M71G7D	QPSK
LTE Band 5	22H	825.5 - 847.5	0.043	16.30	2M71W7D	16QAM
LTE Band 5	22H	826.5 - 846.5	0.065	18.16	4M54G7D	QPSK
LTE Band 5	22H	826.5 - 846.5	0.038	15.85	4M52W7D	16QAM
LTE Band 5	22H	829 - 844	0.070	18.48	9M00G7D	QPSK
LTE Band 5	22H	829 - 844	0.052	17.19	9M00W7D	16QAM

EUT Overview (<1 GHz)

Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 4	27	1710.7 - 1754.3	0.212	23.26	1M08G7D	QPSK
LTE Band 4	27	1710.7 - 1754.3	0.197	22.93	1M08W7D	16QAM
LTE Band 4	27	1711.5 - 1753.5	0.207	23.15	2M71G7D	QPSK
LTE Band 4	27	1711.5 - 1753.5	0.186	22.69	2M71W7D	16QAM
LTE Band 4	27	1712.5 - 1752.5	0.218	23.37	4M55G7D	QPSK
LTE Band 4	27	1712.5 - 1752.5	0.164	22.14	4M55W7D	16QAM
LTE Band 4	27	1715 - 1750	0.219	23.39	9M02G7D	QPSK
LTE Band 4	27	1715 - 1750	0.194	22.87	9M04W7D	16QAM
LTE Band 4	27	1717.5 - 1747.5	0.216	23.34	13M5G7D	QPSK
LTE Band 4	27	1717.5 - 1747.5	0.171	22.32	13M6W7D	16QAM
LTE Band 4	27	1720 - 1745	0.214	23.30	18M0G7D	QPSK
LTE Band 4	27	1720 - 1745	0.156	21.93	18M0W7D	16QAM
LTE Band 2	24E	1850.7 - 1909.3	0.269	24.29	1M11G7D	QPSK
LTE Band 2	24E	1850.7 - 1909.3	0.215	23.32	1M10W7D	16QAM
LTE Band 2	24E	1851.5 - 1908.5	0.263	24.20	2M72G7D	QPSK
LTE Band 2	24E	1851.5 - 1908.5	0.226	23.54	2M71W7D	16QAM
LTE Band 2	24E	1852.5 - 1907.5	0.269	24.30	4M54G7D	QPSK
LTE Band 2	24E	1852.5 - 1907.5	0.222	23.45	4M55W7D	16QAM
LTE Band 2	24E	1855 - 1905	0.270	24.31	8M98G7D	QPSK
LTE Band 2	24E	1855 - 1905	0.214	23.29	9M02W7D	16QAM
LTE Band 2	24E	1857.5 - 1902.5	0.264	24.22	13M5G7D	QPSK
LTE Band 2	24E	1857.5 - 1902.5	0.198	22.97	13M5W7D	16QAM
LTE Band 2	24E	1860 - 1900	0.270	24.31	17M9G7D	QPSK
LTE Band 2	24E	1860 - 1900	0.192	22.83	17M9W7D	16QAM

EUT Overview (>1 GHz)

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 17025-2005 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.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFX320AA**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

Test Device Serial No.: 13365, 13423

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, LE), NFC

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.

3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

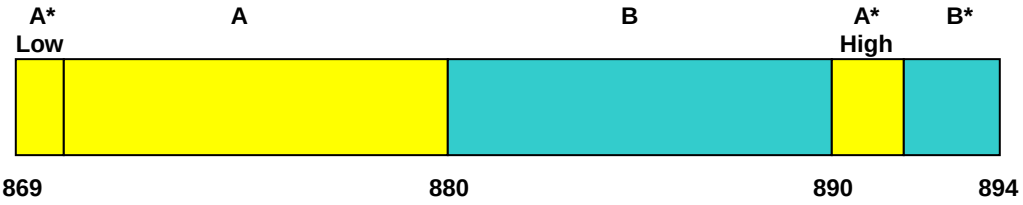
The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission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

3.2 Block A Frequency Range

698-746 MHz band. The following frequencies are available for licensing pursuant to this part in the 698-746 MHz band: (1) Three paired channel blocks of 12 megahertz each are available for assignment as follows:

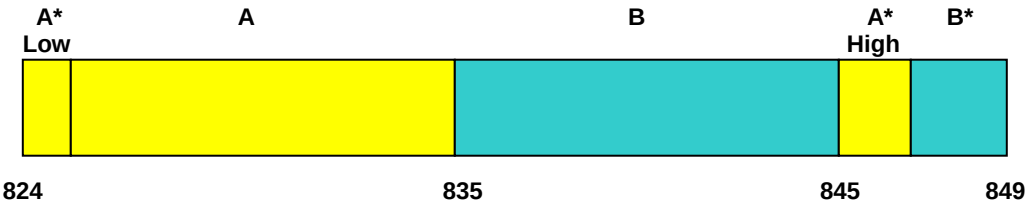
Block A: 698-704 MHz and 728-734 MHz;
Block B: 704-710 MHz and 734-740 MHz; and
Block C: 710-716 MHz and 740-746 MHz.

3.3 Cellular - Base Frequency Blocks



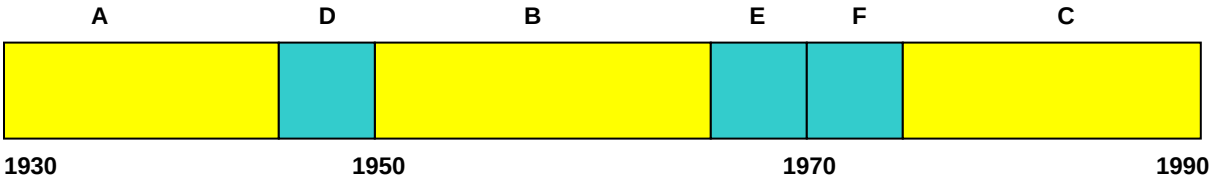
BLOCK 1: 869 – 880 MHz (A* Low + A)
BLOCK 2: 880 – 890 MHz (B)
BLOCK 3: 890 – 891.5 MHz (A* High)
BLOCK 4: 891.5 – 894 MHz (B*)

3.4 Cellular - Mobile Frequency Blocks



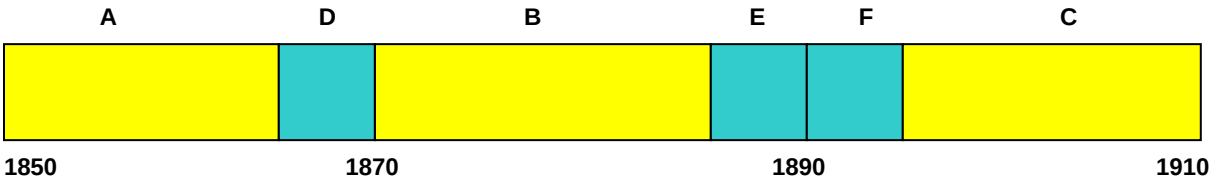
BLOCK 1: 824 – 835 MHz (A* Low + A)
BLOCK 2: 835 – 845 MHz (B)
BLOCK 3: 845 – 846.5 MHz (A* High)
BLOCK 4: 846.5 – 849 MHz (B*)

3.5 PCS - Base Frequency Blocks



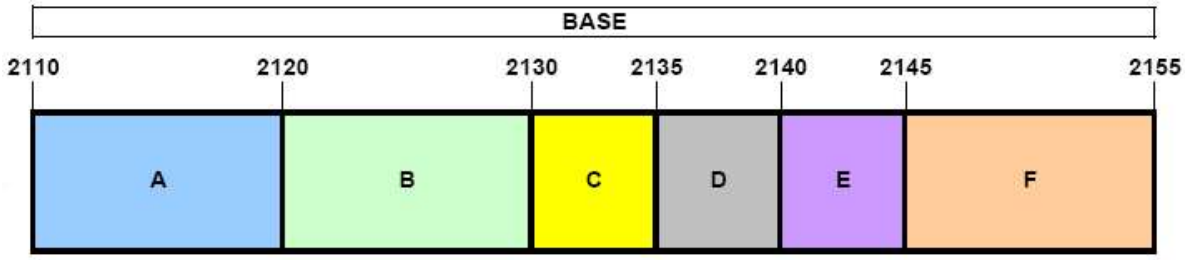
BLOCK 1: 1930 – 1945 MHz (A)
BLOCK 2: 1945 – 1950 MHz (D)
BLOCK 3: 1950 – 1965 MHz (B)
BLOCK 4: 1965 – 1970 MHz (E)
BLOCK 5: 1970 – 1975 MHz (F)
BLOCK 6: 1975 – 1990 MHz (C)

3.6 PCS - Mobile Frequency Blocks



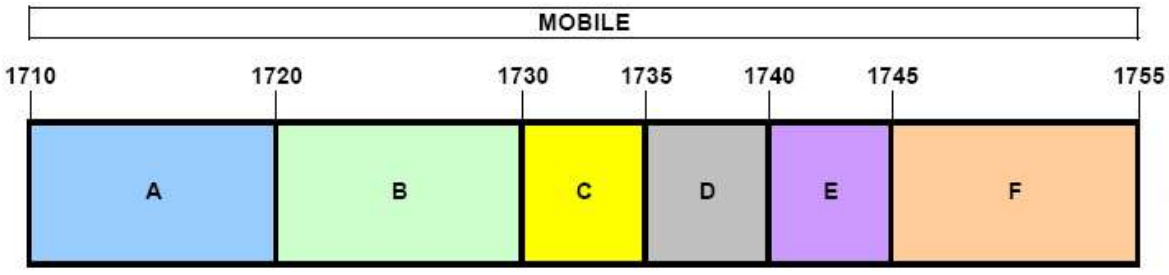
BLOCK 1: 1850 – 1865 MHz (A)
BLOCK 2: 1865 – 1870 MHz (D)
BLOCK 3: 1870 – 1885 MHz (B)
BLOCK 4: 1885 – 1890 MHz (E)
BLOCK 5: 1890 – 1895 MHz (F)
BLOCK 6: 1895 – 1910 MHz (C)

3.7 AWS - Base Frequency Blocks



BLOCK 1: 2110 – 2120 MHz (A)
BLOCK 2: 2120 – 2130 MHz (B)
BLOCK 3: 2130 – 2135 MHz (C)
BLOCK 4: 2135 – 2140 MHz (D)
BLOCK 5: 2140 – 2145 MHz (E)
BLOCK 6: 2145 – 2155 MHz (F)

3.8 AWS - Mobile Frequency Blocks



BLOCK 1: 1710 – 1720 MHz (A)
BLOCK 2: 1720 – 1730 MHz (B)
BLOCK 3: 1730 – 1735 MHz (C)
BLOCK 4: 1735 – 1740 MHz (D)
BLOCK 5: 1740 – 1745 MHz (E)
BLOCK 6: 1745 – 1755 MHz (F)

3.9 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 turntable 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 $_{[dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10 $\log_{10}$(Power $_{[Watts]}$).

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.

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

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
-	LTx3	LIcensed Transmitter Cable Set	8/23/2018	Annual	8/23/2019	LTx3
Agilent	N9038A	MXE EMI Receiver	6/11/2018	Annual	6/11/2019	MY51210133
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2017	Biennial	10/10/2019	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	9/17/2018	Annual	9/17/2019	441119
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
Emco	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	00135427
Espec	ESX-2CA	Environmental Chamber	4/25/2019	Annual	4/25/2020	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	00128338
Huber + Suhner	Sucoflex 102A	40GHz Radiated Cable Set	8/23/2018	Annual	8/23/2019	251425001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			102060
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/9/2018	Annual	8/9/2019	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	6/25/2018	Annual	6/25/2019	102133
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 5-1. Test Equipment

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.

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).

7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics USA, Inc.

FCC ID: ZNFX320AA

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

Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(g) 27.53(h)	Out of Band Emissions	> 43 + 10 $\log_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions			Section 7.3, 7.4
24.232(d)	Peak-Average Ratio	< 13 dB			Section 7.5
2.1046	Transmitter Conducted Output Power	N/A			See RF Exposure Report
2.1055 22.355 24.235 27.54	Frequency Stability	< 2.5 ppm (Part 22) and fundamental emissions stay within authorized frequency block (Part 24, 27)			Section 7.8

Table 7-1. Summary of Conducted Test Results

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.6
27.50(c)(10)	Effective Radiated Power / Equivalent Isotropic Radiated Power (Band 12)	< 3 Watts max. ERP			Section 7.6
24.232(c)	Equivalent Isotropic Radiated Power (Band 2)	< 2 Watts max. EIRP			Section 7.6
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts max. EIRP			Section 7.6
2.1053 22.917(a) 24.238(a) 27.53(g) 27.53(h)	Undesirable Emissions (Band 12/5/4/2)	> 43 + 10 $\log_{10}$ (P[Watts]) for all out-of-band emissions			Section 7.7

Table 7-2. Summary of Radiated 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 (Sections 7.2, 7.3, 7.4, 7.5) were all 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 "LTE Automation," Version 4.8.
5) For operation <1GHz, the EIRP limits in the table above are referenced to the specifications written in the relevant Radio Standards Specifications for Innovation, Science, and Economic Development Canada.

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

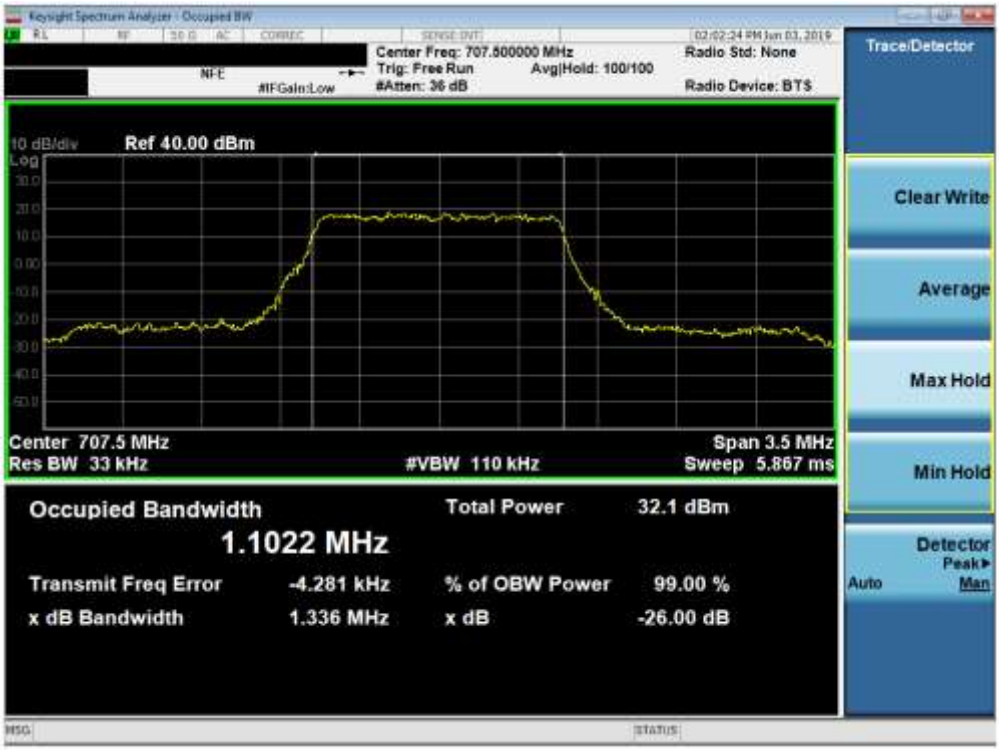
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

Band 12



Plot 7-1. Occupied Bandwidth Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-2. Occupied Bandwidth Plot (Band 12 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-3. Occupied Bandwidth Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-4. Occupied Bandwidth Plot (Band 12 - 3.0MHz 16-QAM - Full RB Configuration)

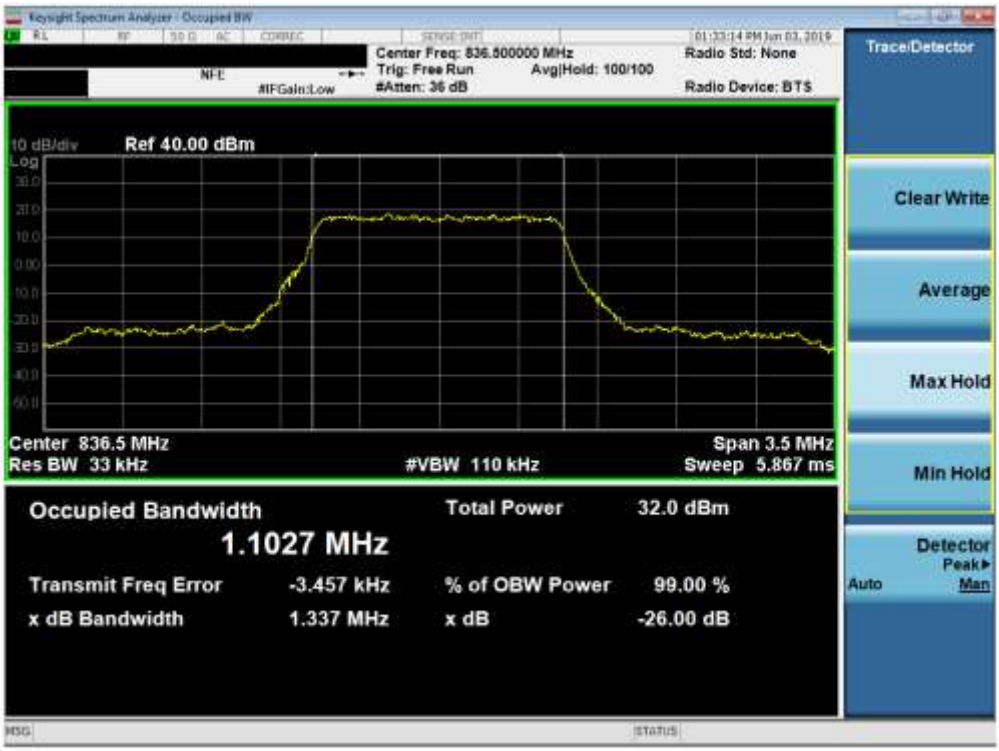
Plot 7-5. Occupied Bandwidth Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-6. Occupied Bandwidth Plot (Band 12 - 5.0MHz 16-QAM - Full RB Configuration)

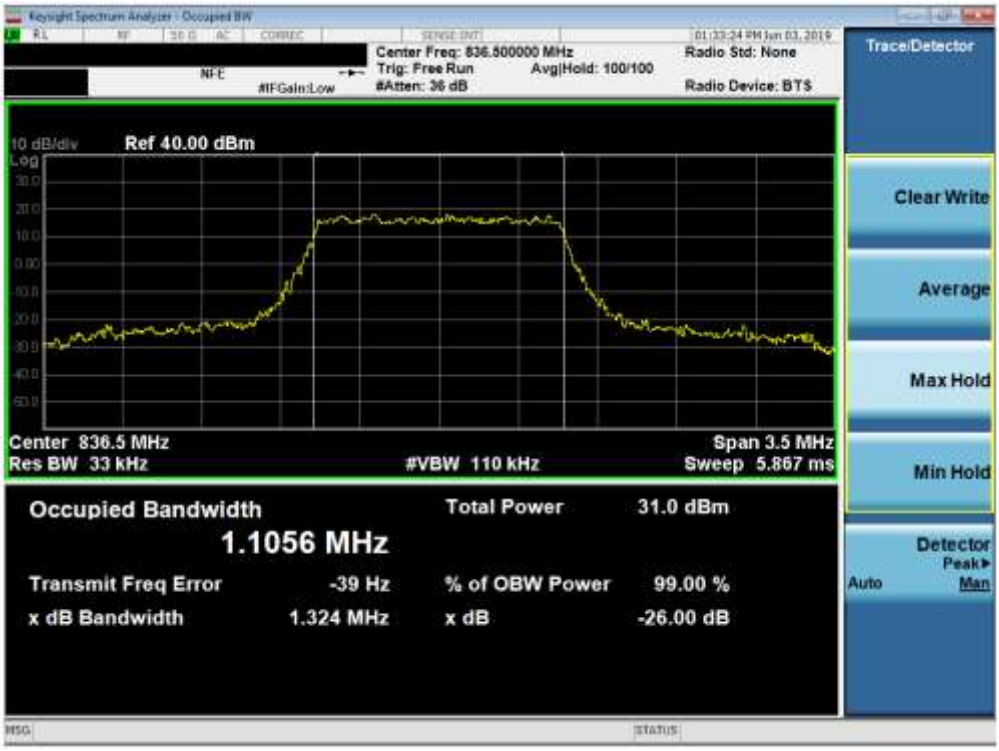
Plot 7-7. Occupied Bandwidth Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-8. Occupied Bandwidth Plot (Band 12 - 10.0MHz 16-QAM - Full RB Configuration)

Band 5



Plot 7-9. Occupied Bandwidth Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (Band 5 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-11. Occupied Bandwidth Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-12. Occupied Bandwidth Plot (Band 5 - 3.0MHz 16-QAM - Full RB Configuration)

Plot 7-13. Occupied Bandwidth Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)

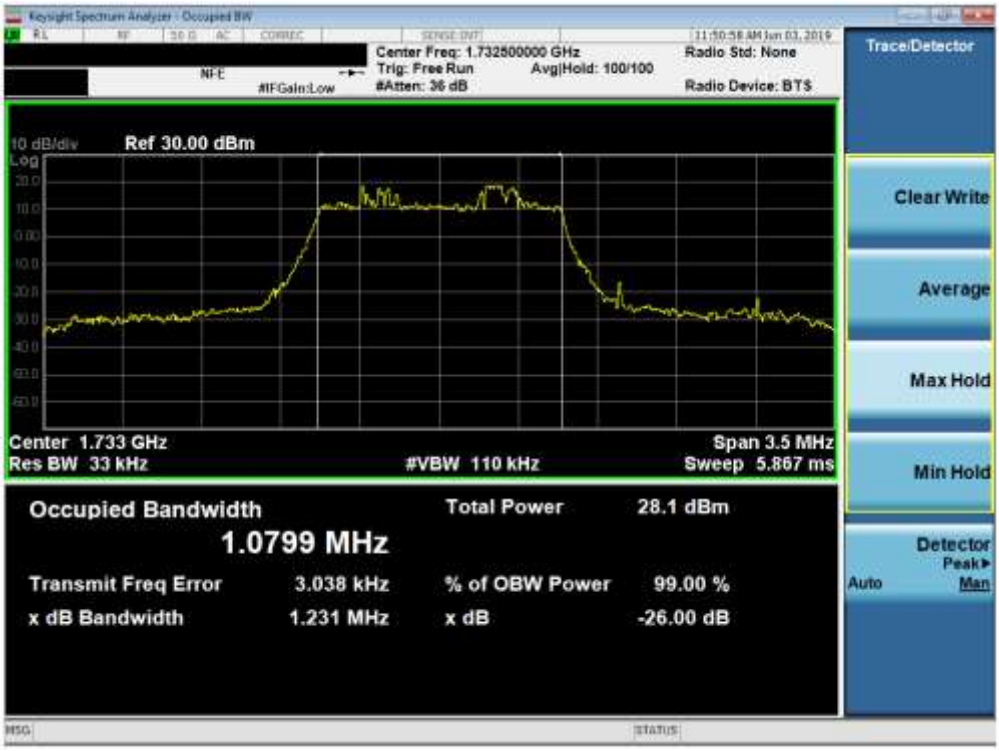
Plot 7-14. Occupied Bandwidth Plot (Band 5 - 5.0MHz 16-QAM - Full RB Configuration)

Plot 7-15. Occupied Bandwidth Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-16. Occupied Bandwidth Plot (Band 5 - 10.0MHz 16-QAM - Full RB Configuration)

Band 4

Plot 7-17. Occupied Bandwidth Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (Band 4 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-19. Occupied Bandwidth Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-20. Occupied Bandwidth Plot (Band 4 - 3.0MHz 16-QAM - Full RB Configuration)

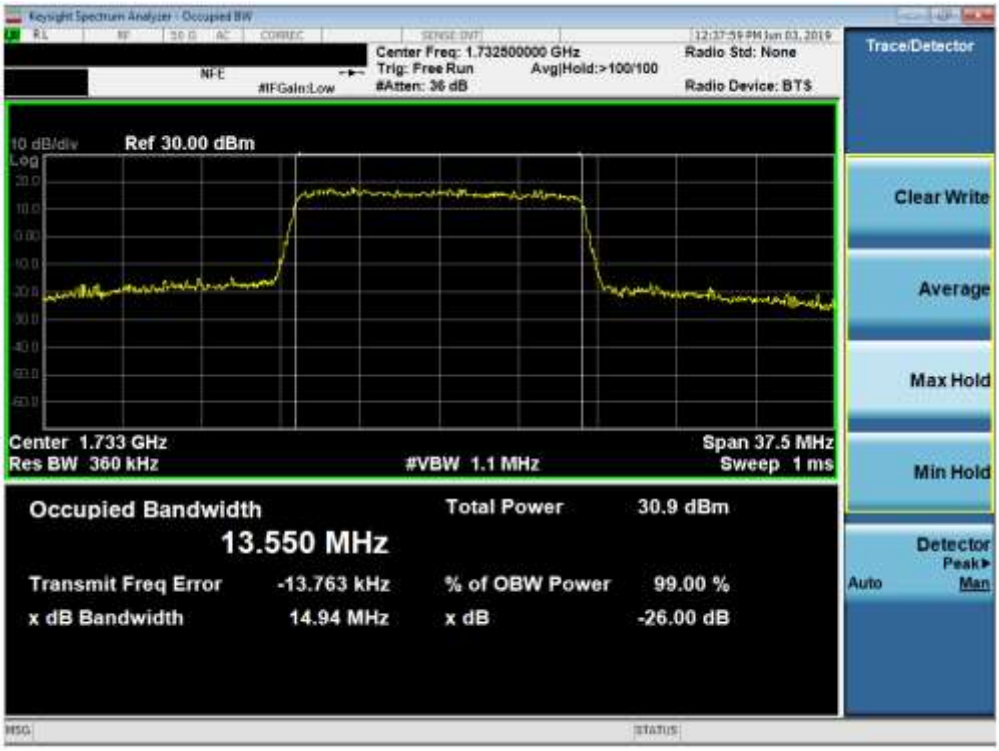
Plot 7-21. Occupied Bandwidth Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-22. Occupied Bandwidth Plot (Band 4 - 5.0MHz 16-QAM - Full RB Configuration)

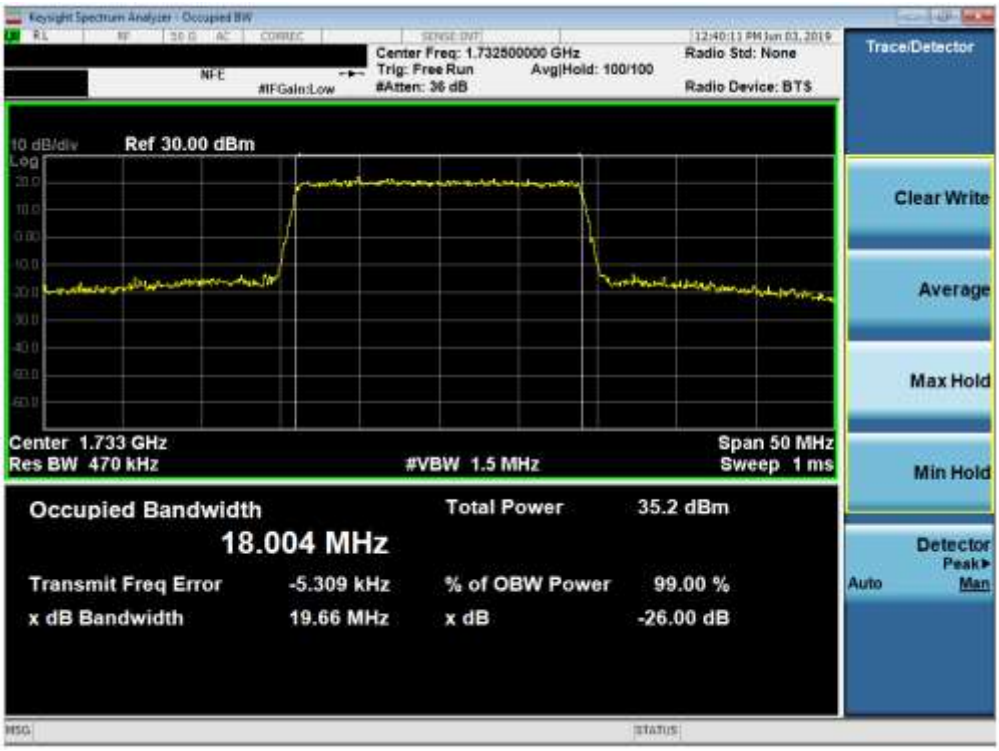
Plot 7-23. Occupied Bandwidth Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-24. Occupied Bandwidth Plot (Band 4 - 10.0MHz 16-QAM - Full RB Configuration)

Plot 7-25. Occupied Bandwidth Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (Band 4 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-27. Occupied Bandwidth Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-28. Occupied Bandwidth Plot (Band 4 - 20.0MHz 16-QAM - Full RB Configuration)

Band 2

Plot 7-29. Occupied Bandwidth Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-30. Occupied Bandwidth Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)

Plot 7-31. Occupied Bandwidth Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-32. Occupied Bandwidth Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)

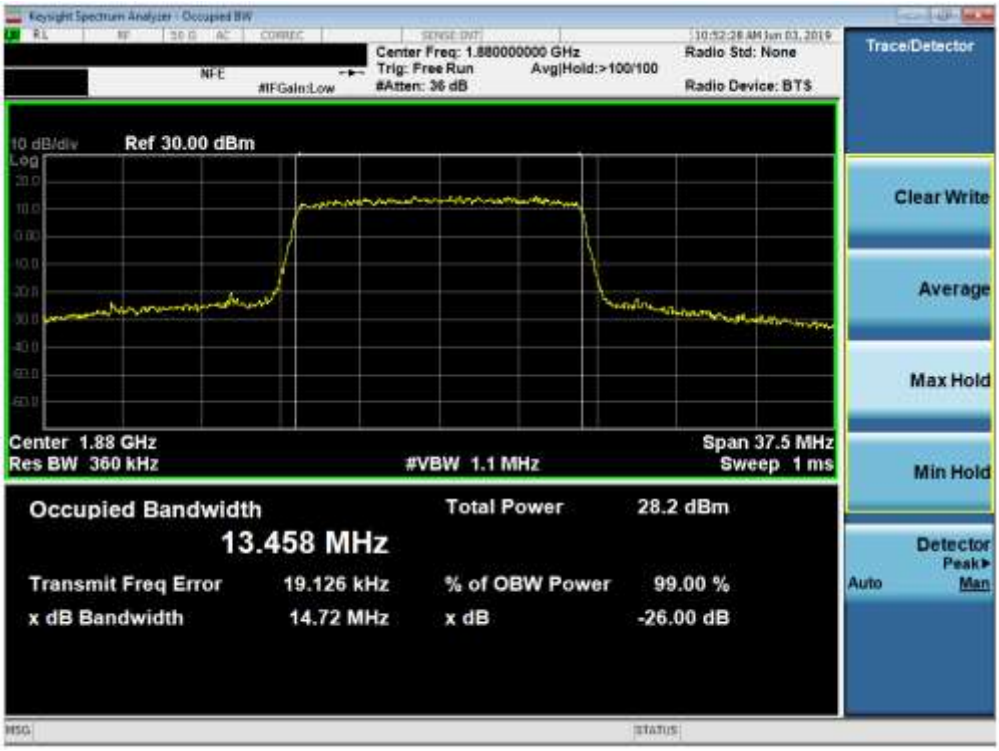
Plot 7-33. Occupied Bandwidth Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-34. Occupied Bandwidth Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)

Plot 7-35. Occupied Bandwidth Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

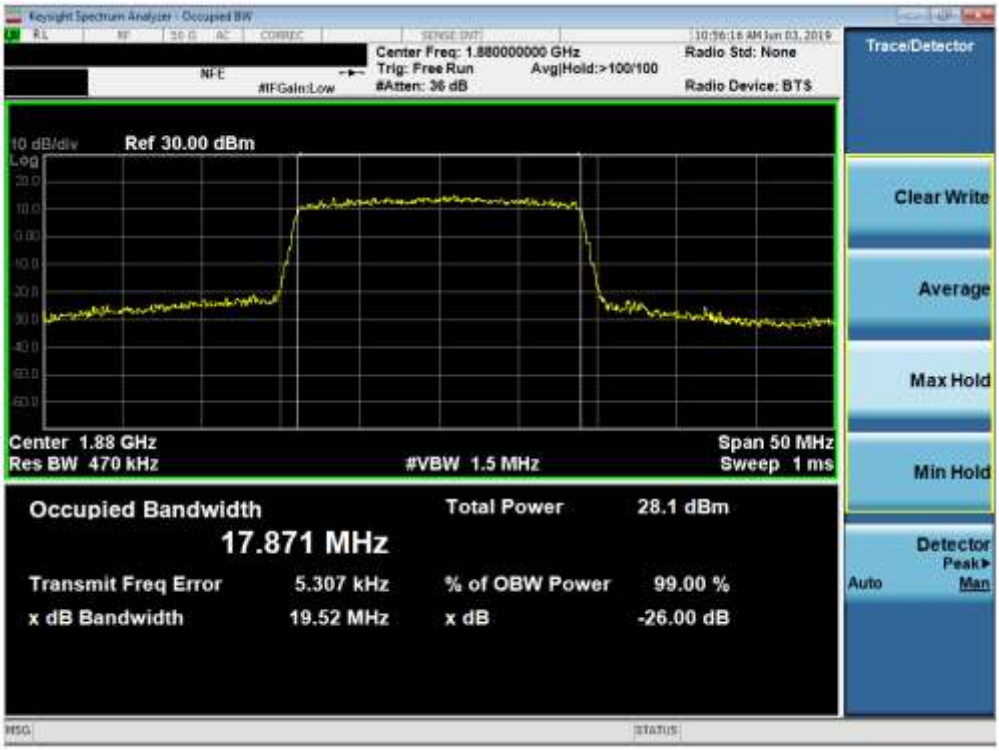
Plot 7-36. Occupied Bandwidth Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)

Plot 7-37. Occupied Bandwidth Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-38. Occupied Bandwidth Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)

Plot 7-39. Occupied Bandwidth Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-40. Occupied Bandwidth Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)

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 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 frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

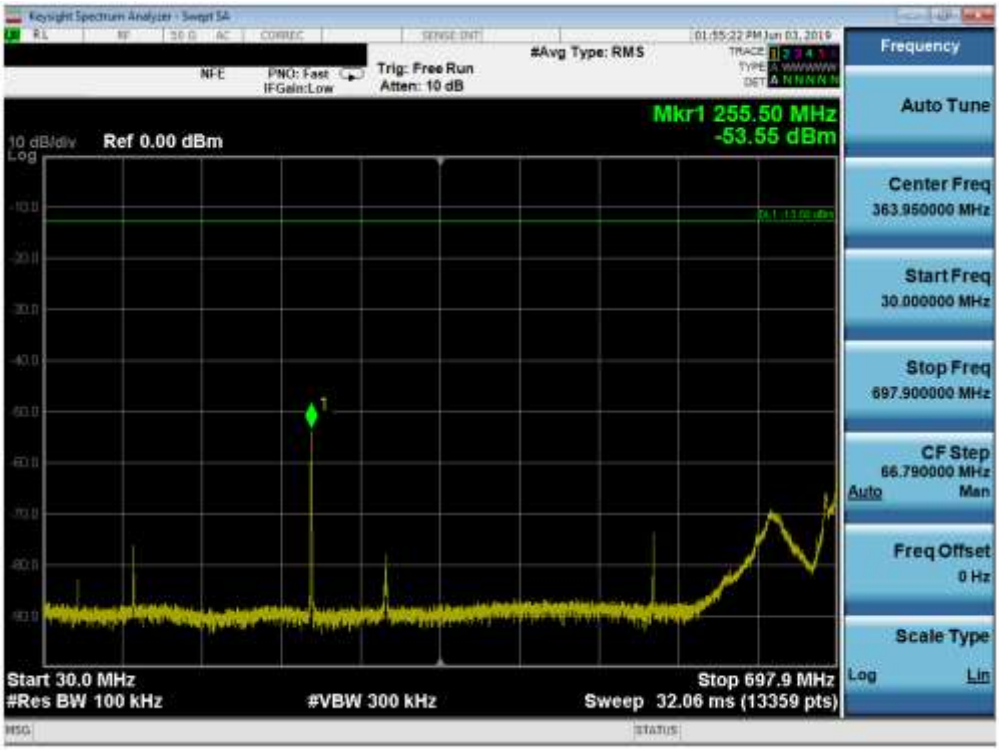
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-2. Test Instrument & Measurement Setup

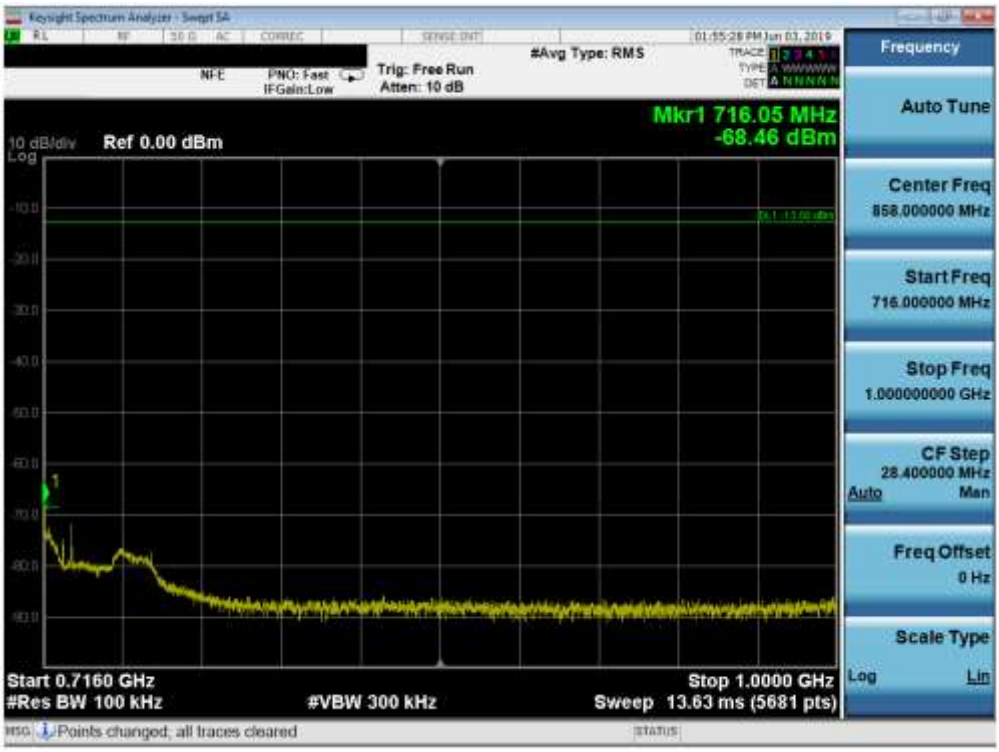
Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. 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.

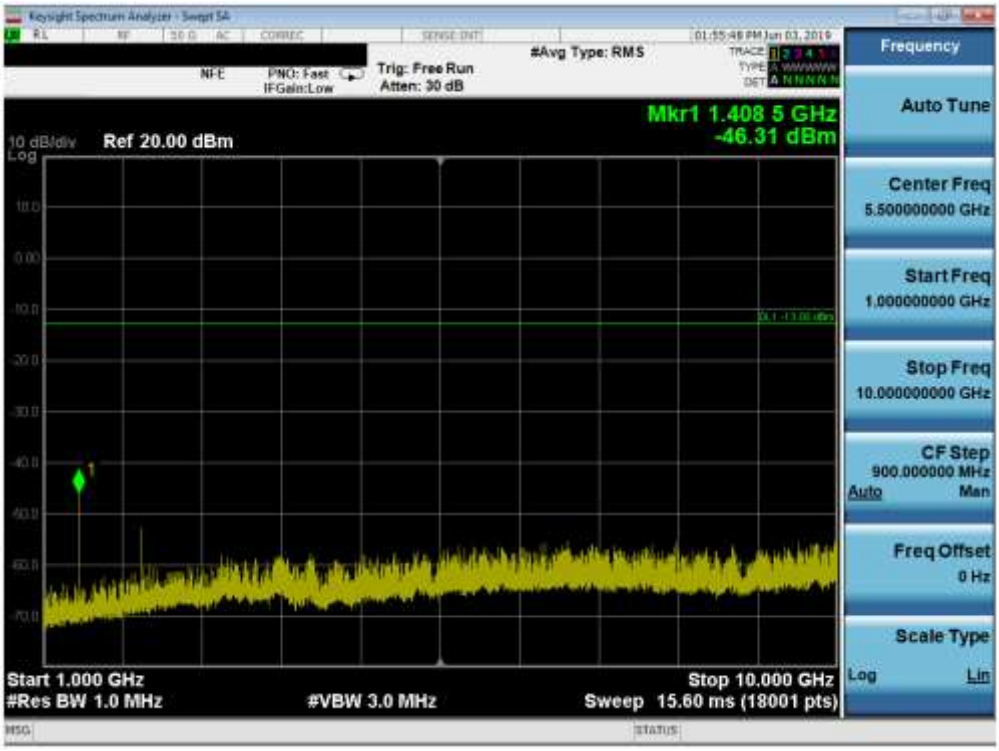
Band 12



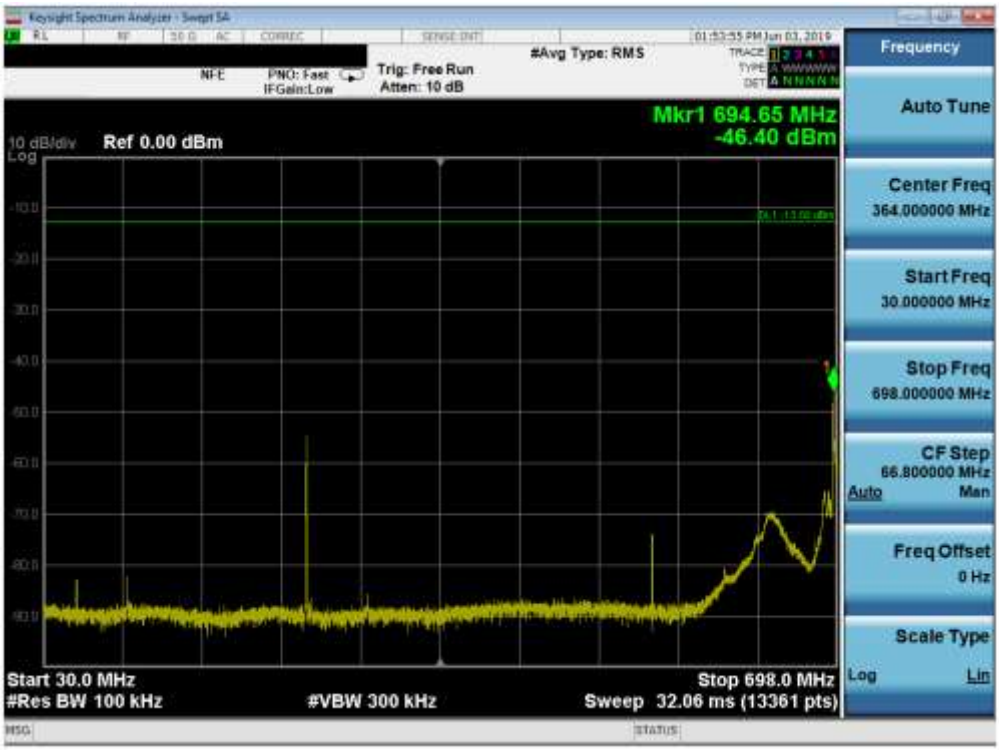
Plot 7-41. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



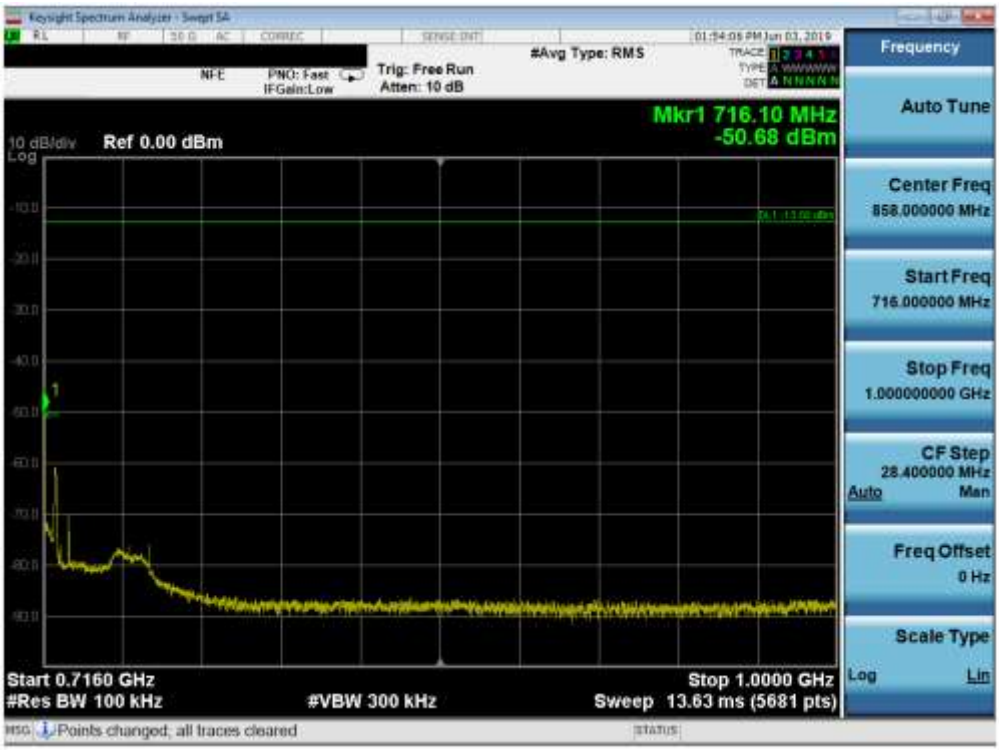
Plot 7-42. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



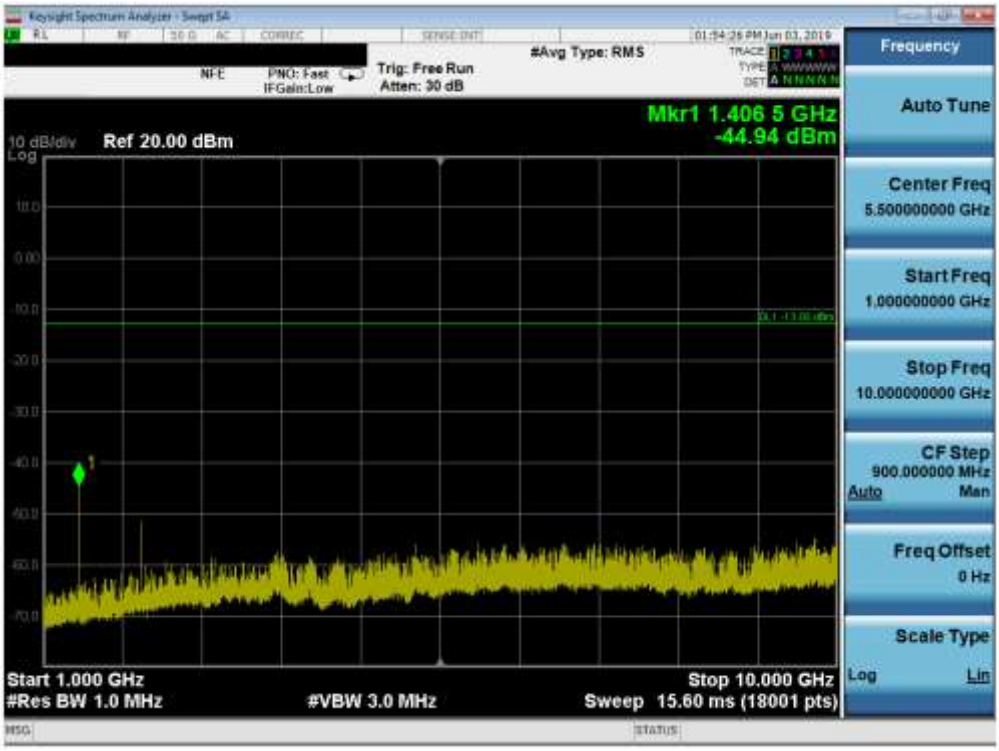
Plot 7-43. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



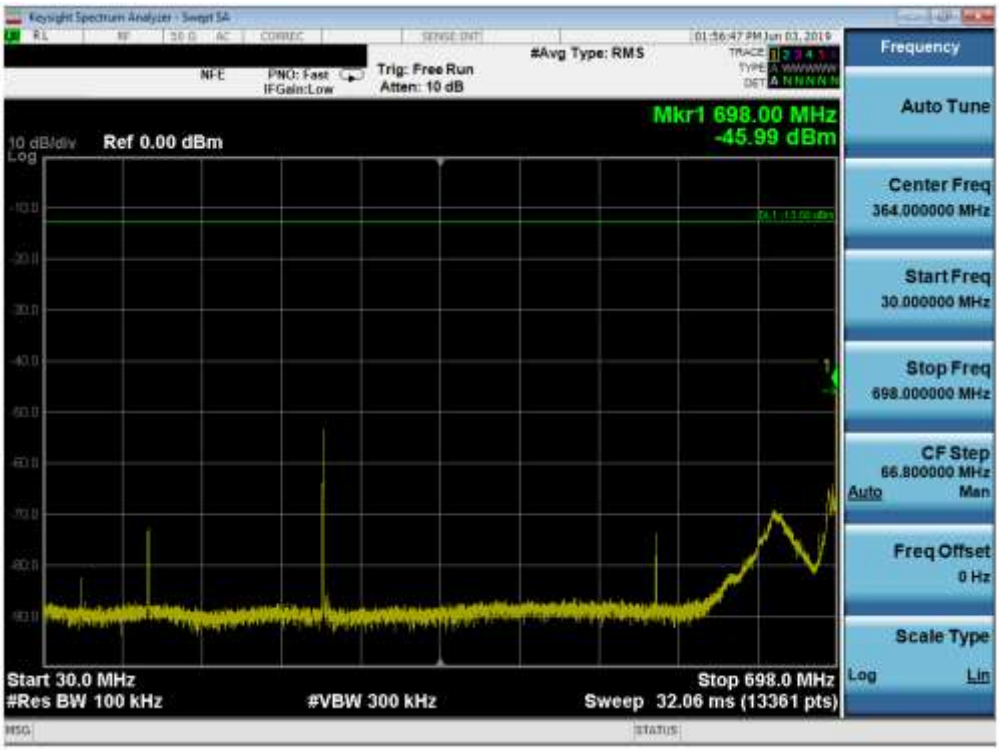
Plot 7-44. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



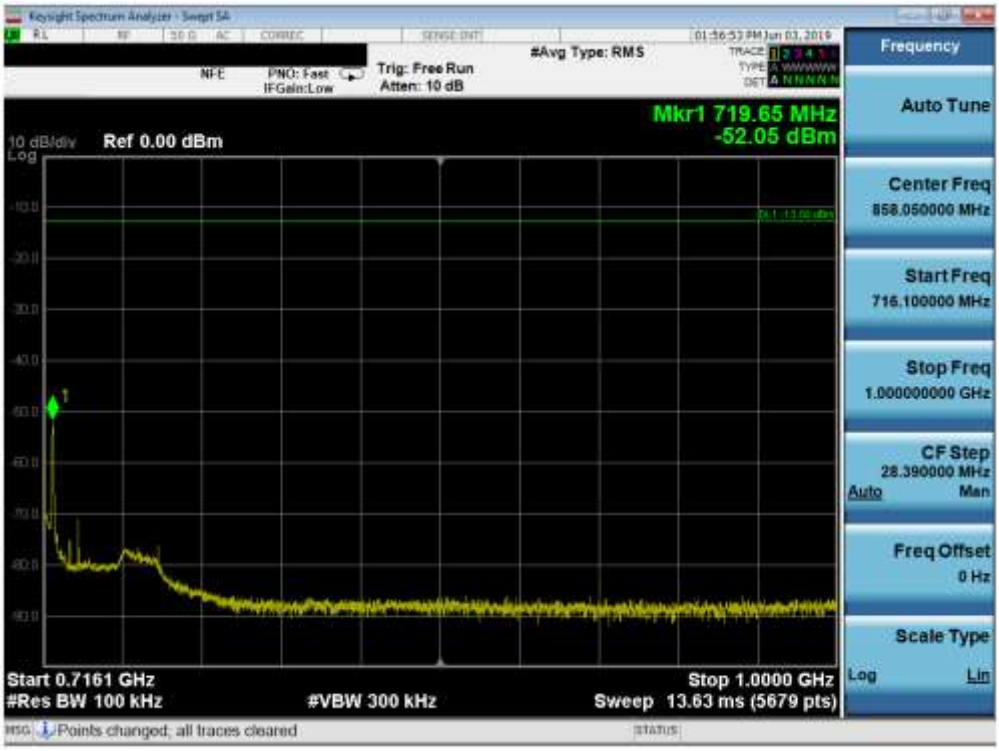
Plot 7-45. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



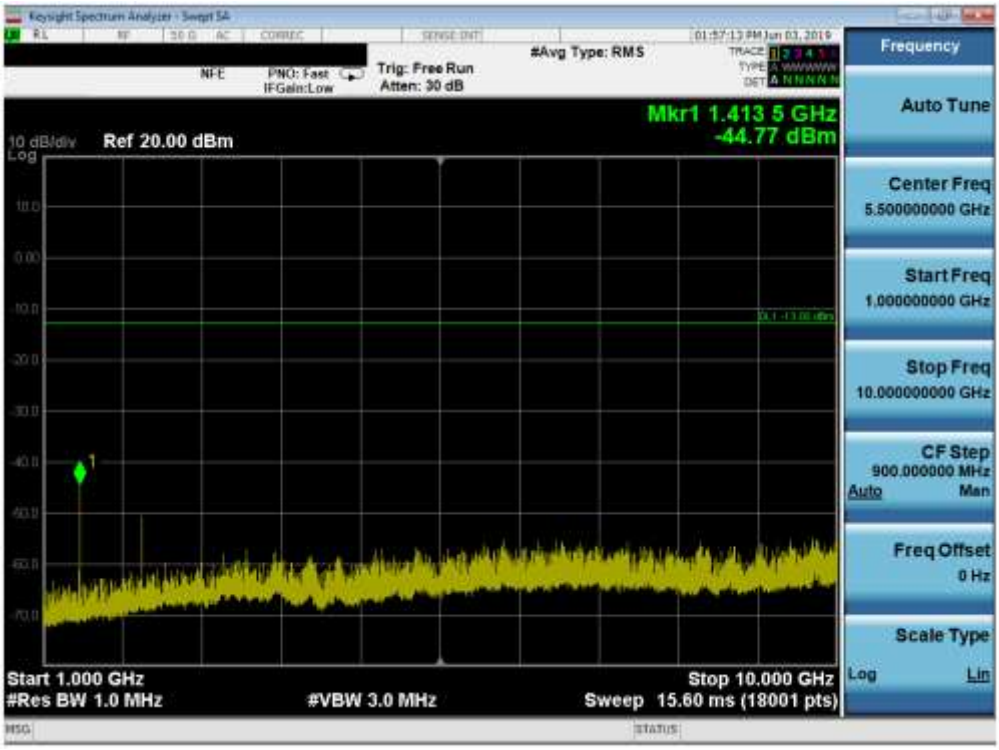
Plot 7-46. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-47. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

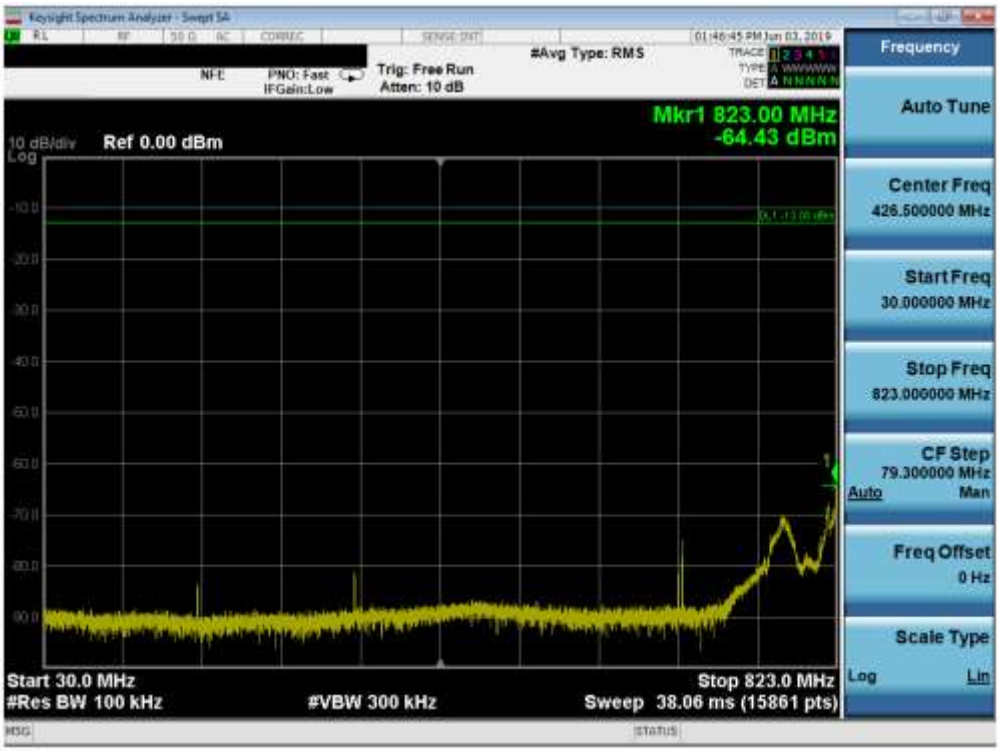


Plot 7-48. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

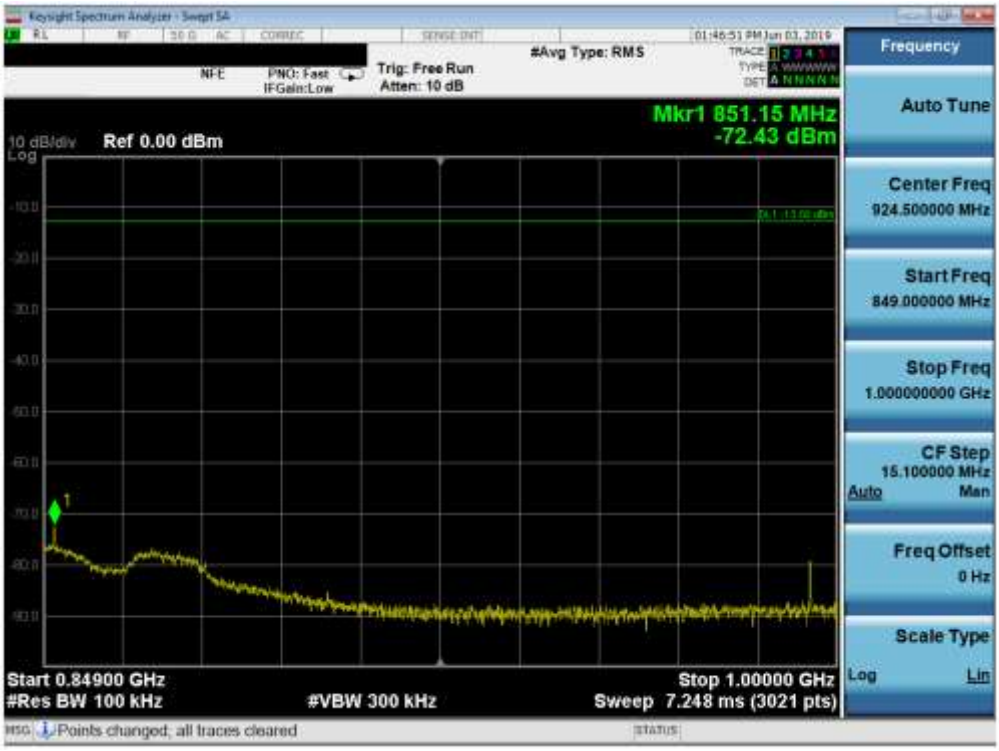


Plot 7-49. Conducted Spurious Plot (Band 12 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

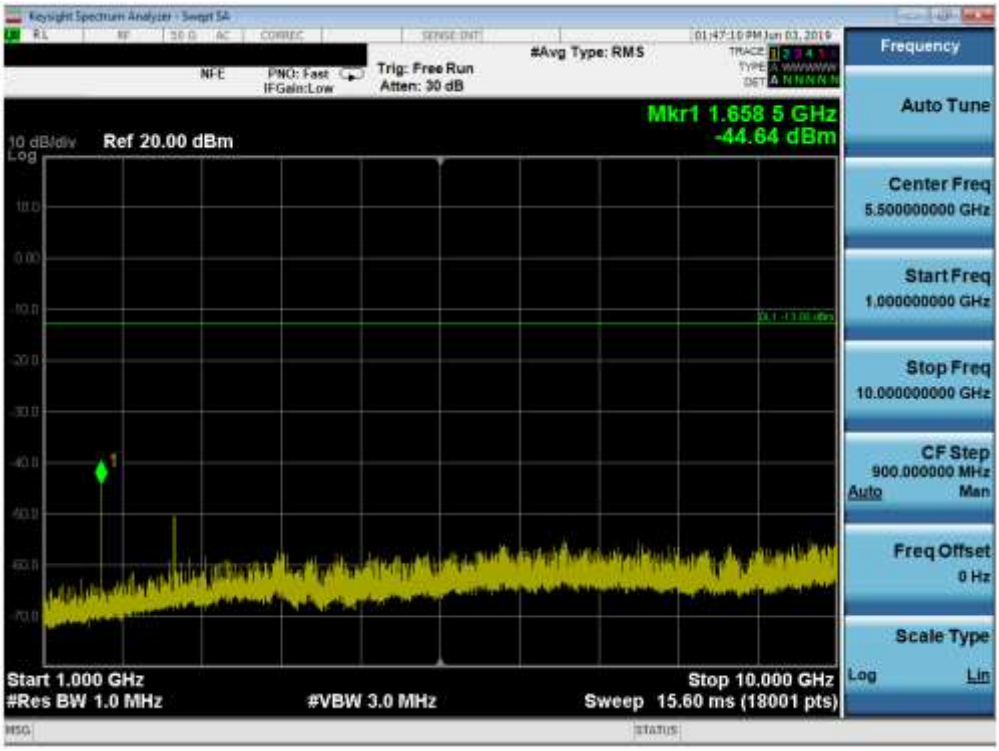
Band 5



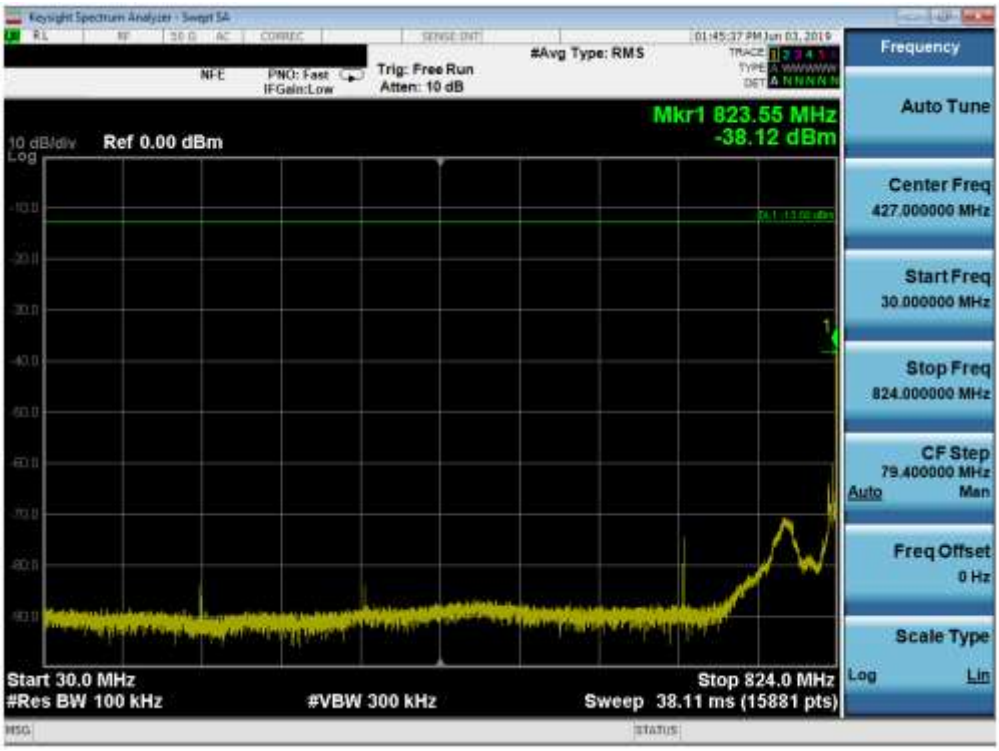
Plot 7-50. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



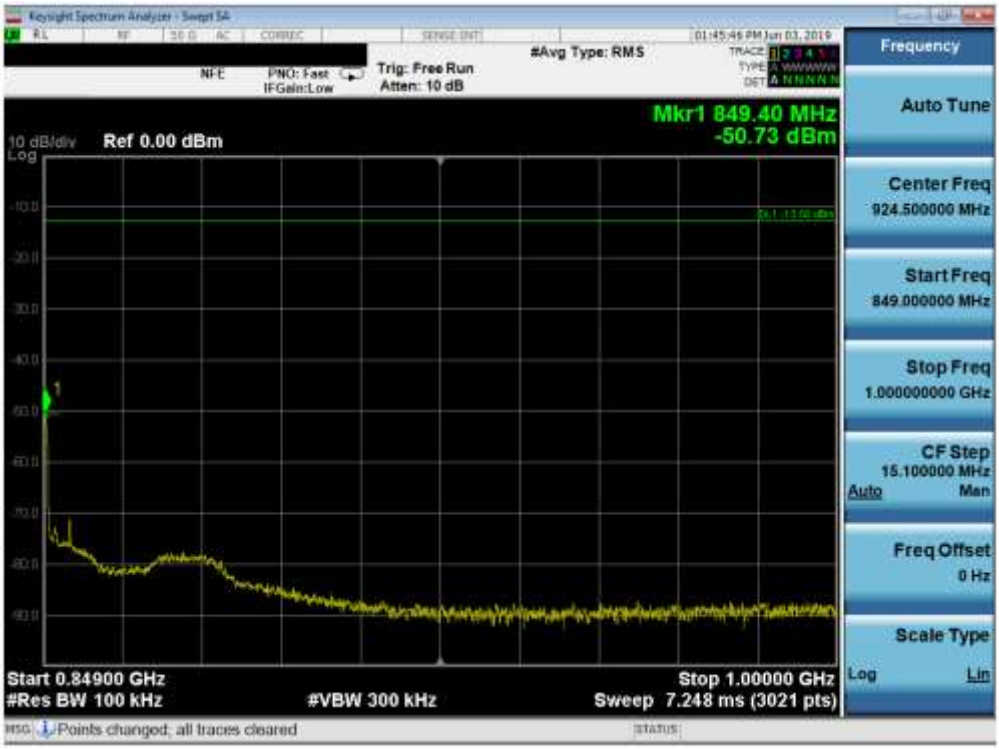
Plot 7-51. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



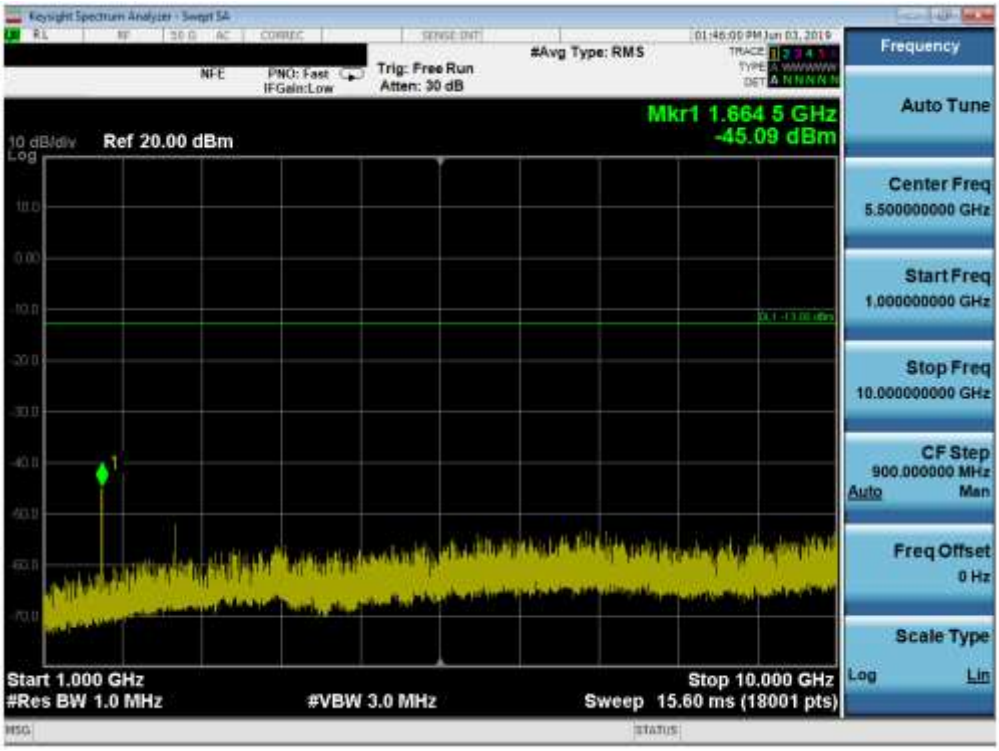
Plot 7-52. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



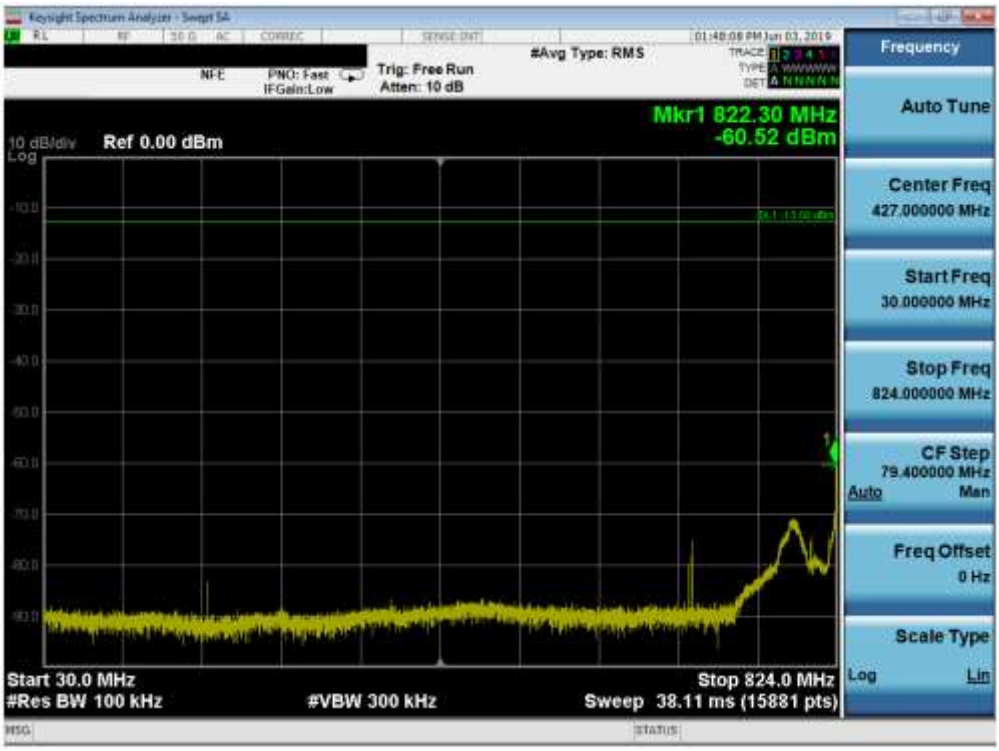
Plot 7-53. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



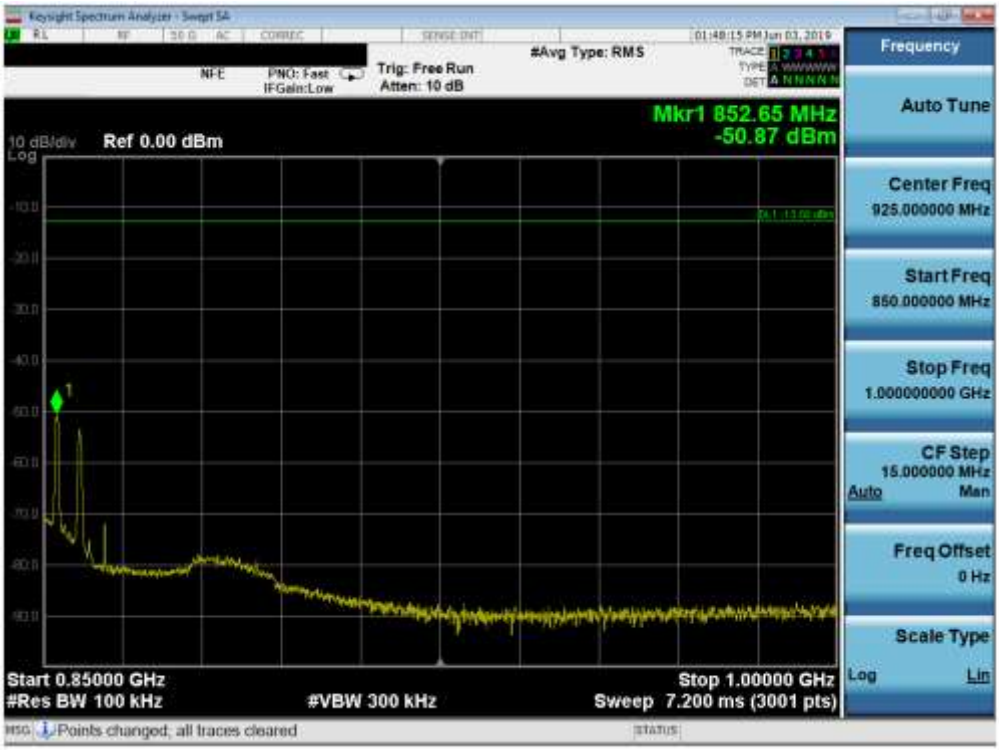
Plot 7-54. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



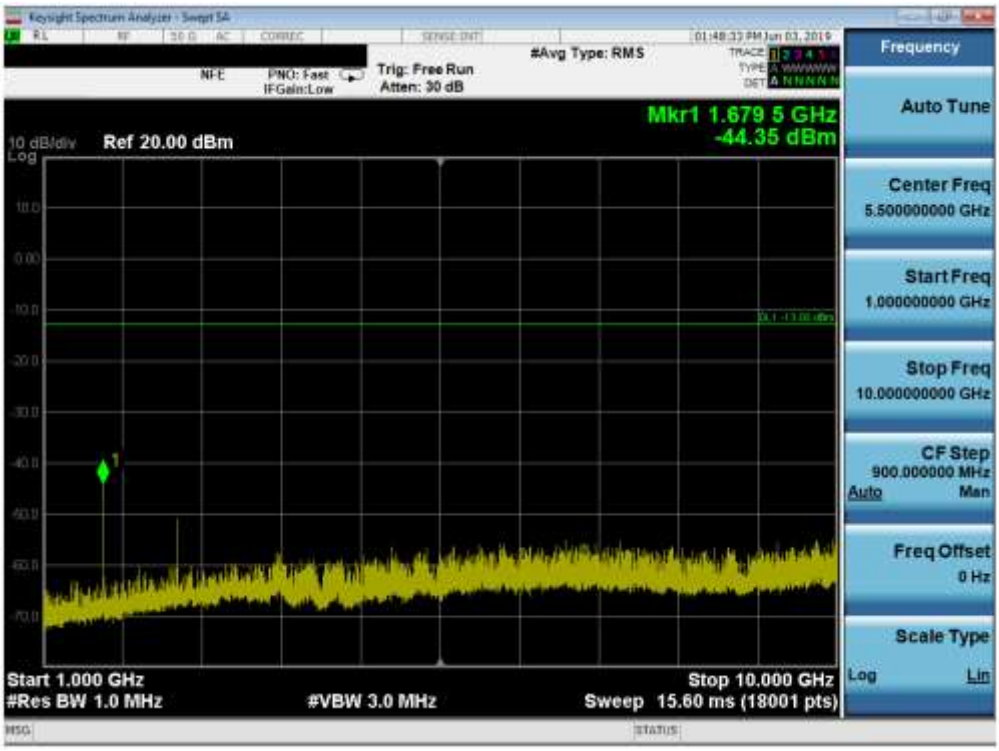
Plot 7-55. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-56. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

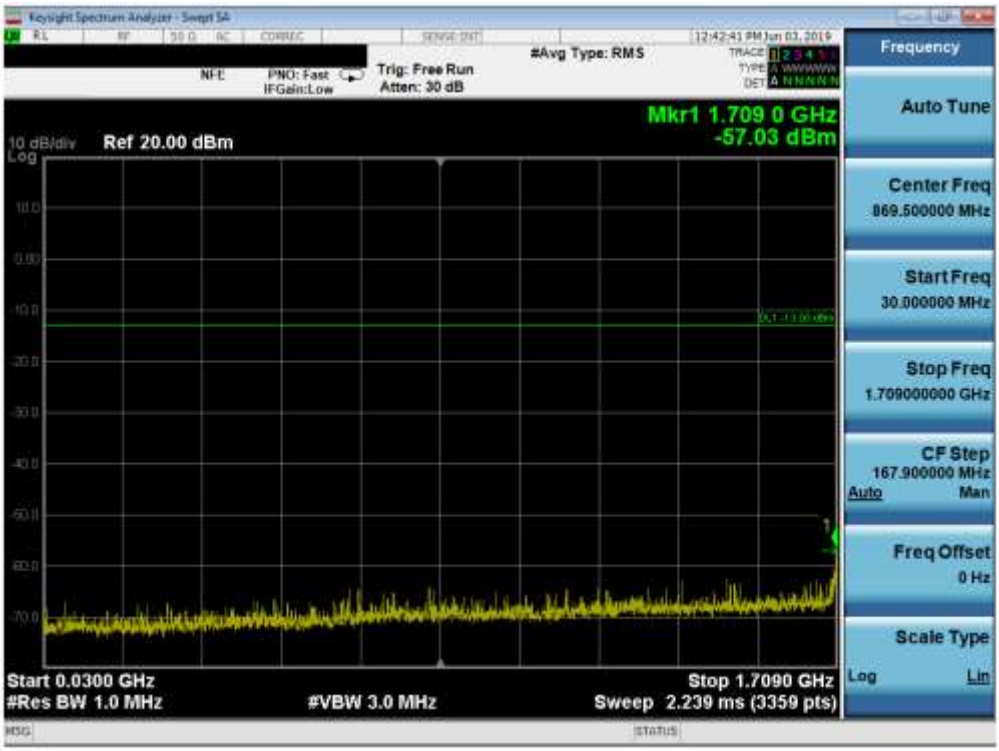


Plot 7-57. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

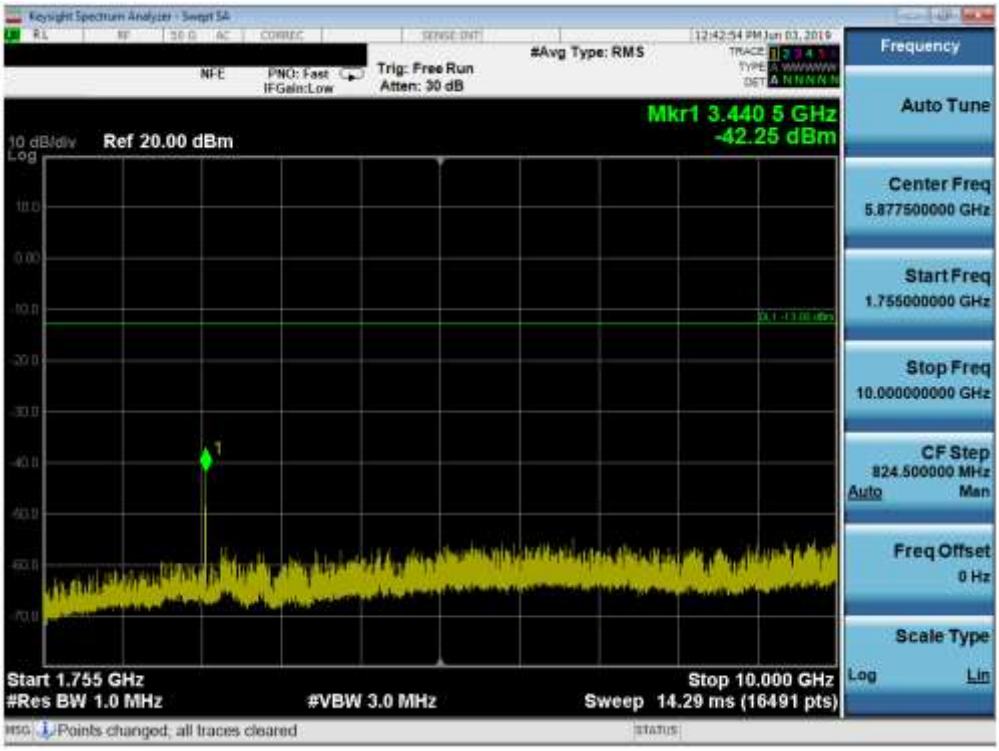


Plot 7-58. Conducted Spurious Plot (Band 5 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

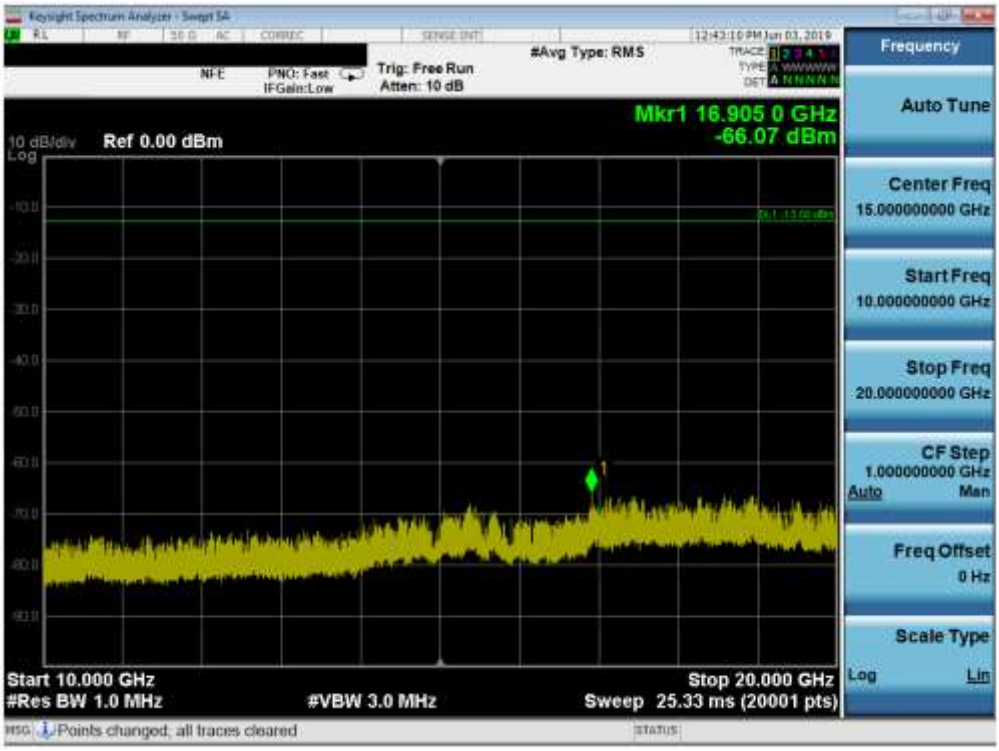
Band 4



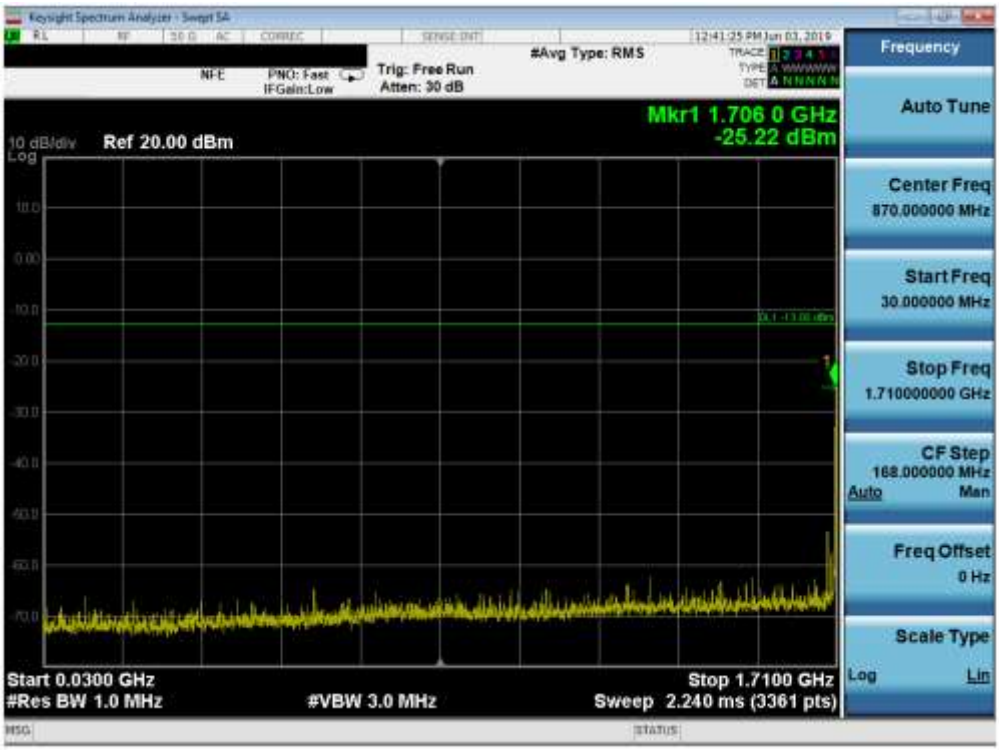
Plot 7-59. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



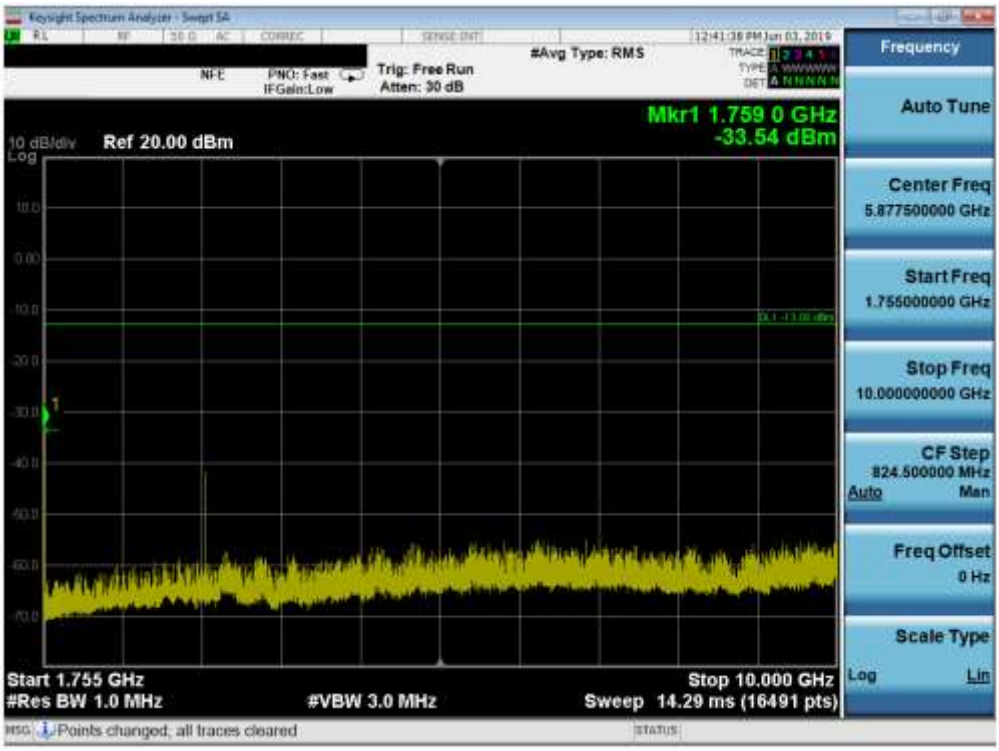
Plot 7-60. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



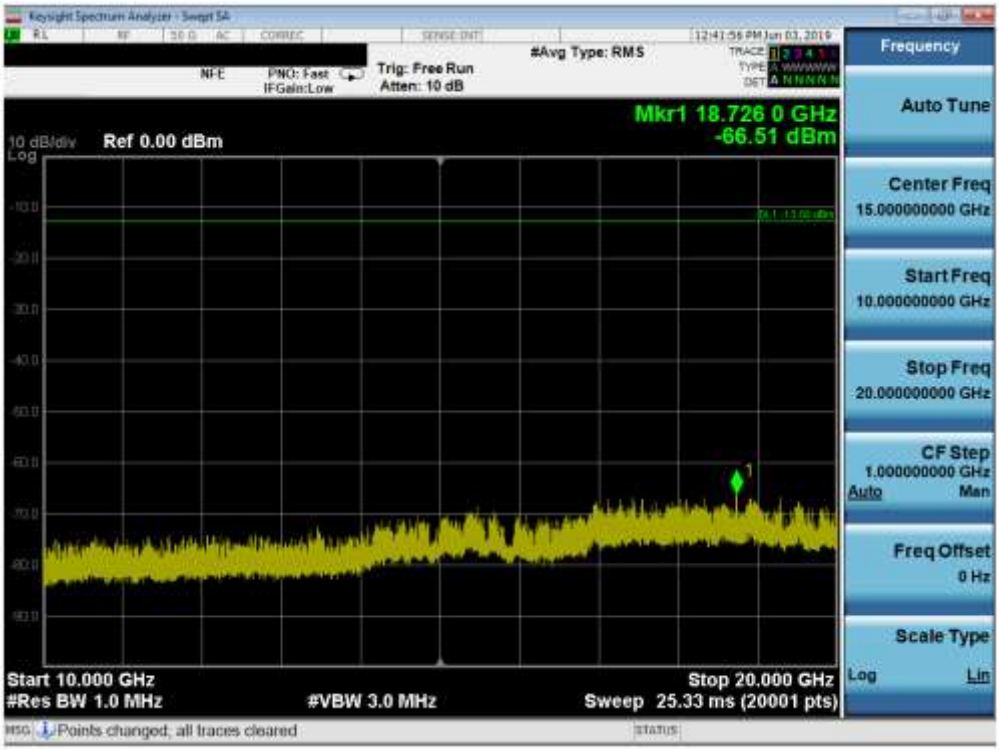
Plot 7-61. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



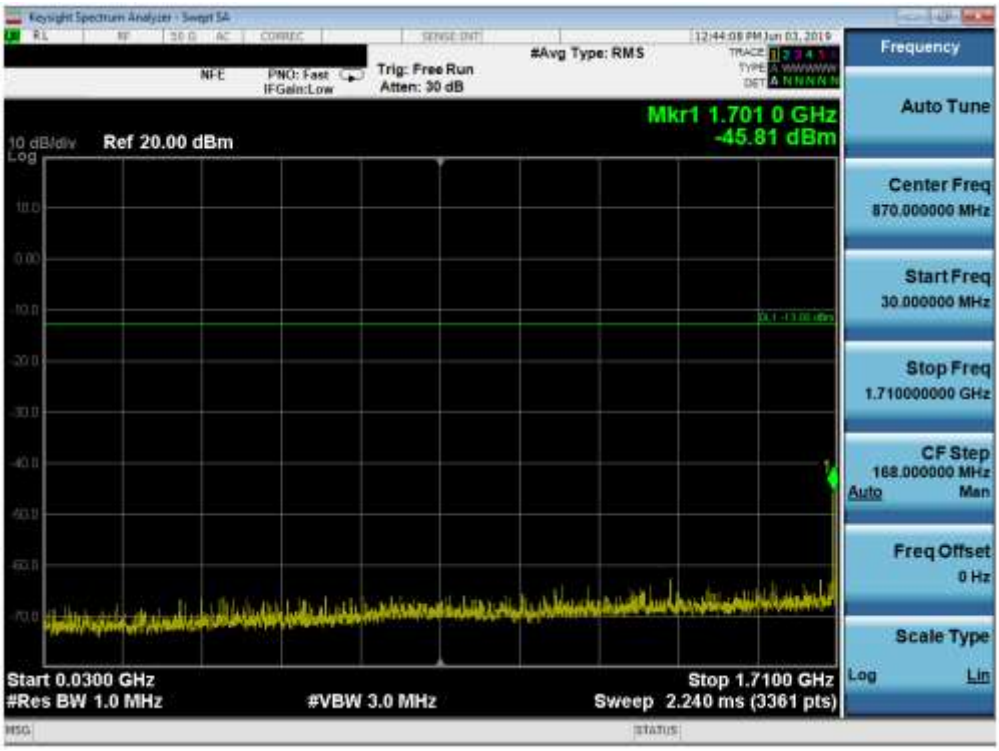
Plot 7-62. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



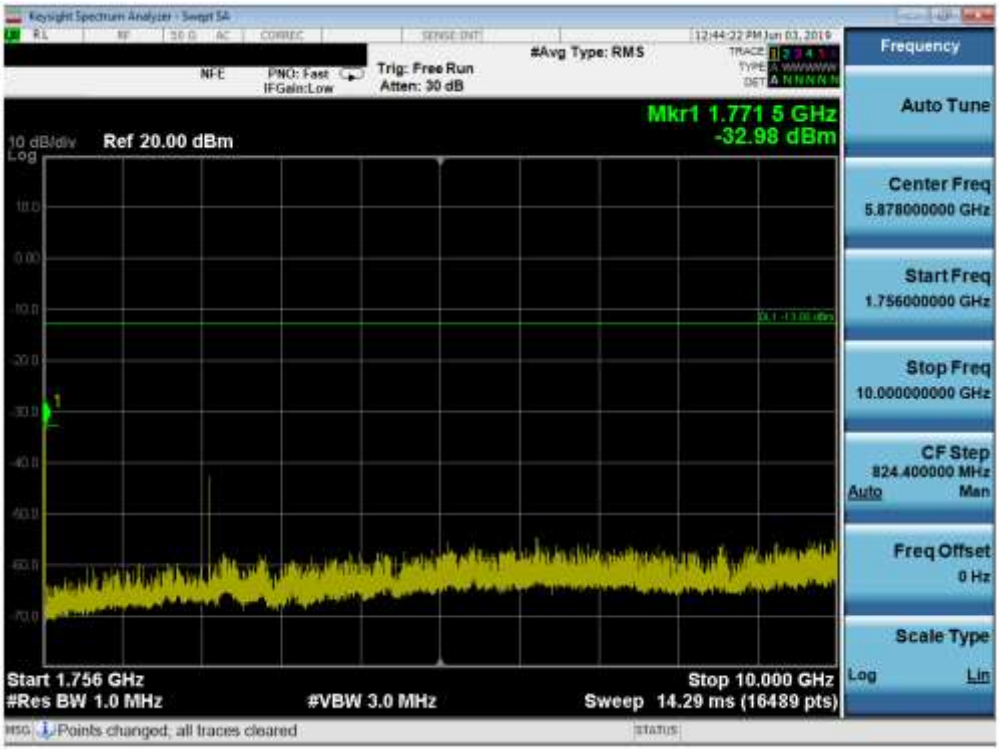
Plot 7-63. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



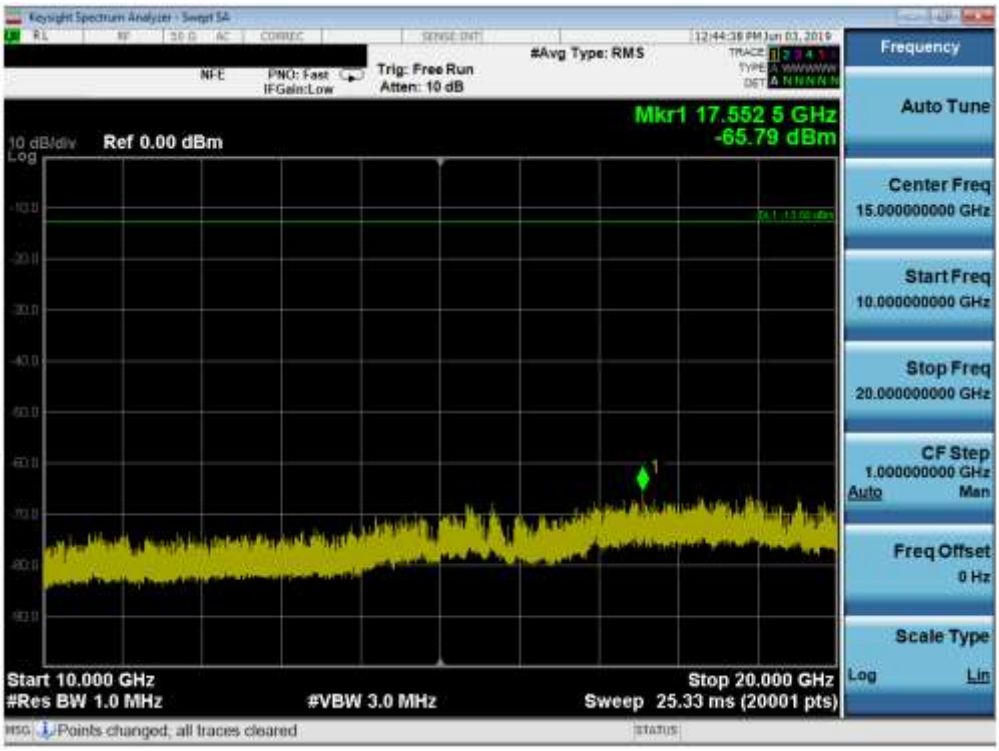
Plot 7-64. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-65. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

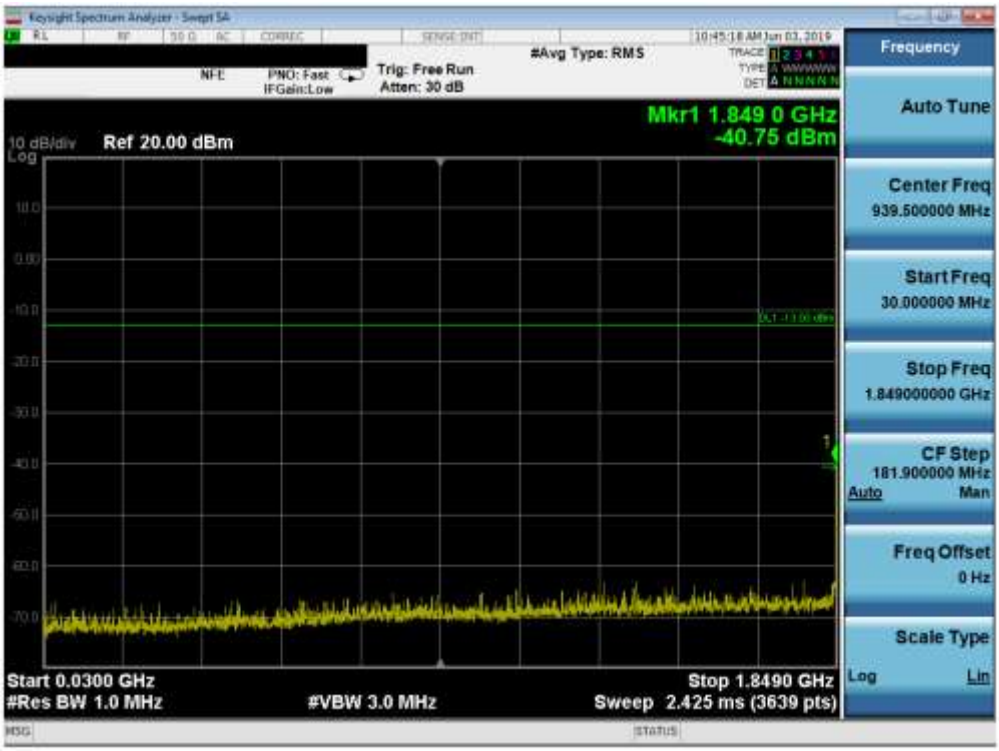


Plot 7-66. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

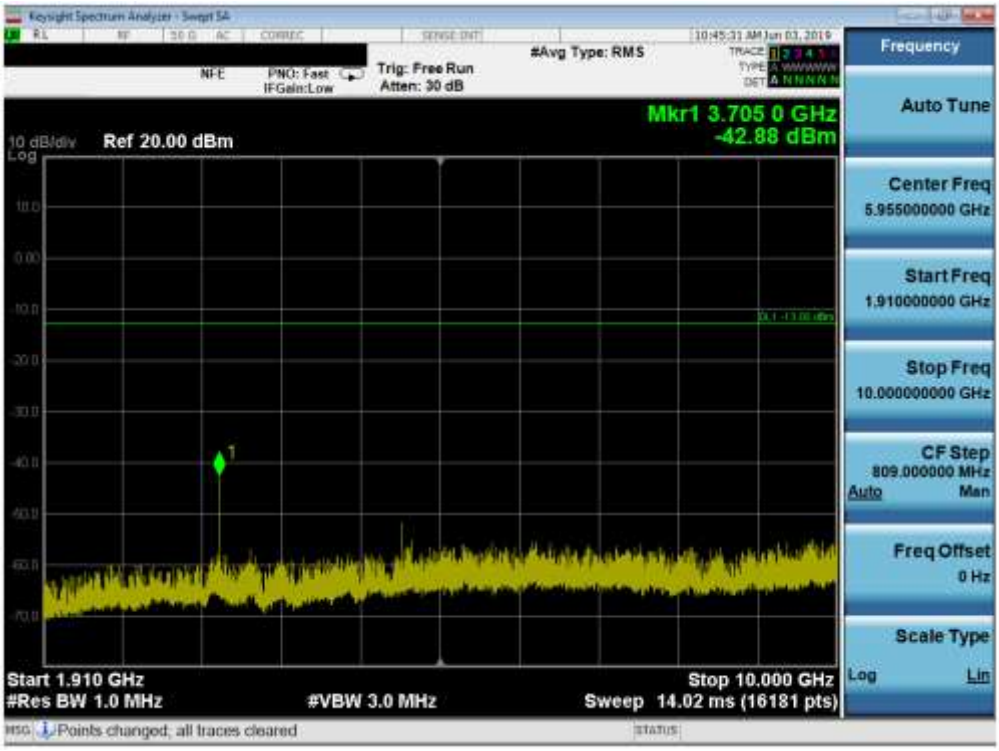


Plot 7-67. Conducted Spurious Plot (Band 4 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

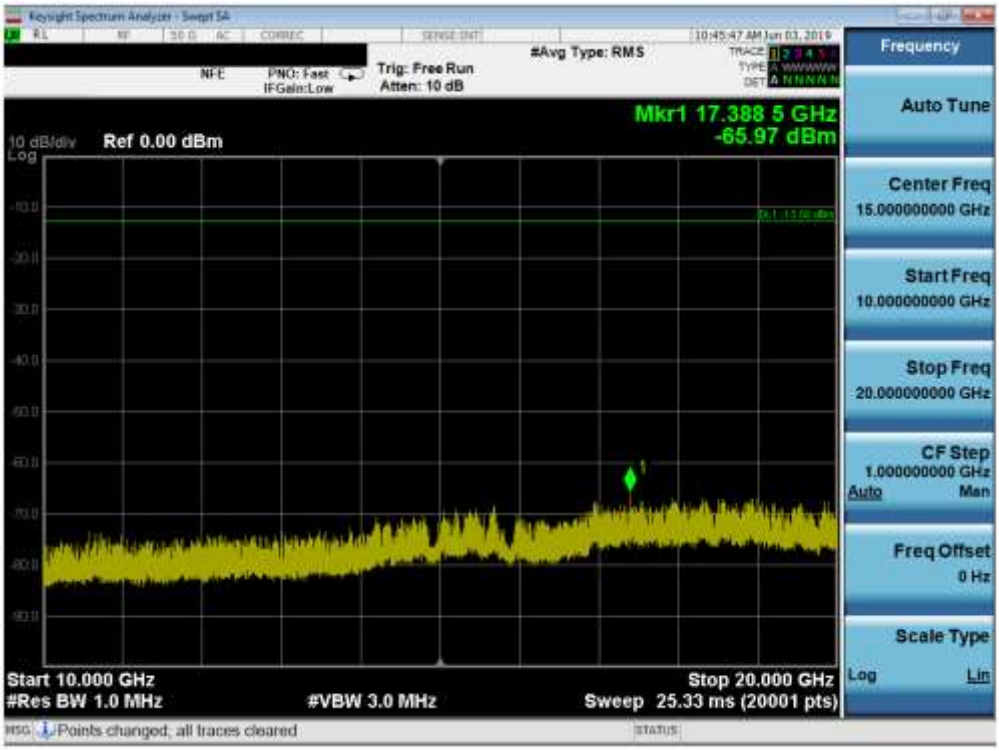
Band 2



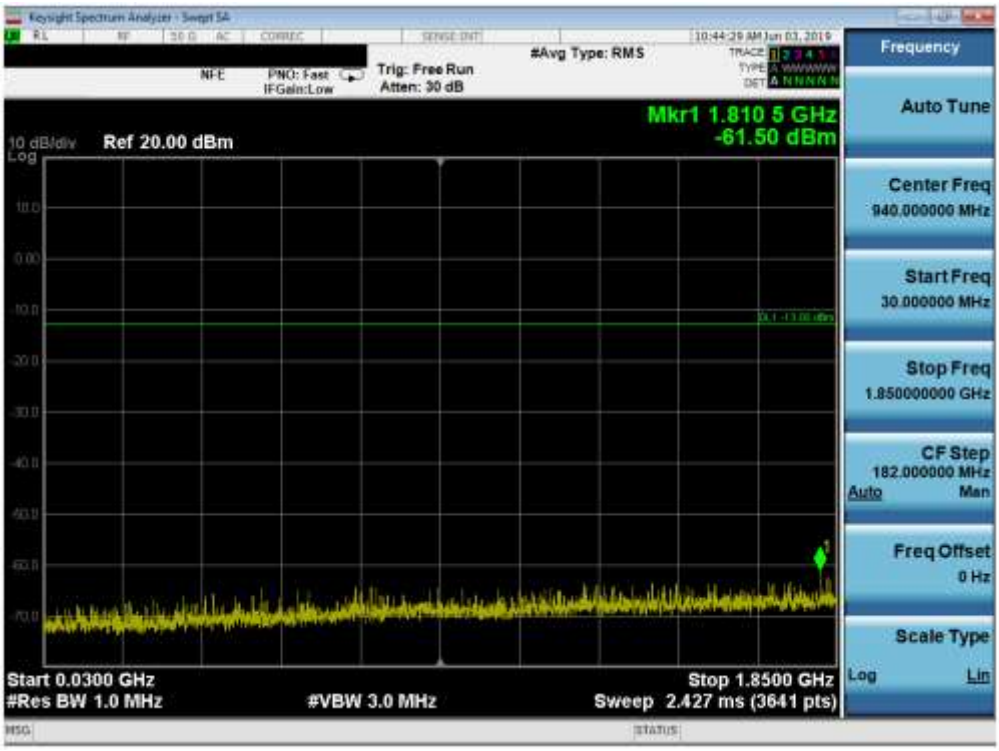
Plot 7-68. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



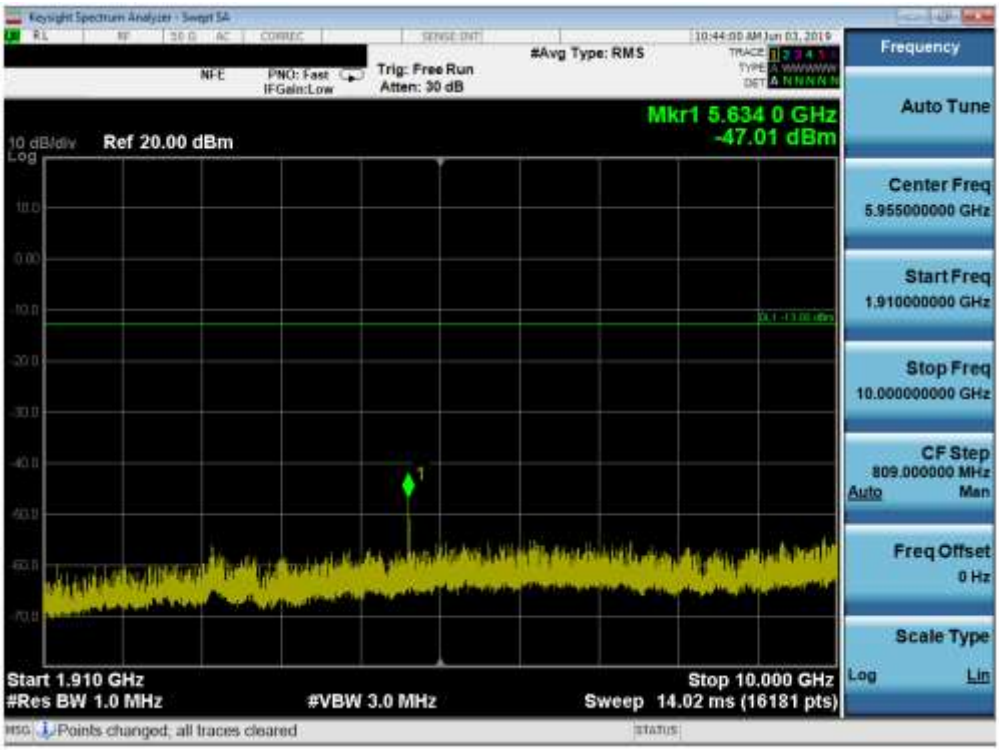
Plot 7-69. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



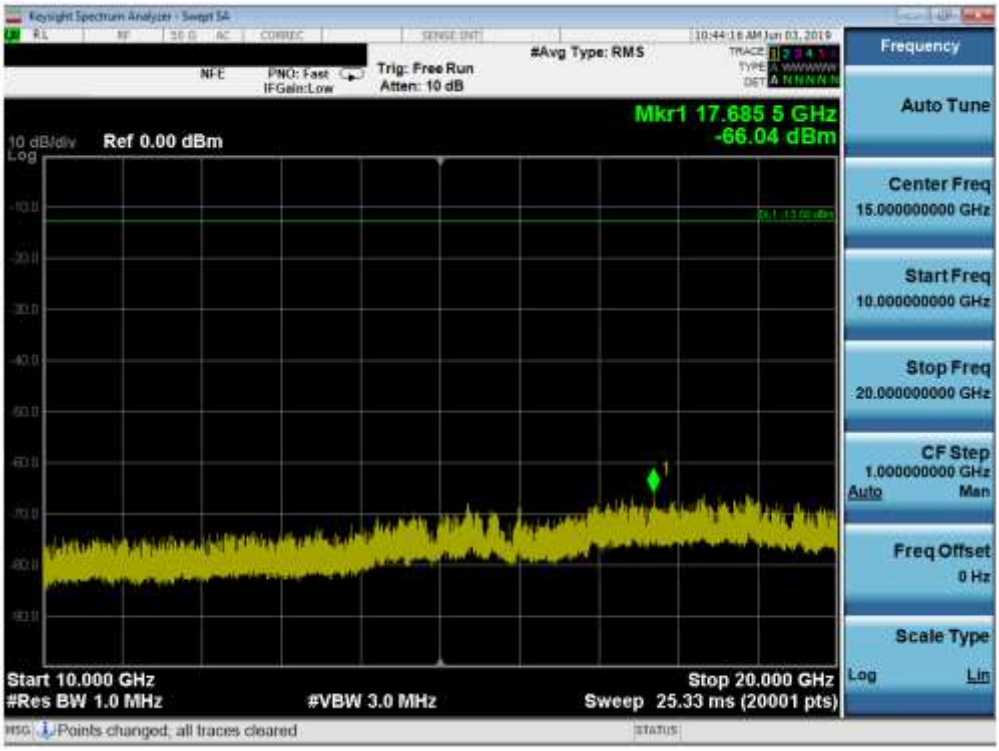
Plot 7-70. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



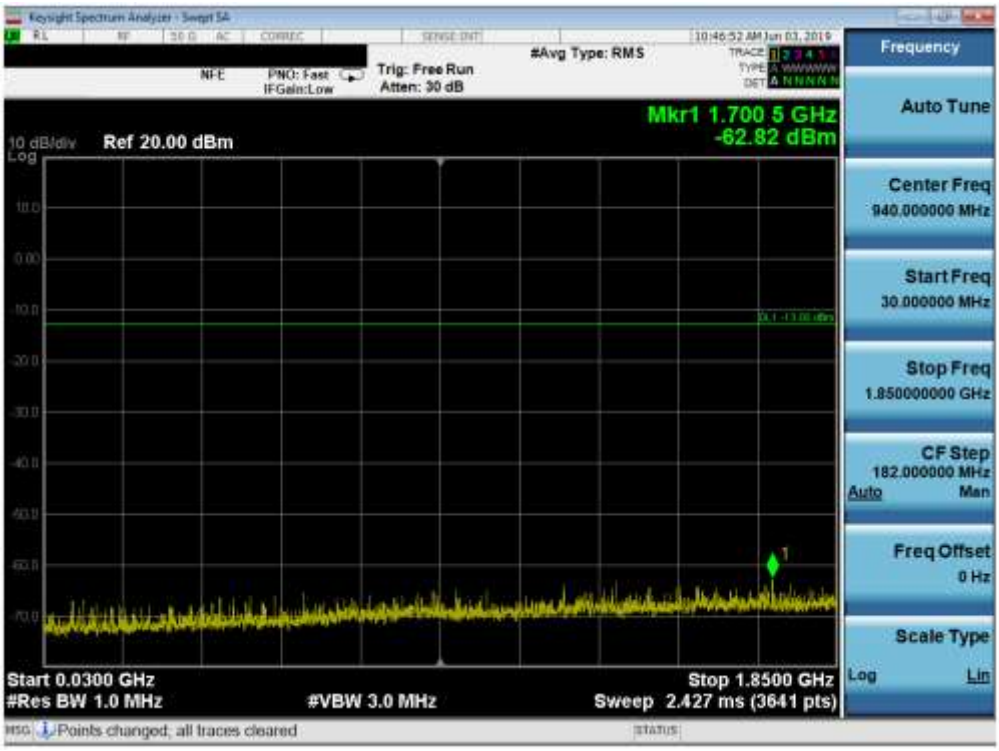
Plot 7-71. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



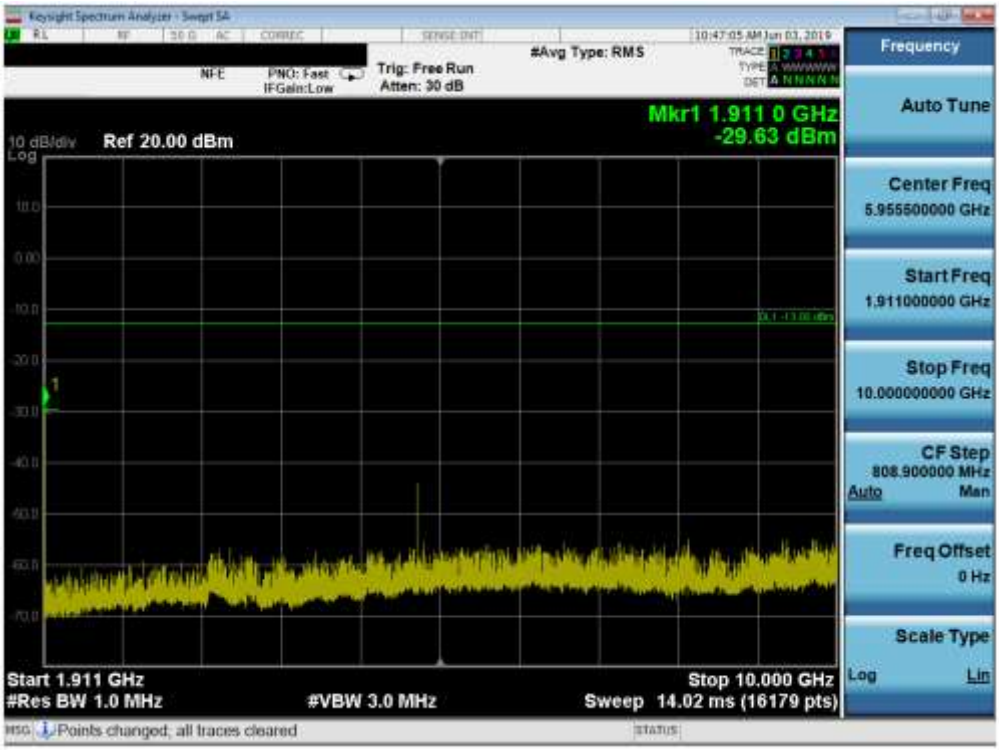
Plot 7-72. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



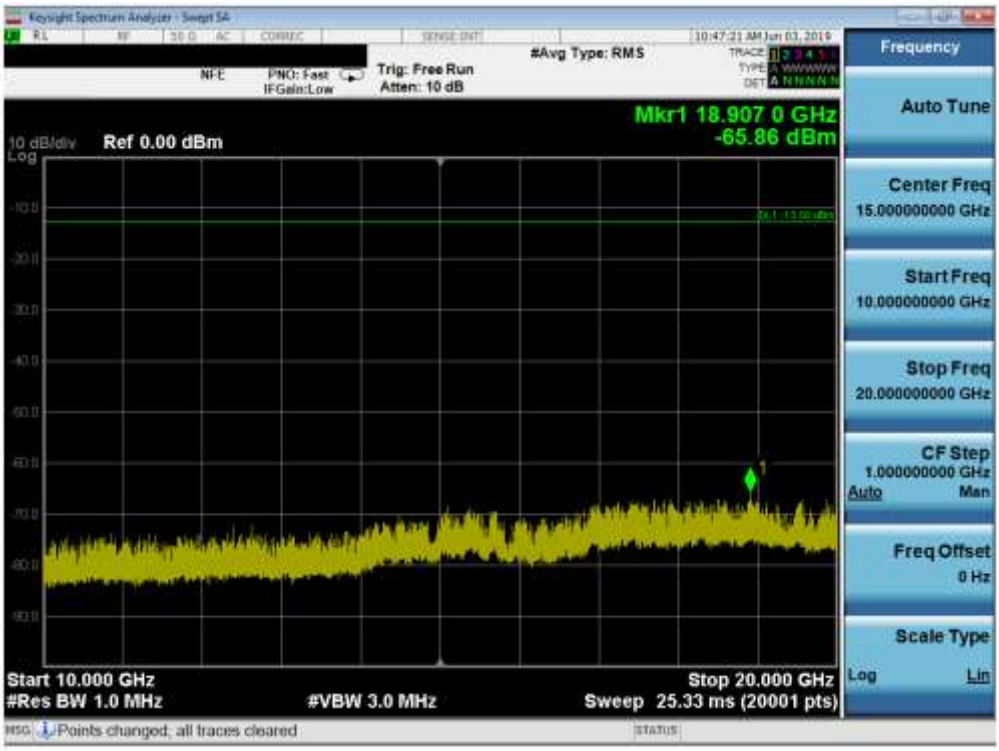
Plot 7-73. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-74. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-75. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-76. Conducted Spurious Plot (Band 2 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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
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

Test Notes

Per 22.917(b), 24.238(a), and 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.

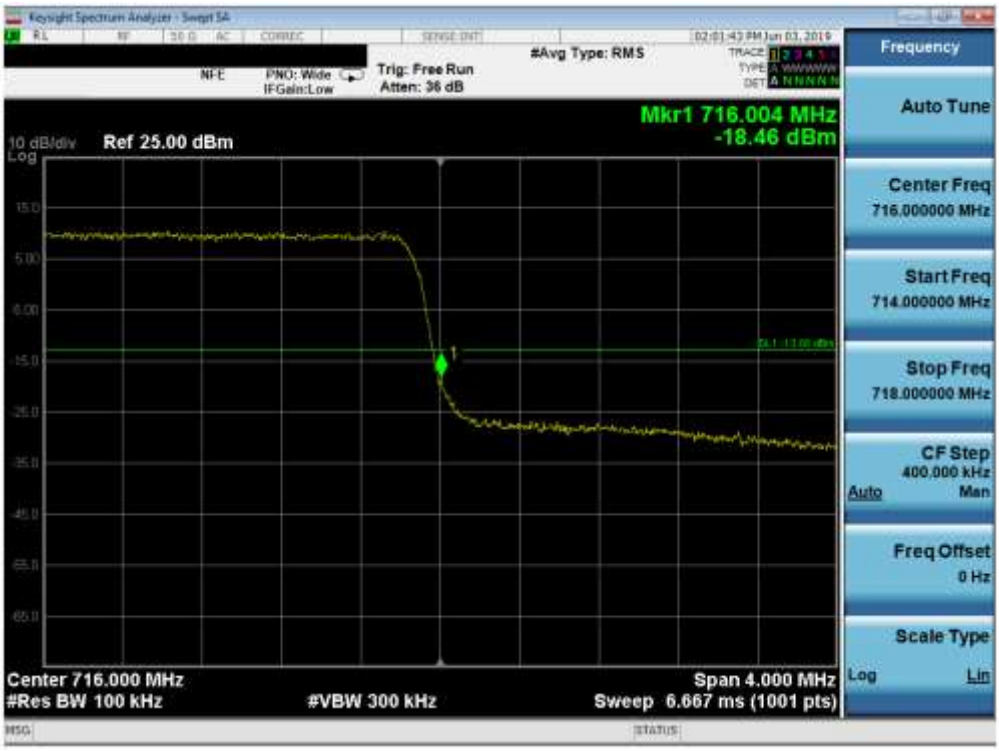
Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Band 12

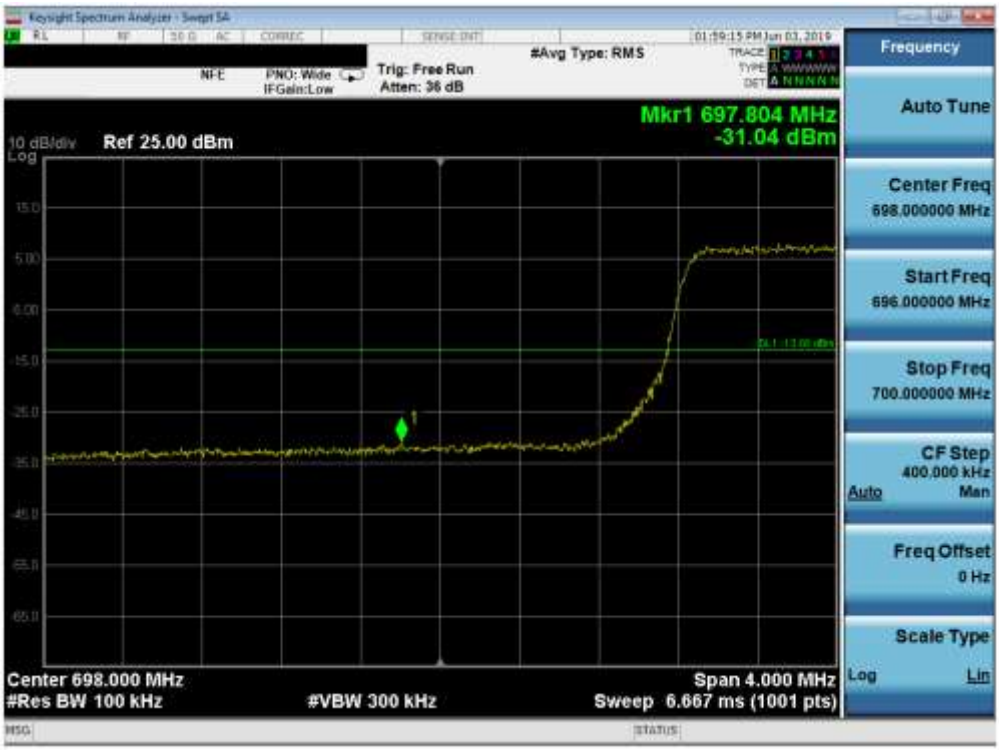
Plot 7-77. Lower Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-78. Upper Band Edge Plot (Band 12 - 1.4MHz QPSK - Full RB Configuration)

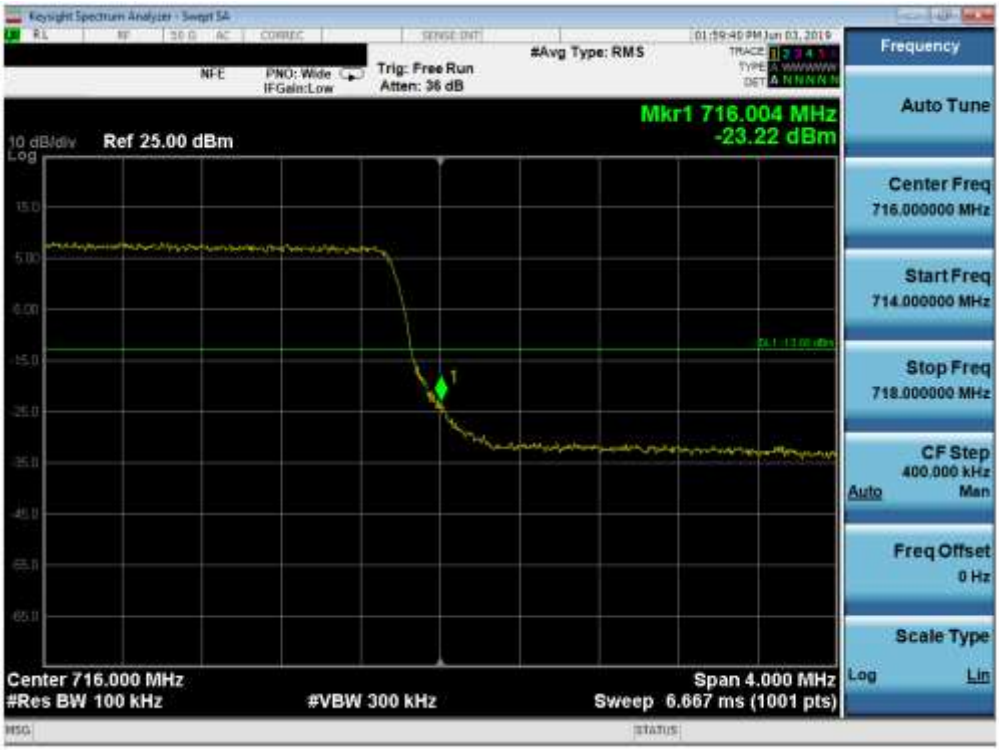
Plot 7-79. Lower Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)



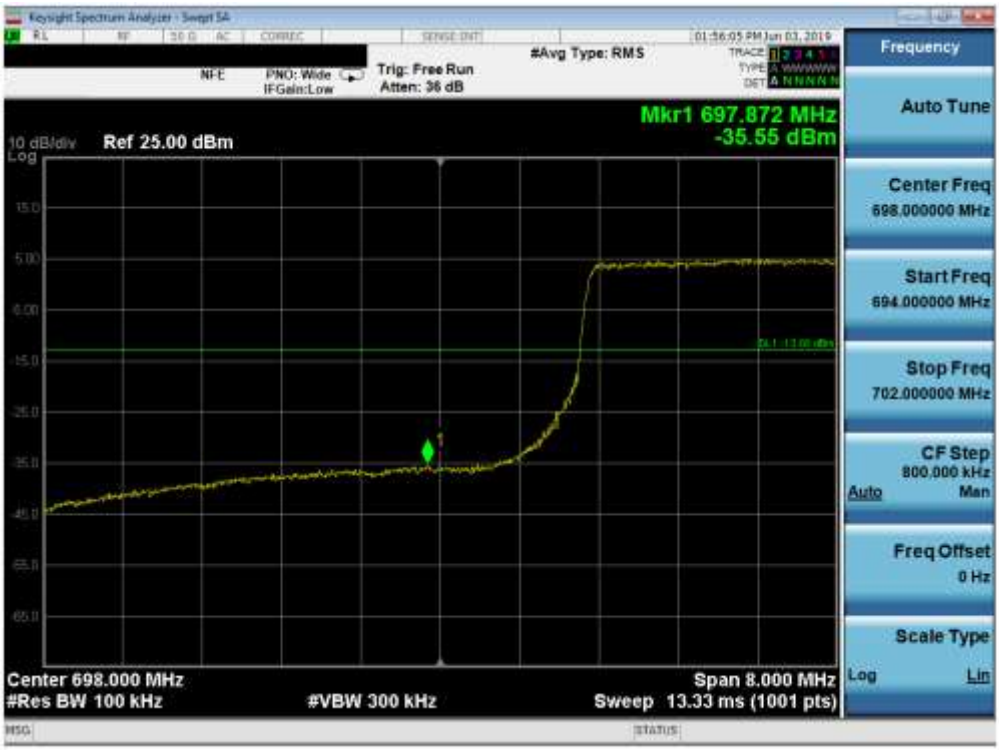
Plot 7-80. Upper Band Edge Plot (Band 12 - 3.0MHz QPSK - Full RB Configuration)



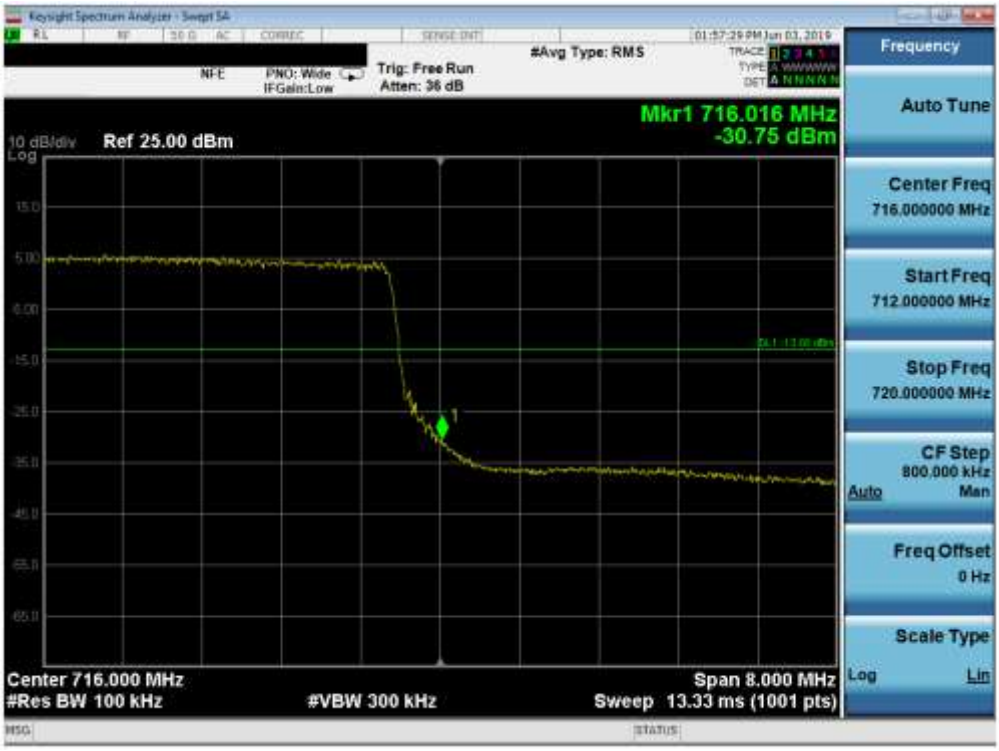
Plot 7-81. Lower Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-82. Upper Band Edge Plot (Band 12 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-83. Lower Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

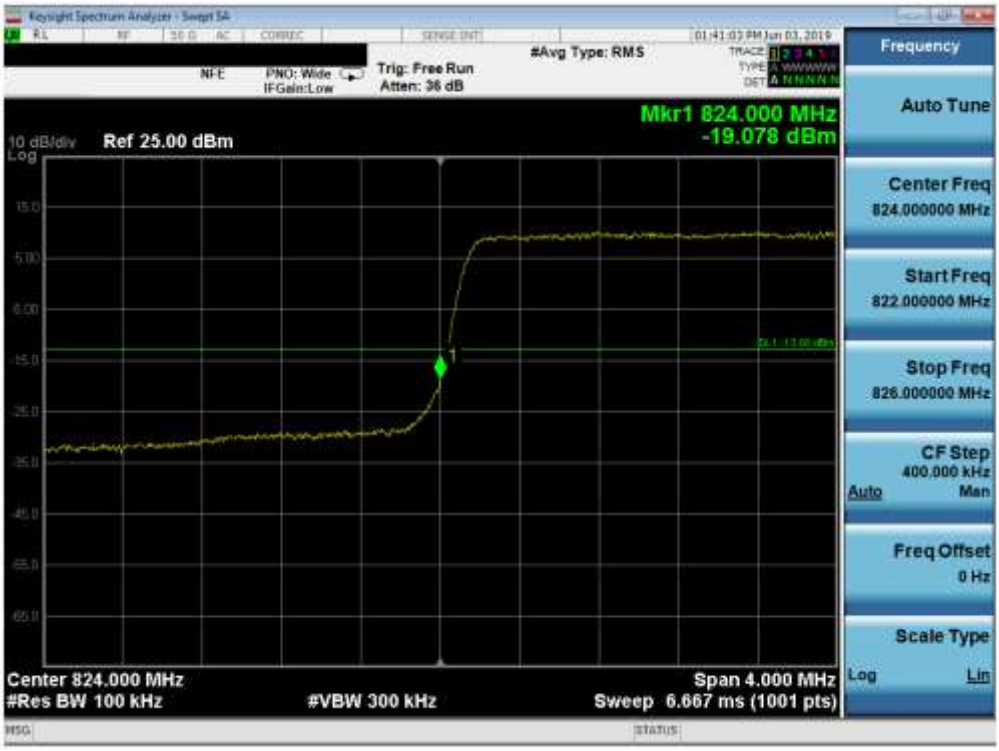


Plot 7-84. Upper Band Edge Plot (Band 12 - 10.0MHz QPSK - Full RB Configuration)

Band 5

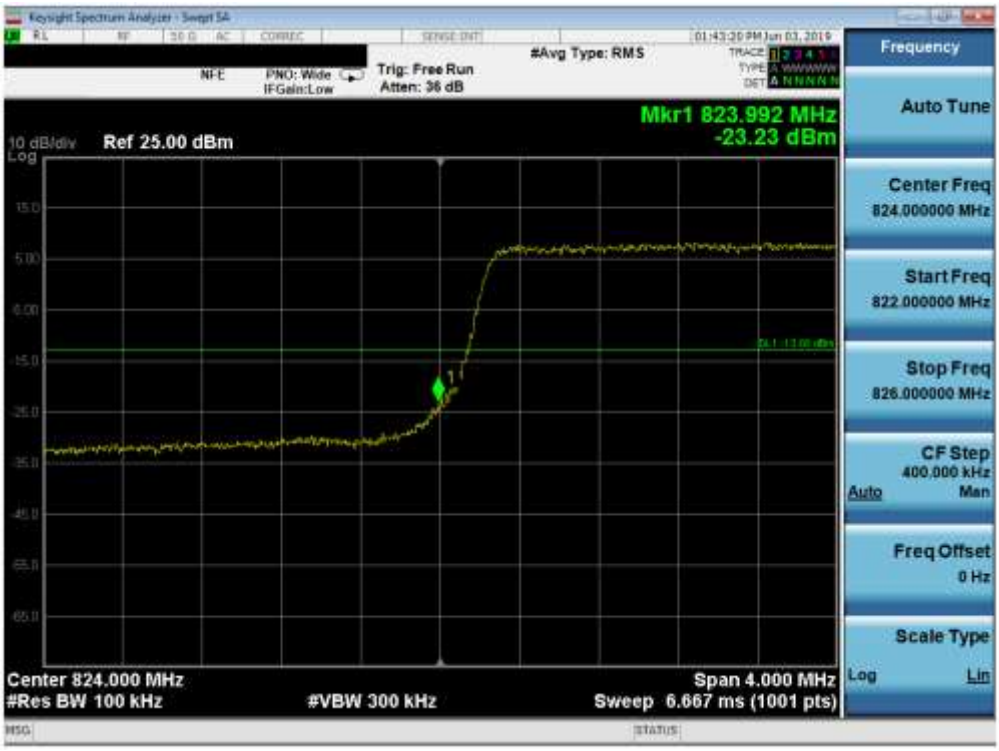
Plot 7-85. Lower Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-86. Upper Band Edge Plot (Band 5 - 1.4MHz QPSK - Full RB Configuration)

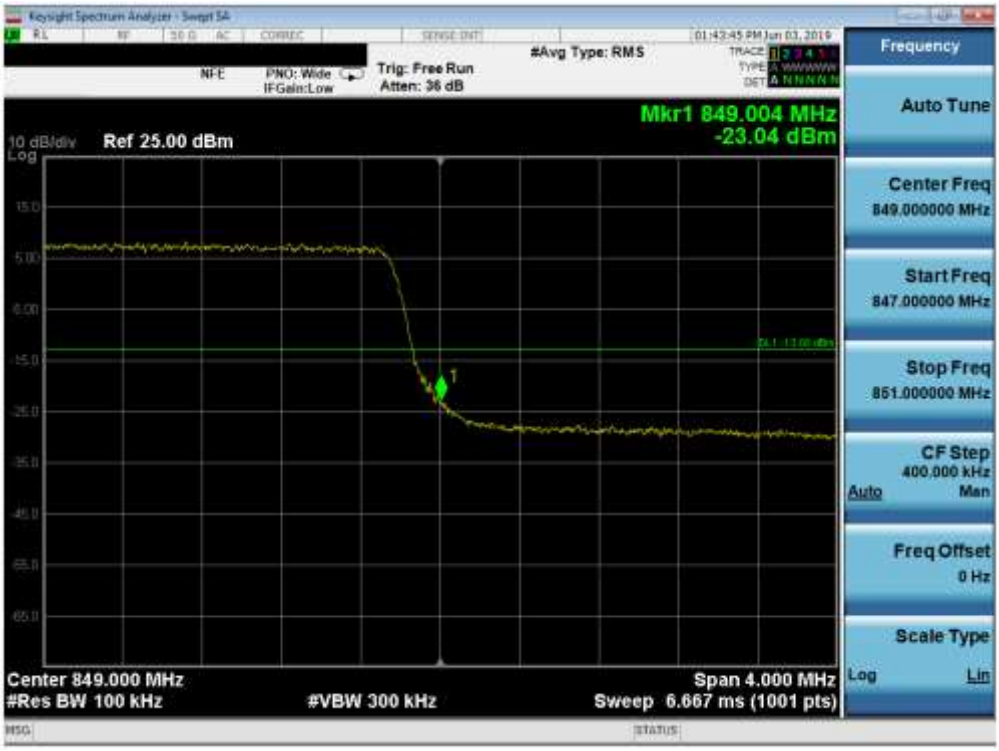


Plot 7-87. Lower Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)

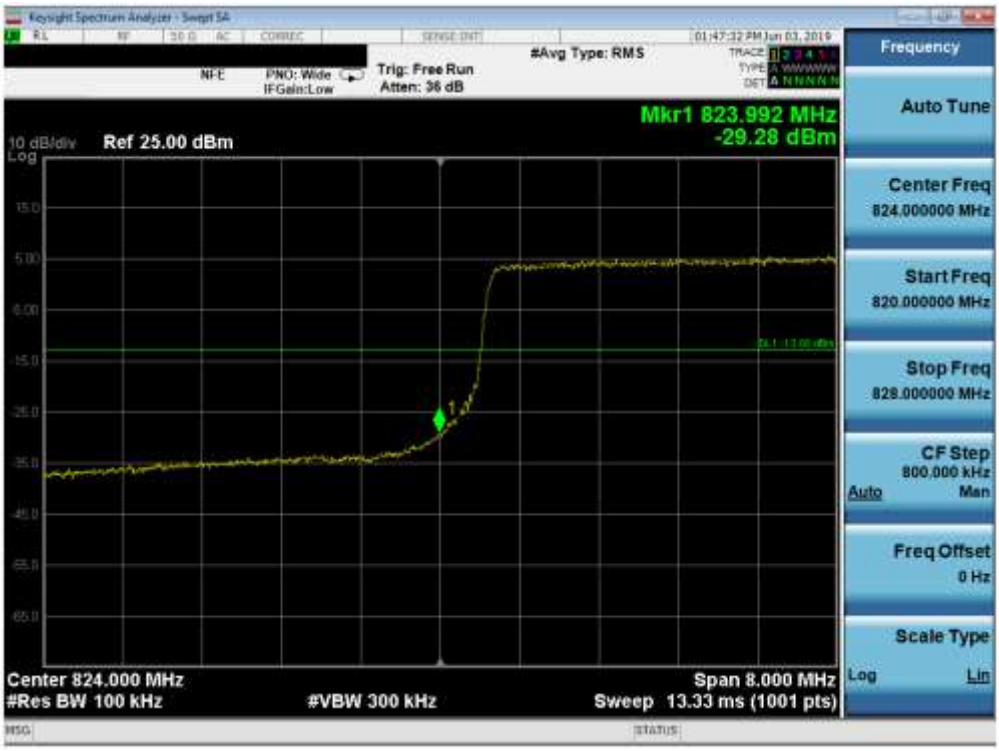
Plot 7-88. Upper Band Edge Plot (Band 5 - 3.0MHz QPSK - Full RB Configuration)



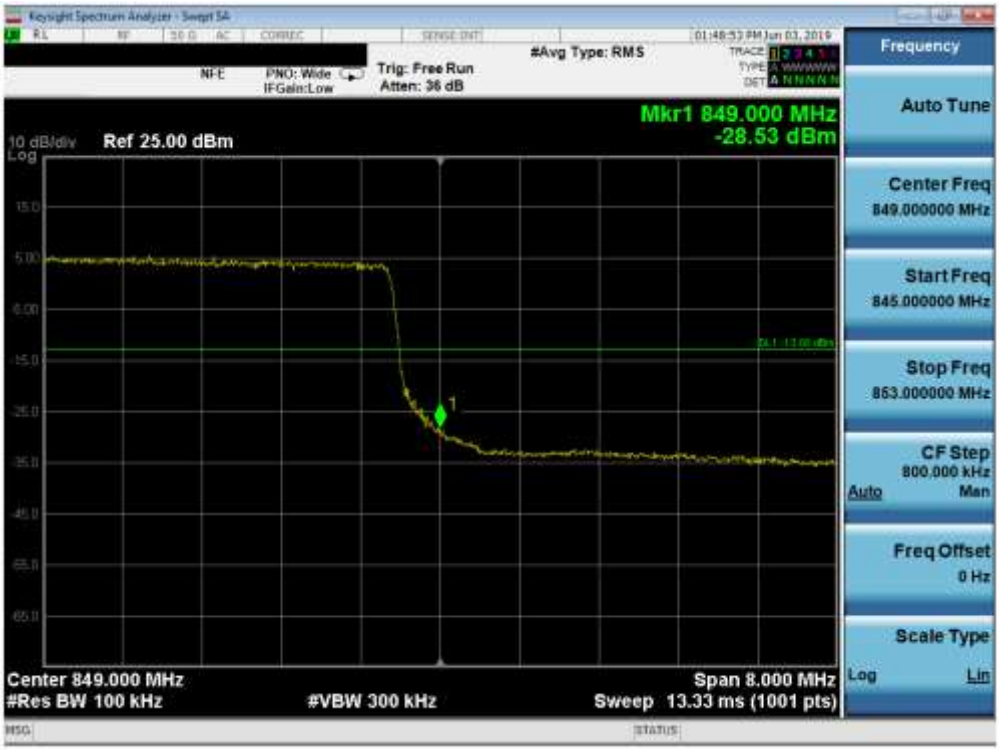
Plot 7-89. Lower Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-90. Upper Band Edge Plot (Band 5 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-91. Lower Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

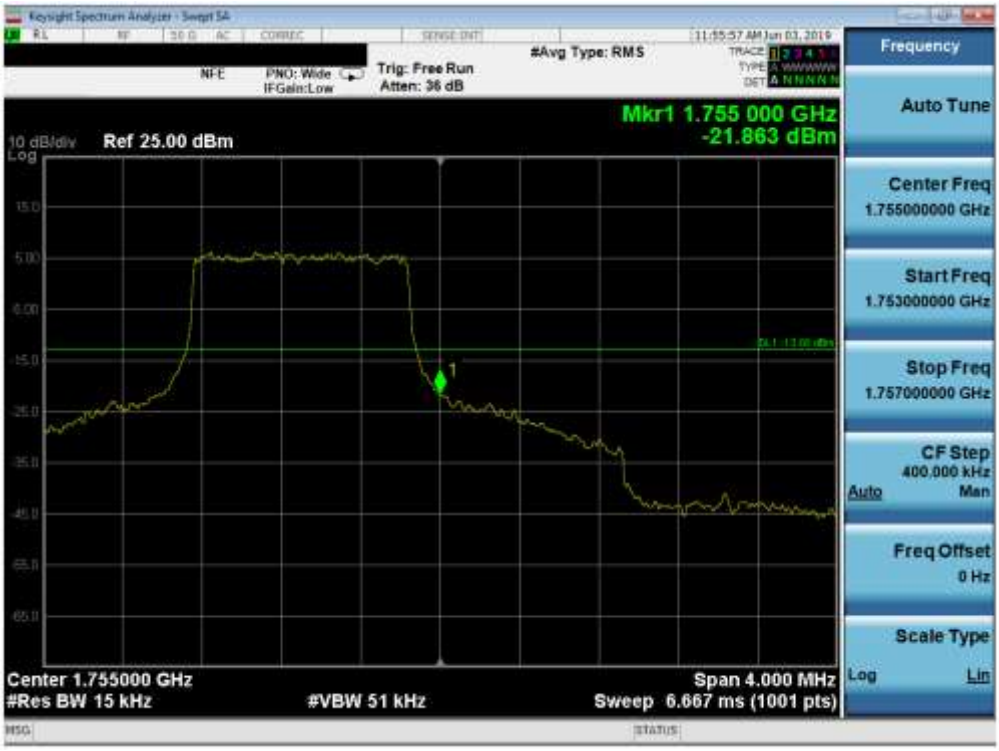


Plot 7-92. Upper Band Edge Plot (Band 5 - 10.0MHz QPSK - Full RB Configuration)

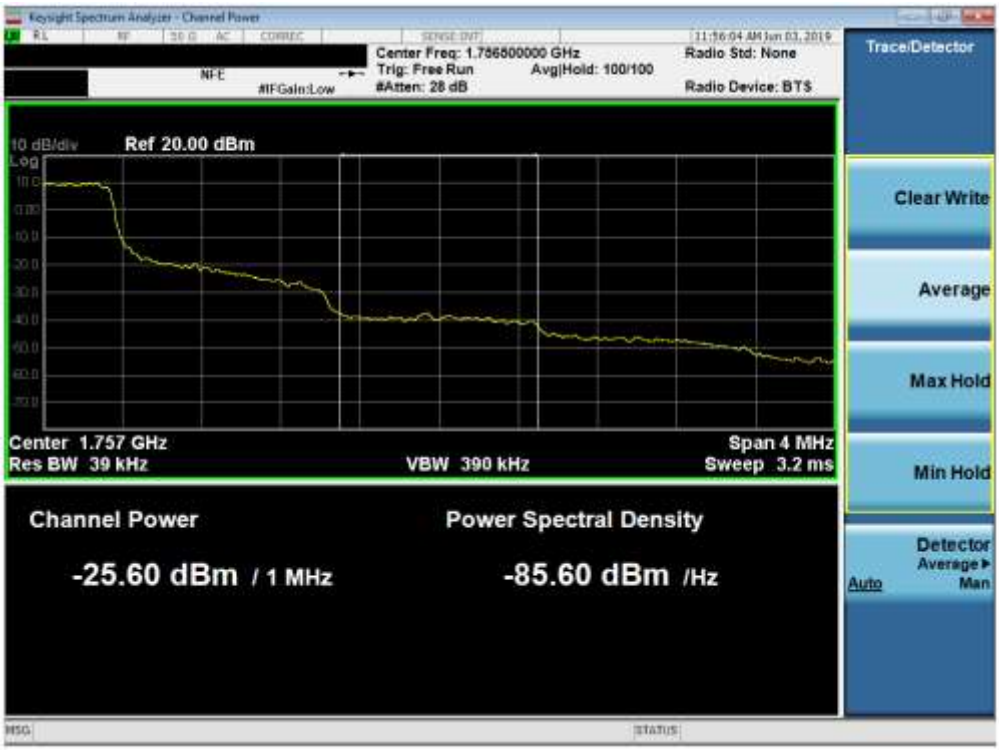
Band 4

Plot 7-93. Lower Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-94. Lower Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-95. Upper Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

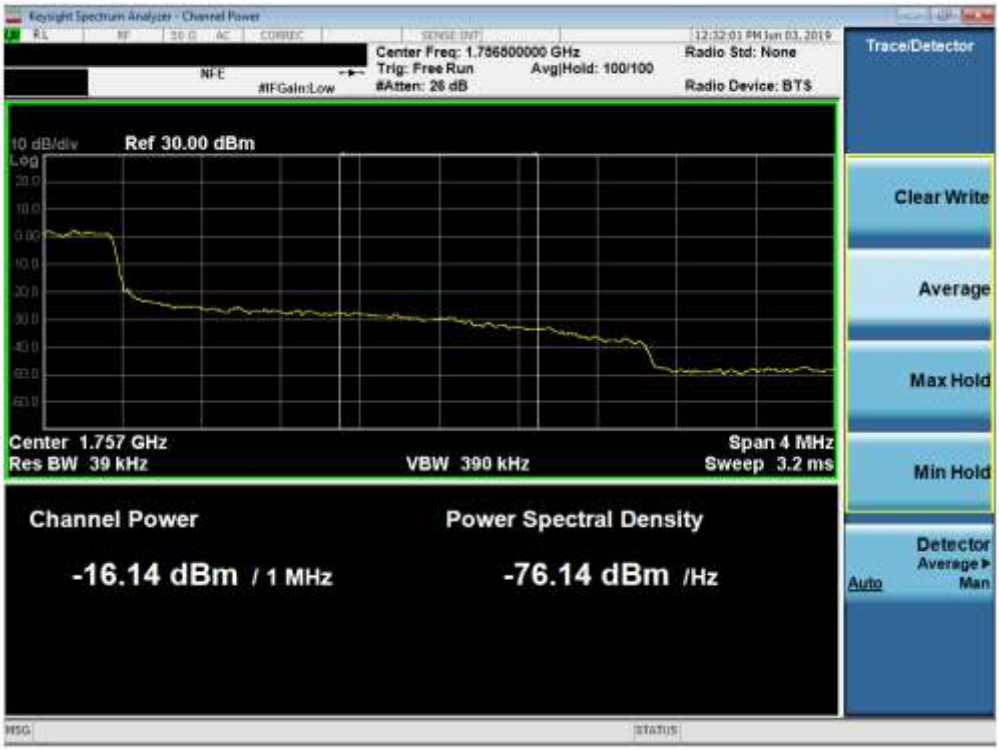


Plot 7-96. Upper Extended Band Edge Plot (Band 4 - 1.4MHz QPSK - Full RB Configuration)

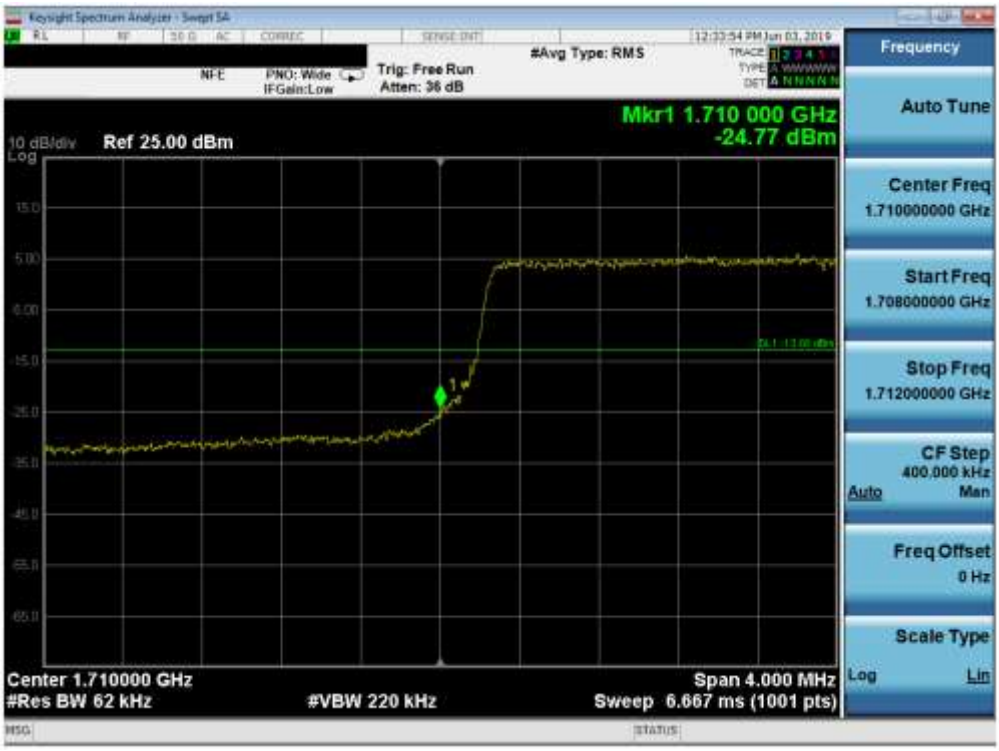
Plot 7-97. Lower Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-98. Lower Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)

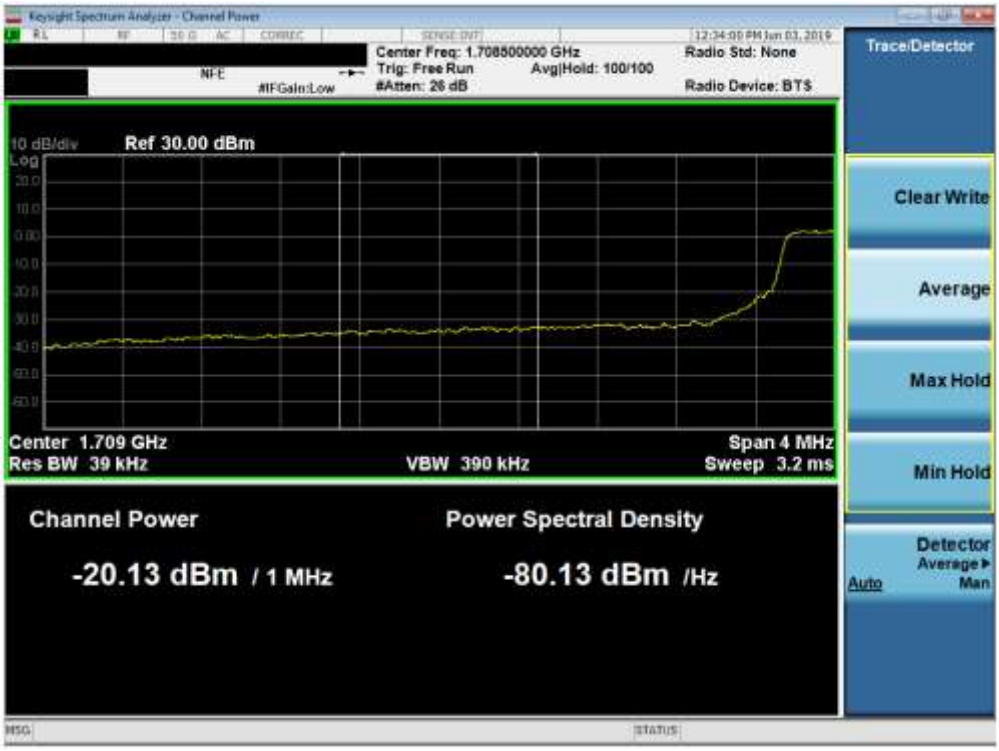
Plot 7-99. Upper Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



Plot 7-100. Upper Extended Band Edge Plot (Band 4 - 3.0MHz QPSK - Full RB Configuration)



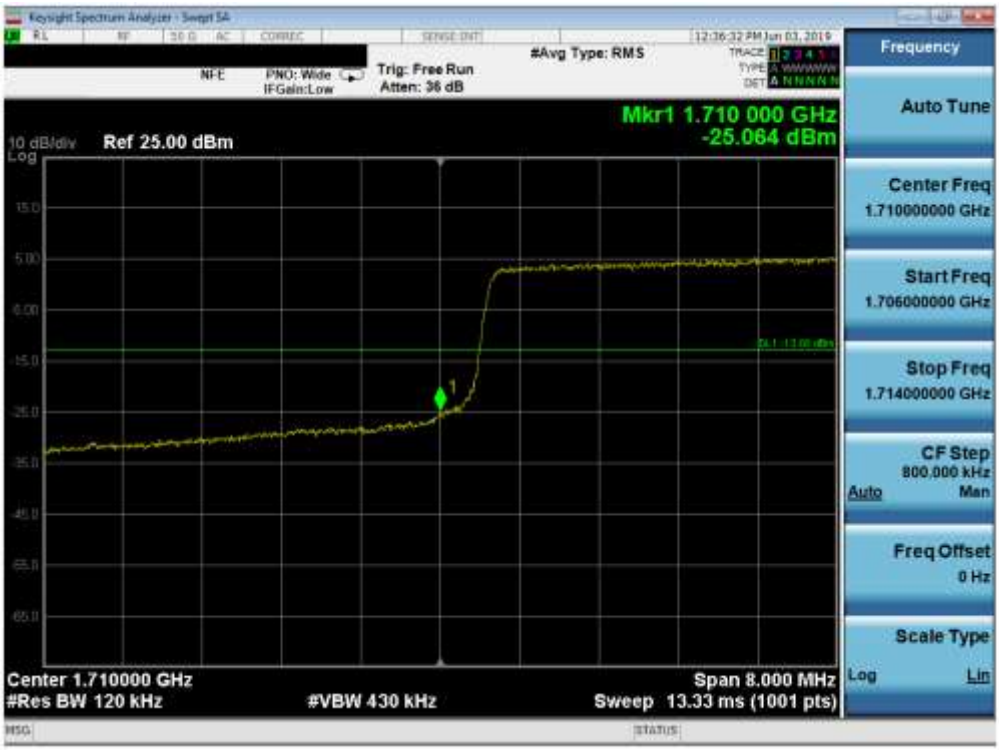
Plot 7-101. Lower Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)



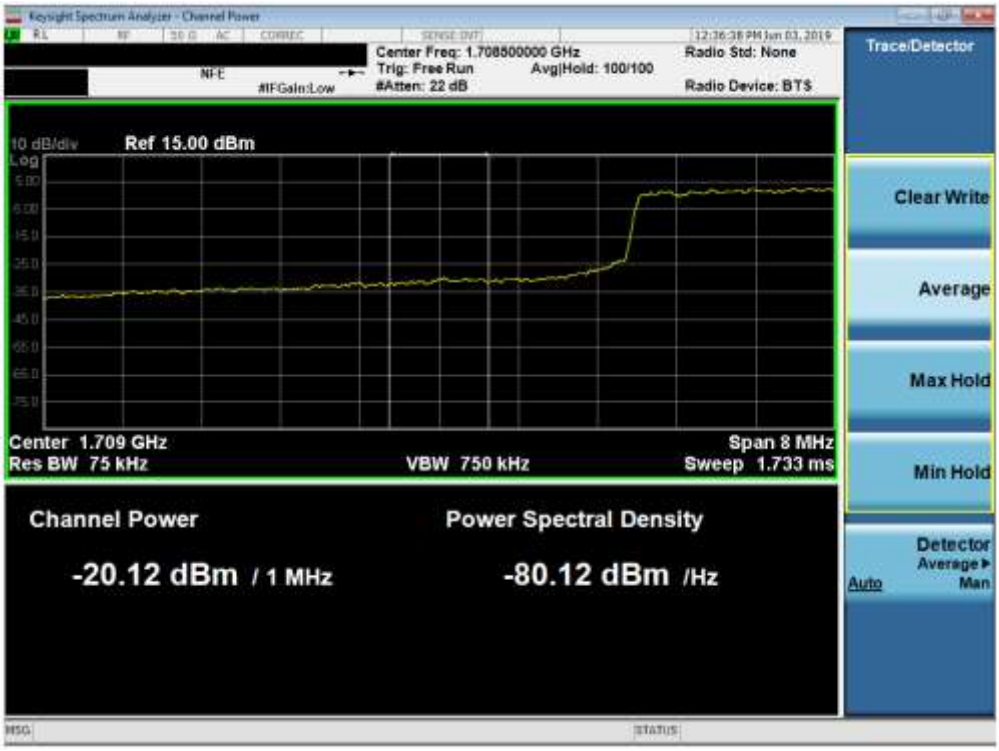
Plot 7-102. Lower Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-103. Upper Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

Plot 7-104. Upper Extended Band Edge Plot (Band 4 - 5.0MHz QPSK - Full RB Configuration)

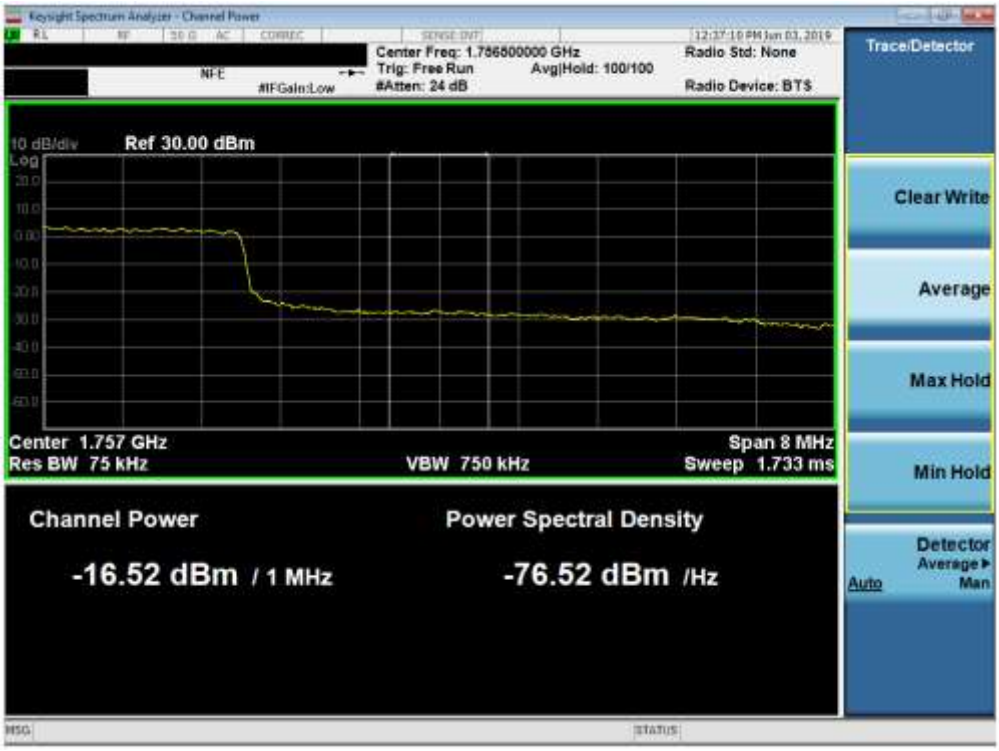


Plot 7-105. Lower Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)



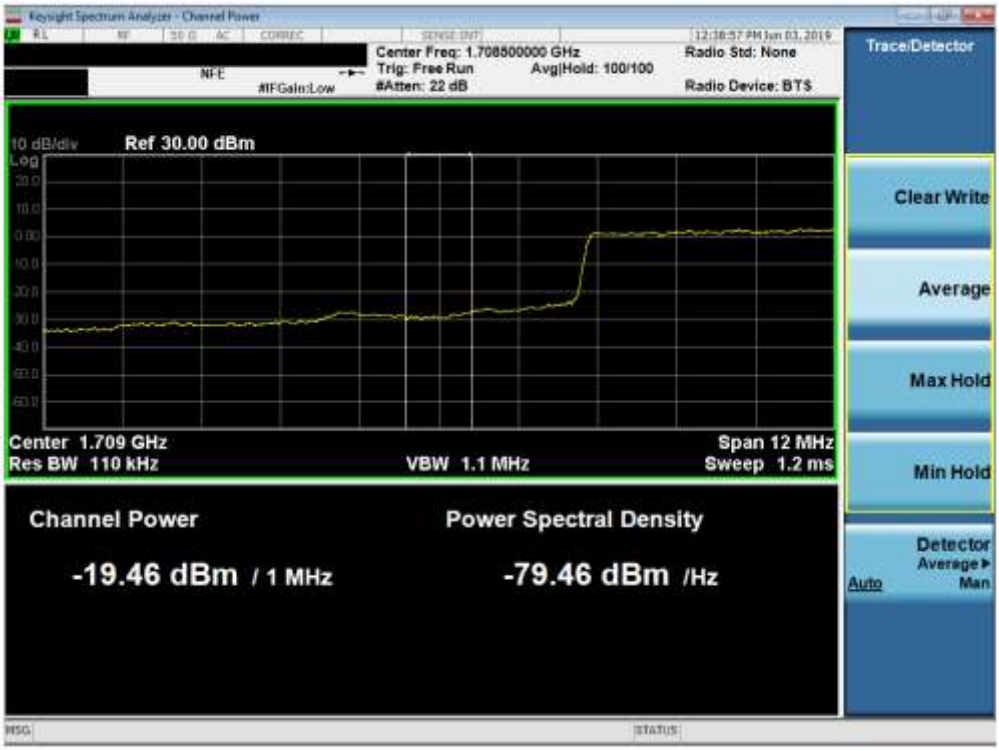
Plot 7-106. Lower Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

Plot 7-107. Upper Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

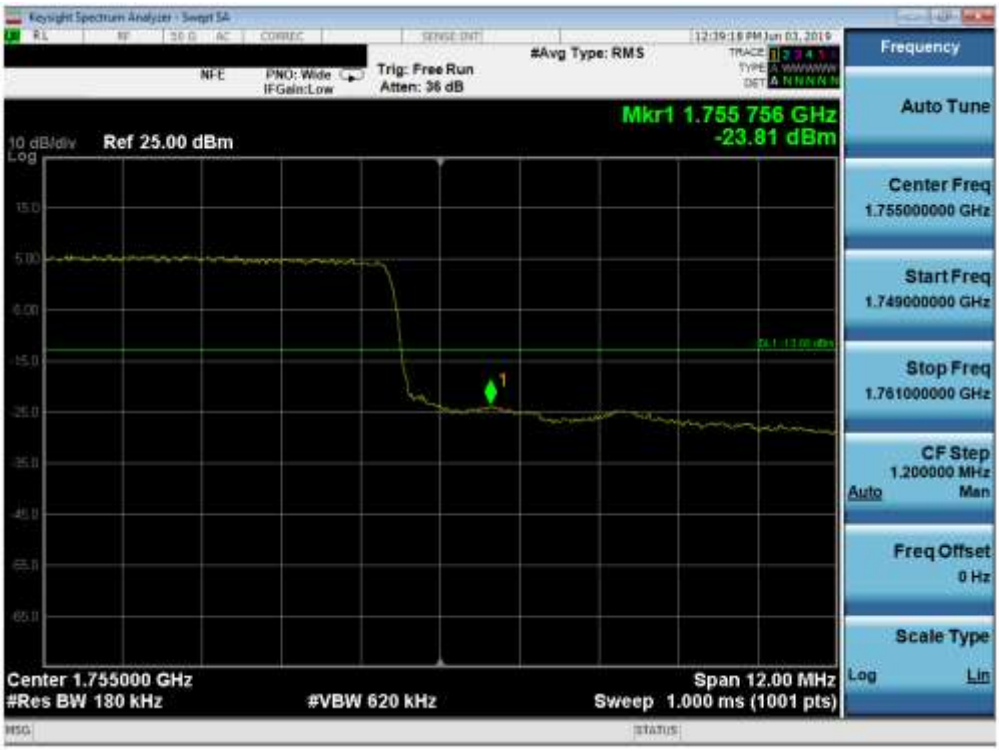


Plot 7-108. Upper Extended Band Edge Plot (Band 4 - 10.0MHz QPSK - Full RB Configuration)

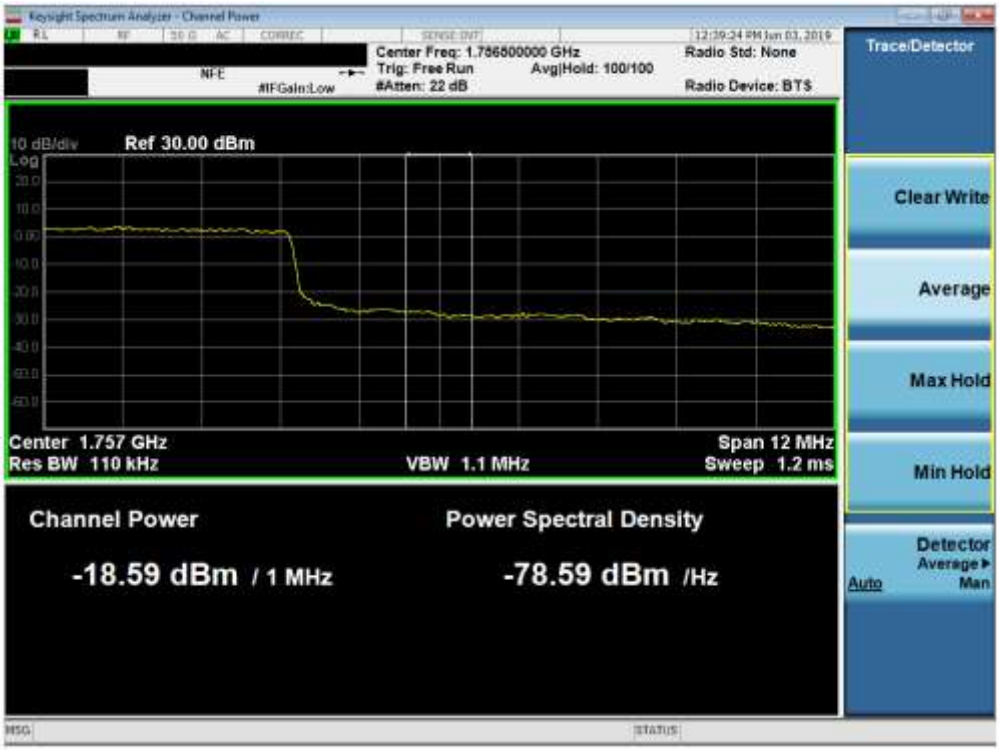
Plot 7-109. Lower Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



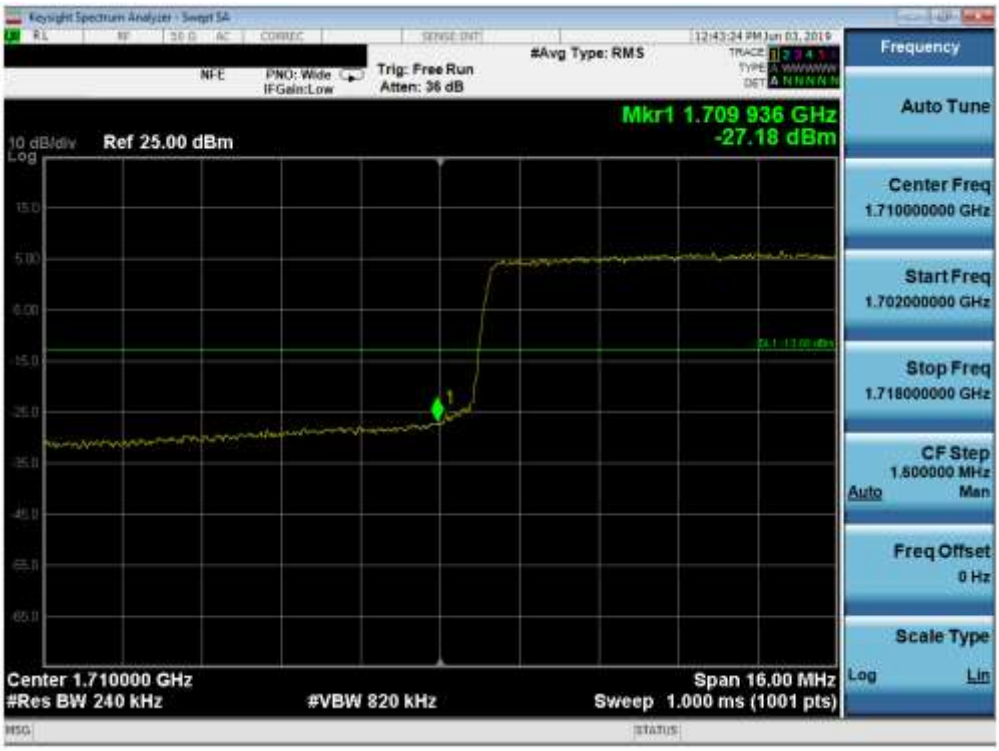
Plot 7-110. Lower Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



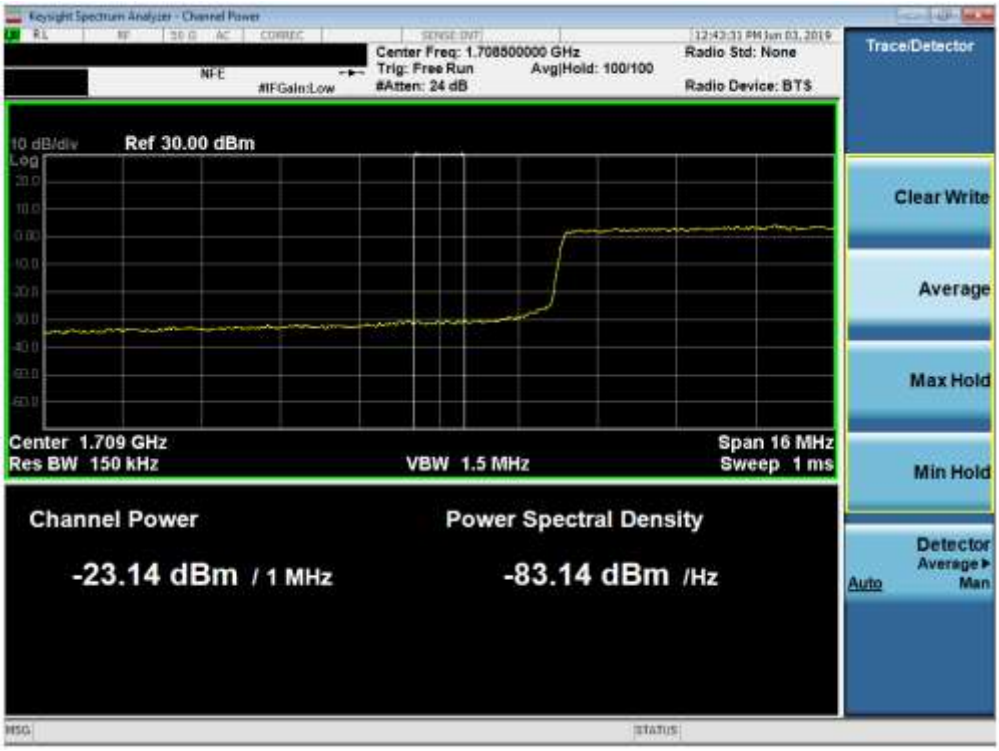
Plot 7-111. Upper Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-112. Upper Extended Band Edge Plot (Band 4 - 15.0MHz QPSK - Full RB Configuration)

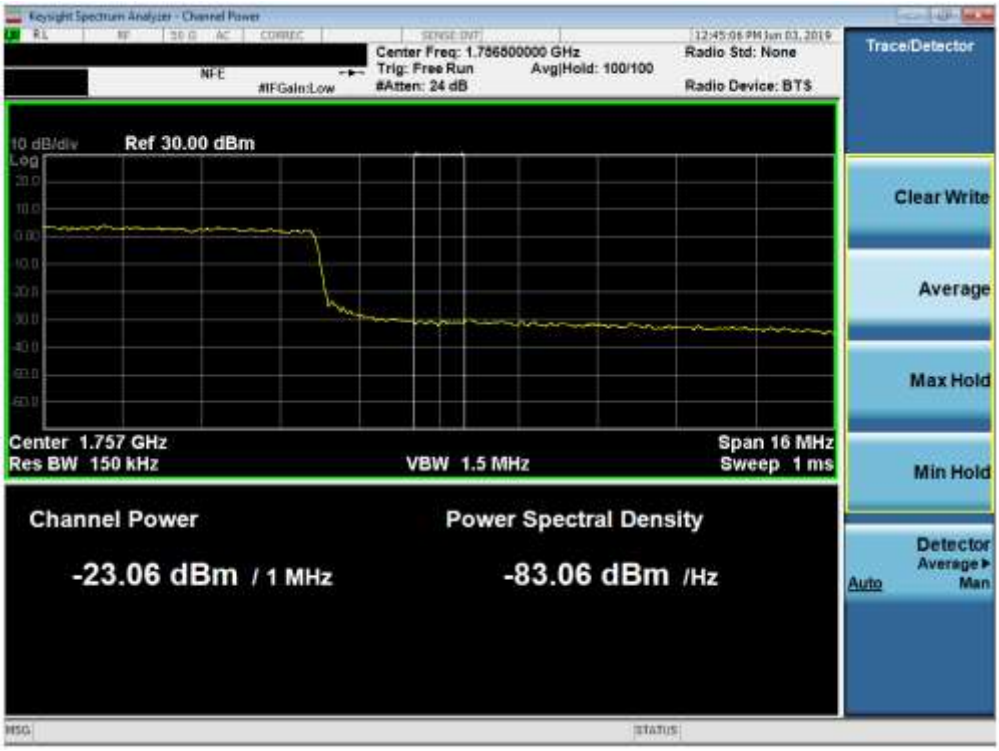


Plot 7-113. Lower Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



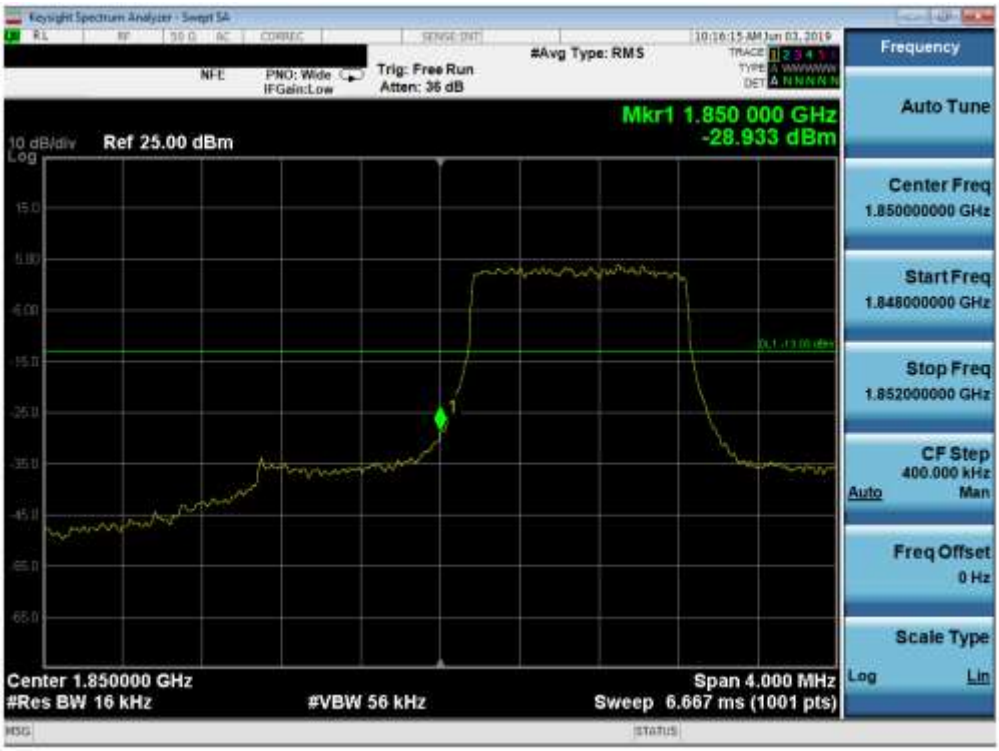
Plot 7-114. Lower Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

Plot 7-115. Upper Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-116. Upper Extended Band Edge Plot (Band 4 - 20.0MHz QPSK - Full RB Configuration)

Band 2

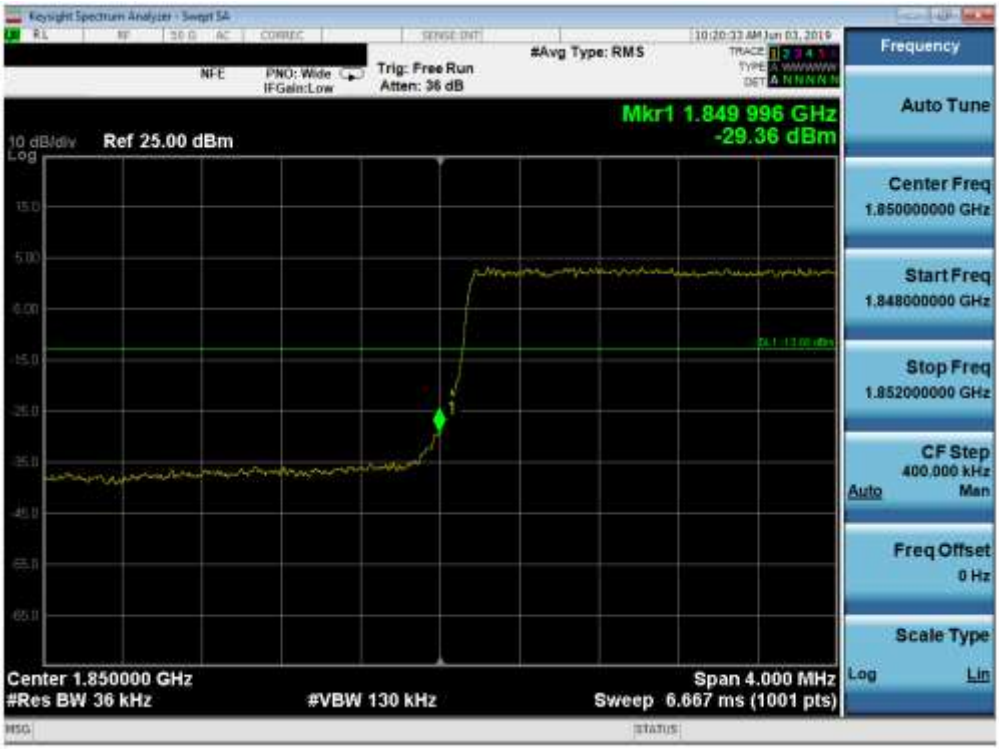


Plot 7-117. Lower Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

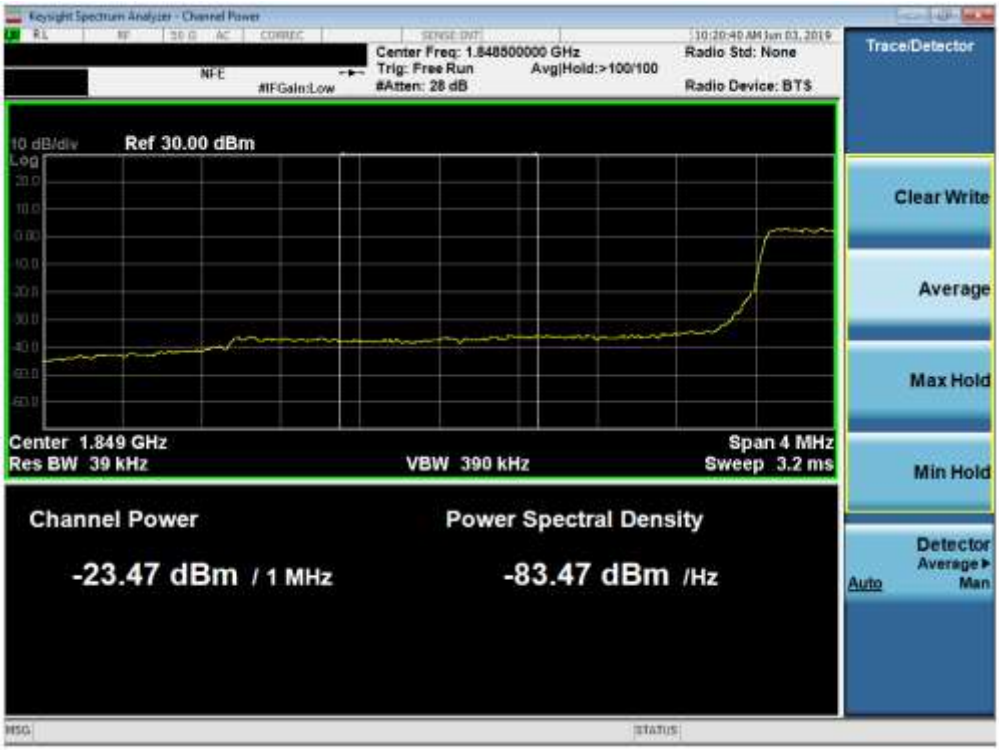
Plot 7-118. Lower Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-119. Upper Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)

Plot 7-120. Upper Extended Band Edge Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



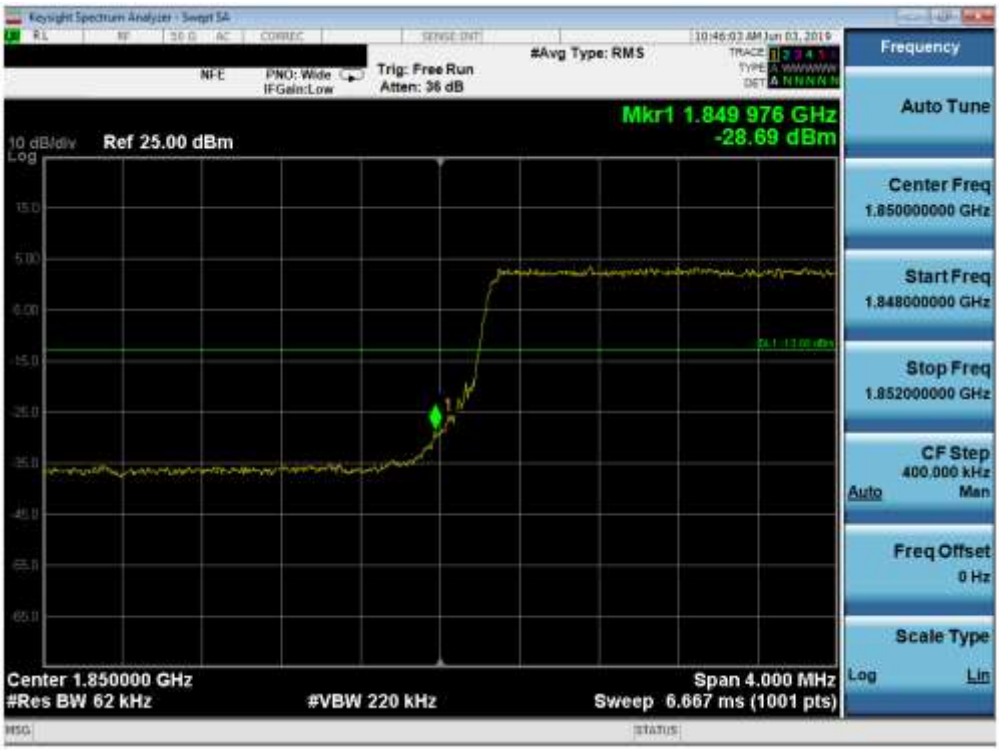
Plot 7-121. Lower Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



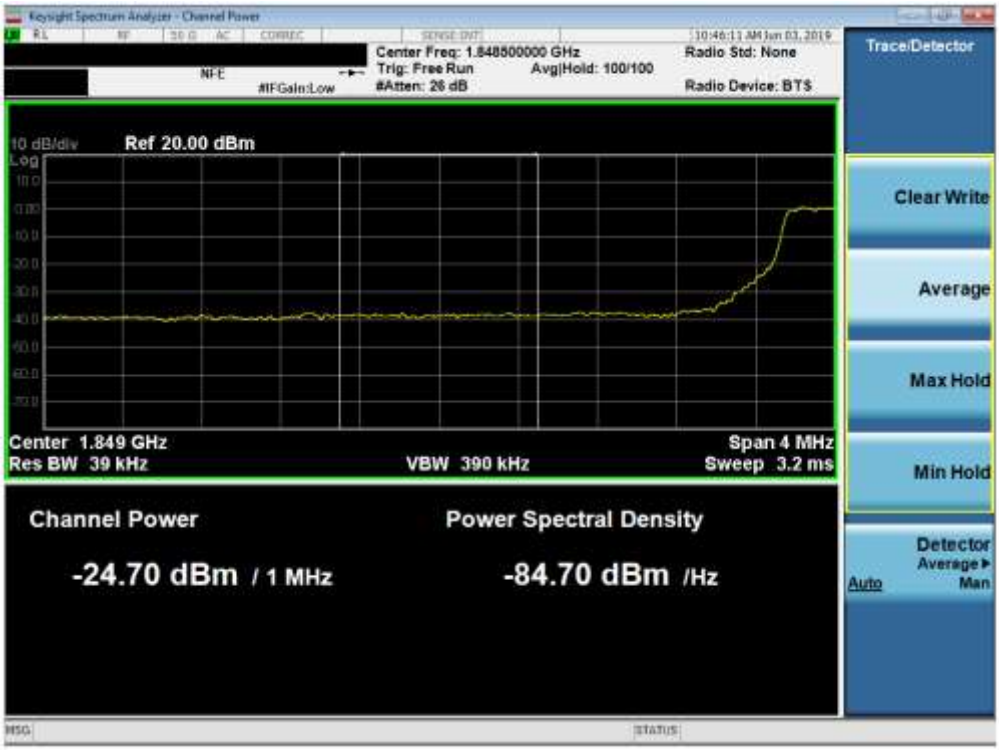
Plot 7-122. Lower Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

Plot 7-123. Upper Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)

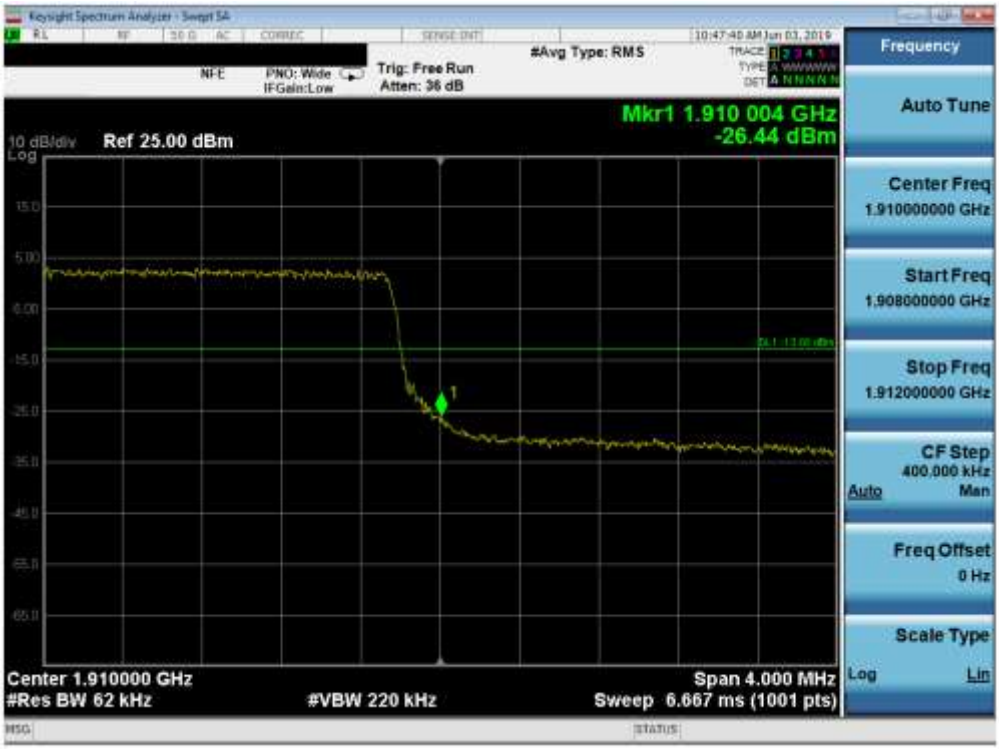
Plot 7-124. Upper Extended Band Edge Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



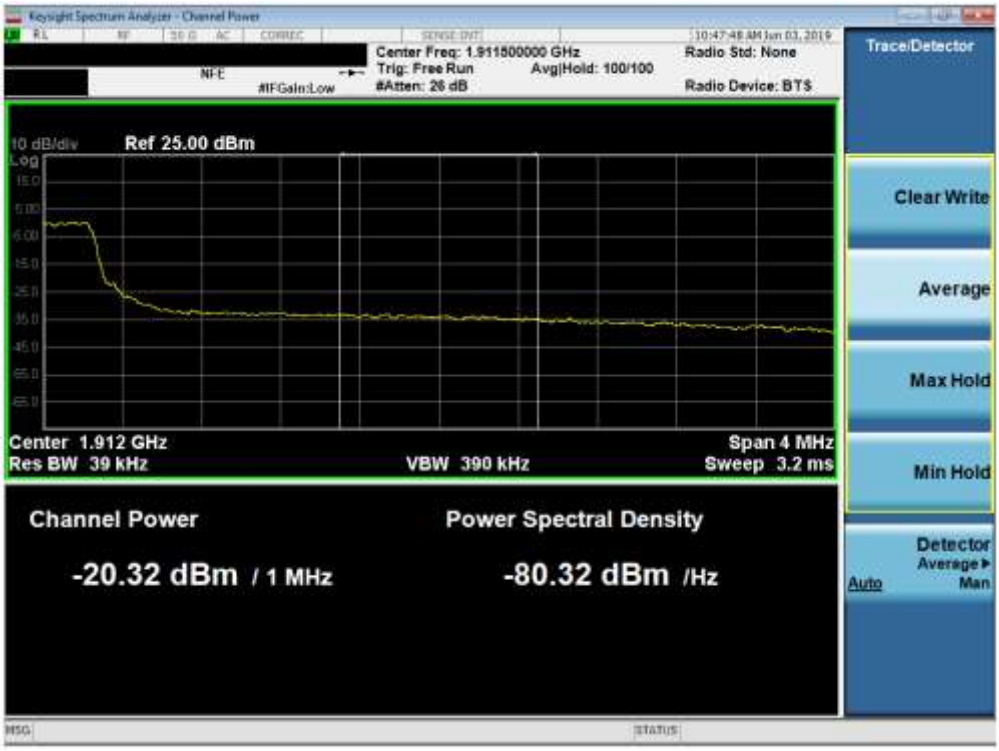
Plot 7-125. Lower Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



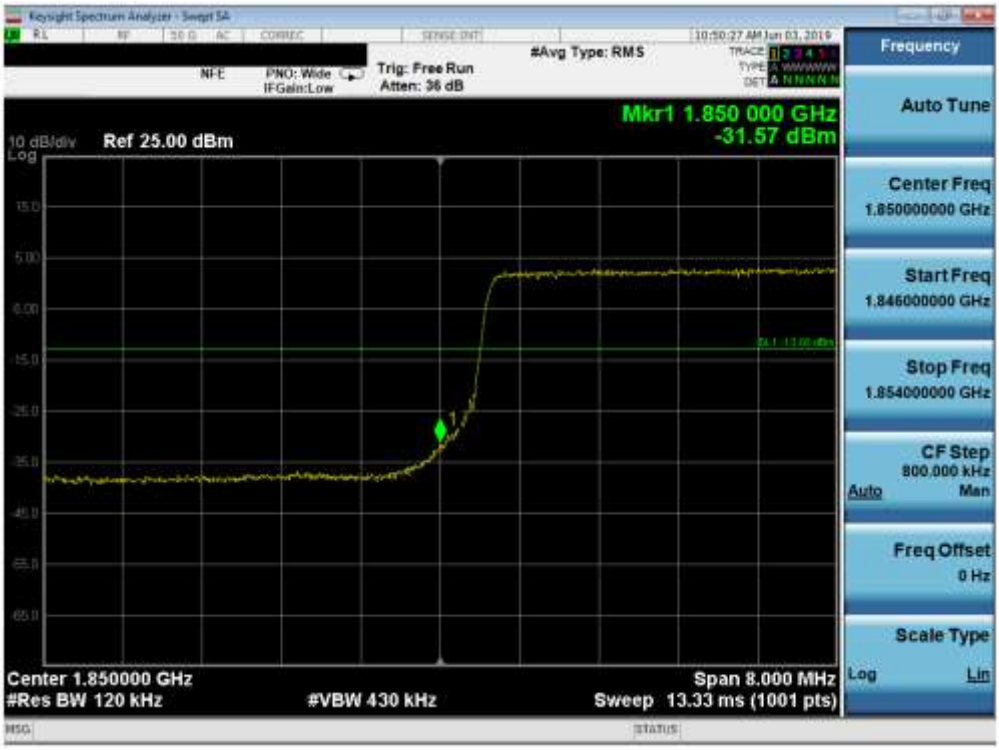
Plot 7-126. Lower Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



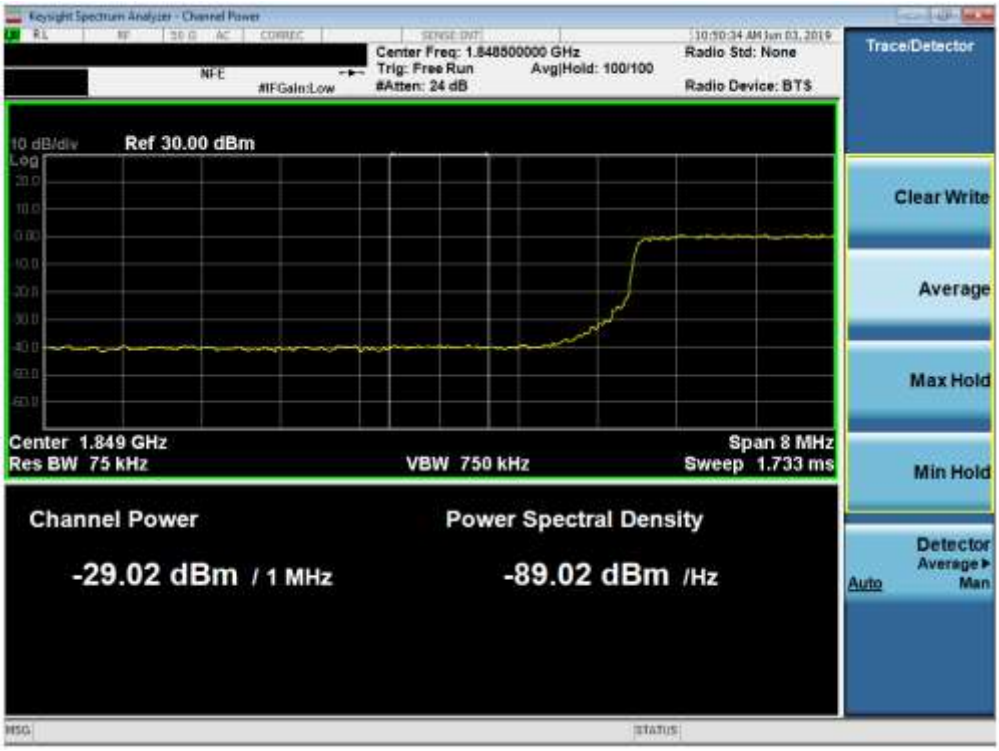
Plot 7-127. Upper Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-128. Upper Extended Band Edge Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)

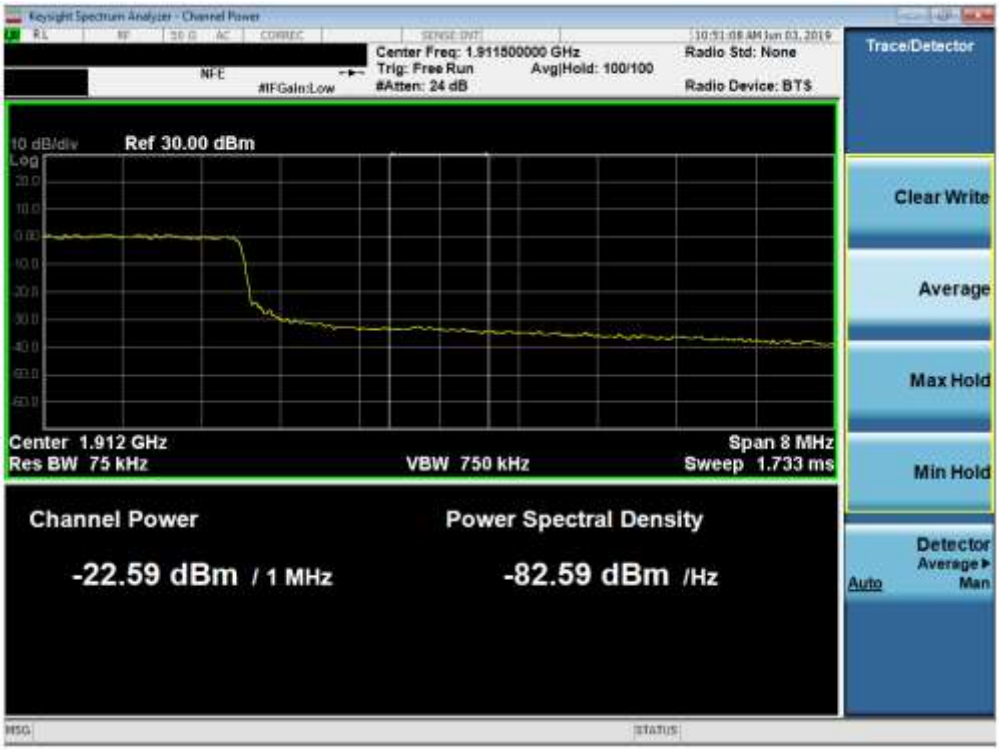


Plot 7-129. Lower Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

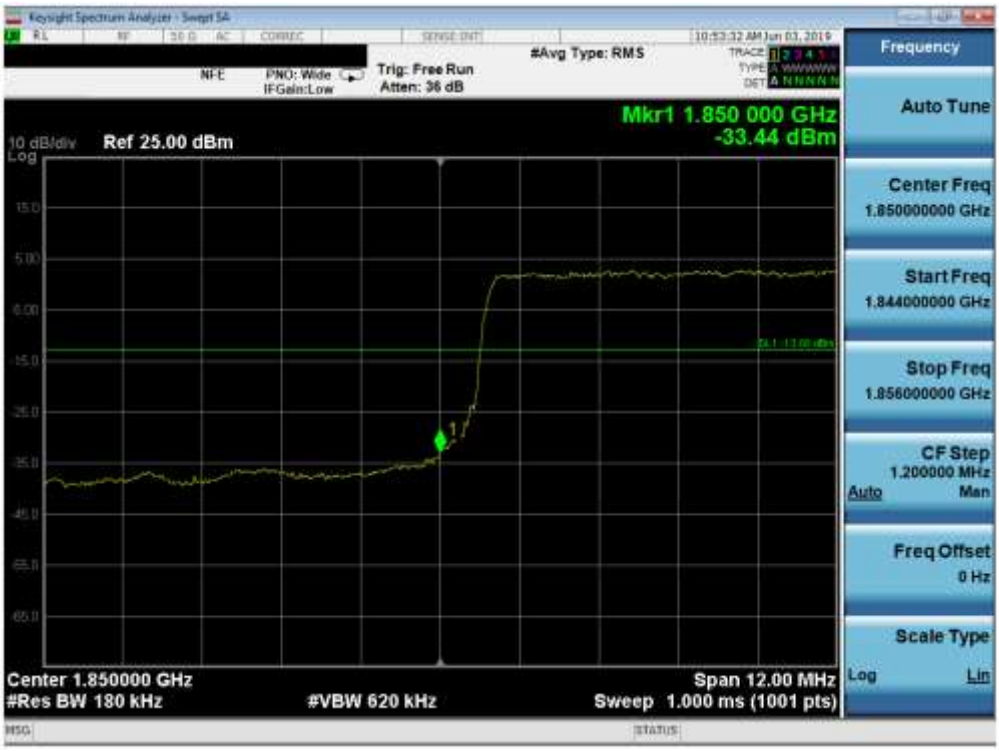


Plot 7-130. Lower Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

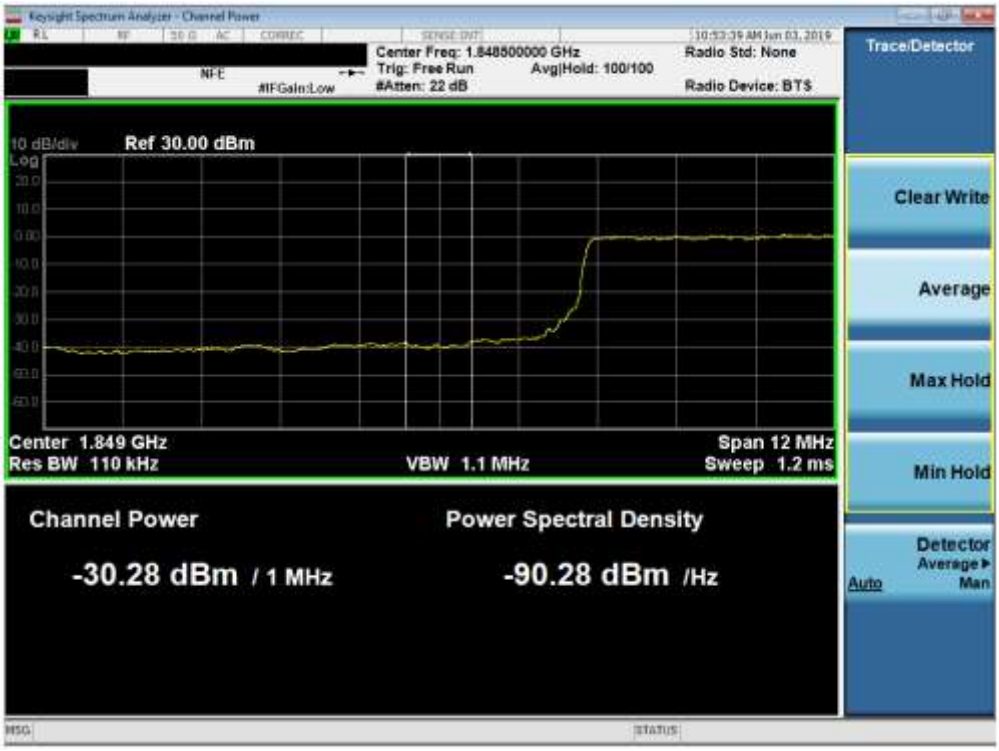
Plot 7-131. Upper Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-132. Upper Extended Band Edge Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)

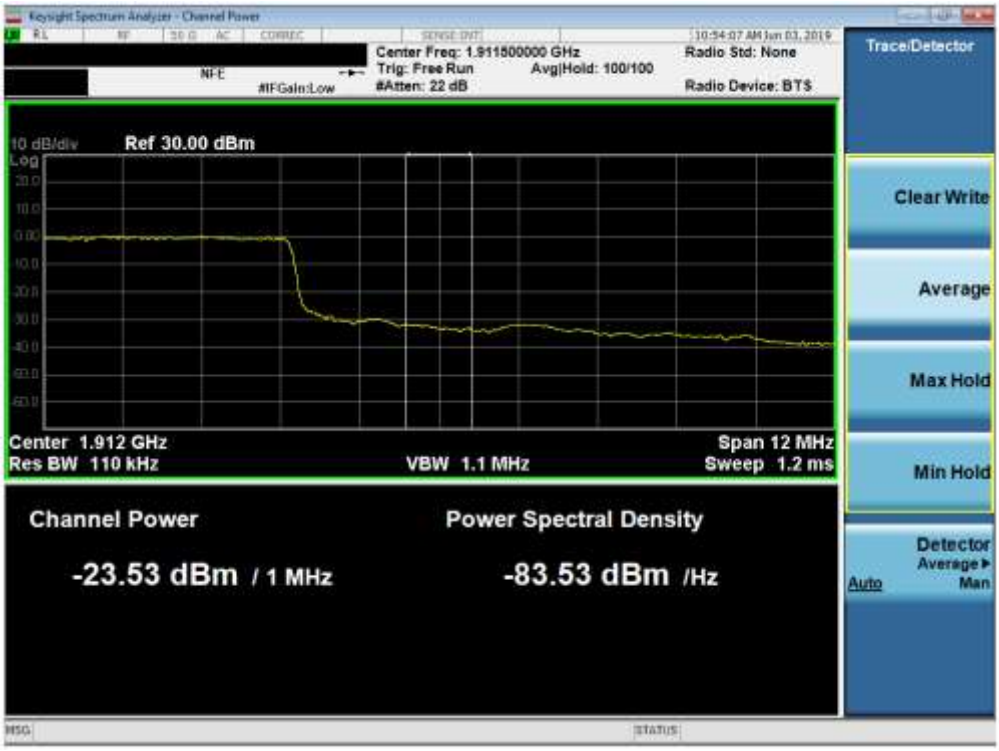


Plot 7-133. Lower Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

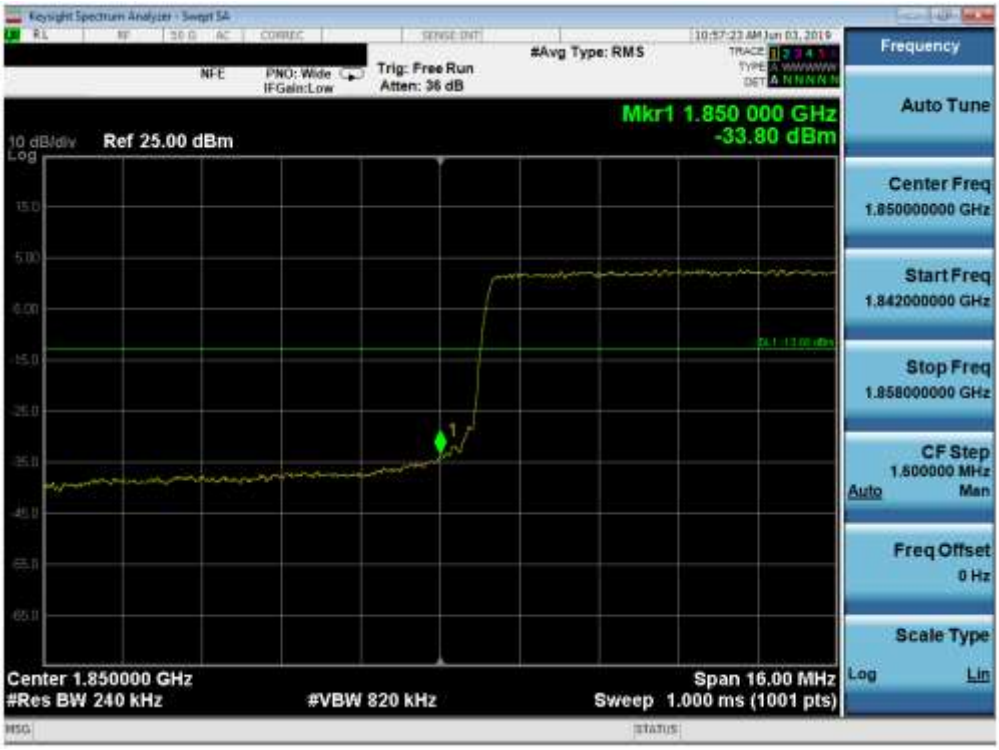


Plot 7-134. Lower Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)

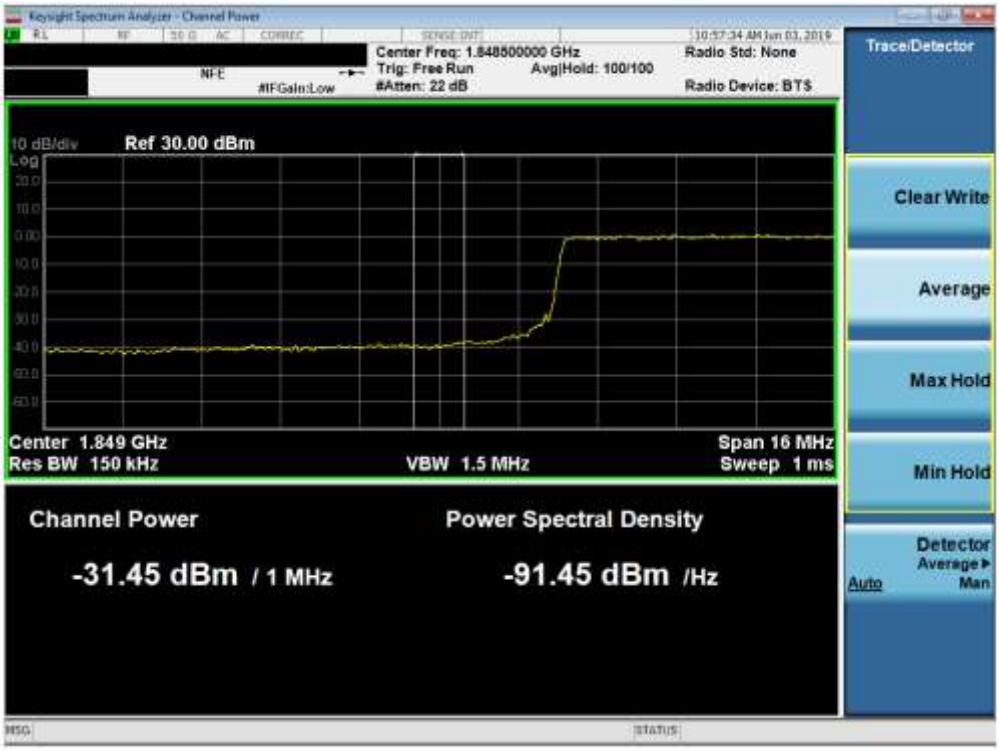
Plot 7-135. Upper Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



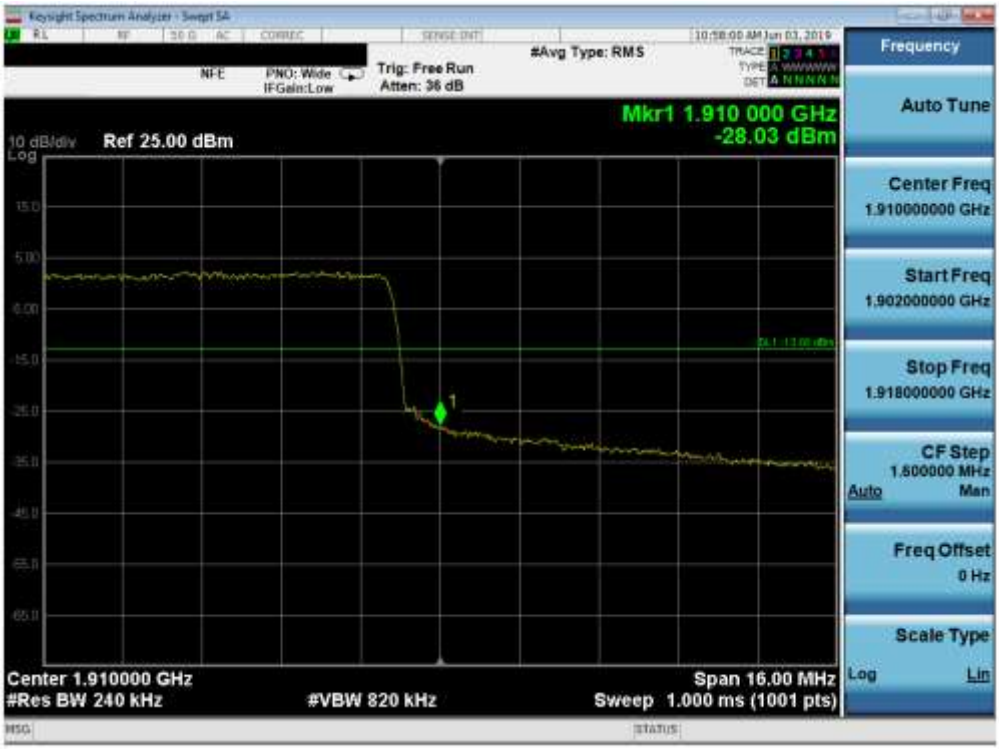
Plot 7-136. Upper Extended Band Edge Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



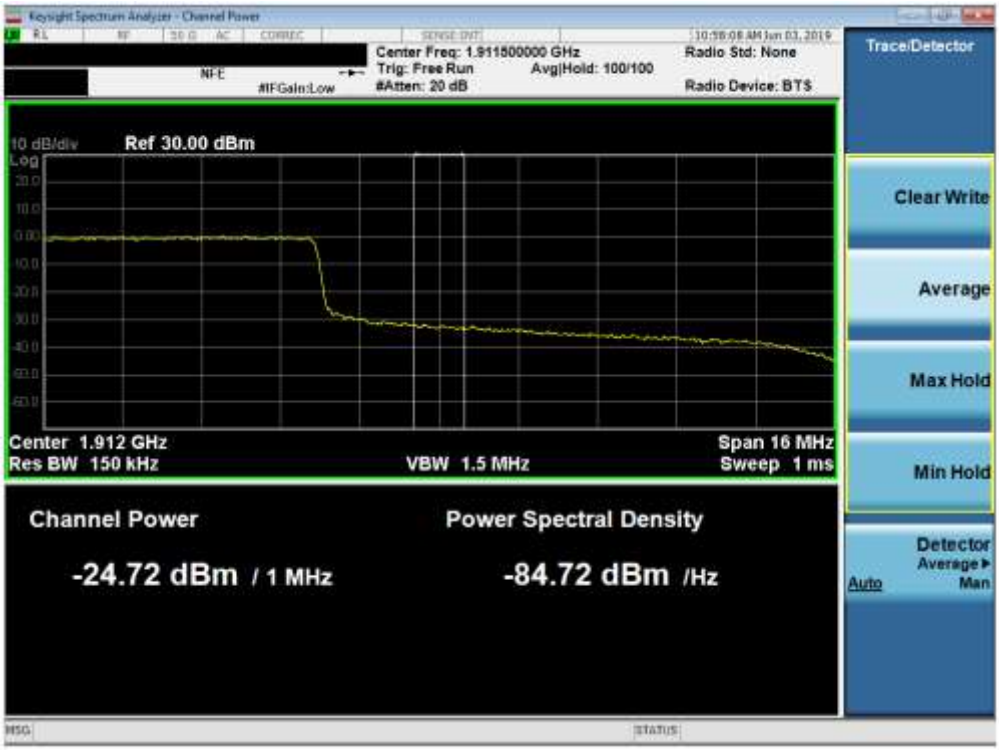
Plot 7-137. Lower Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-138. Lower Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-139. Upper Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-140. Upper Extended Band Edge Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)

7.5 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7.1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

Test Setup

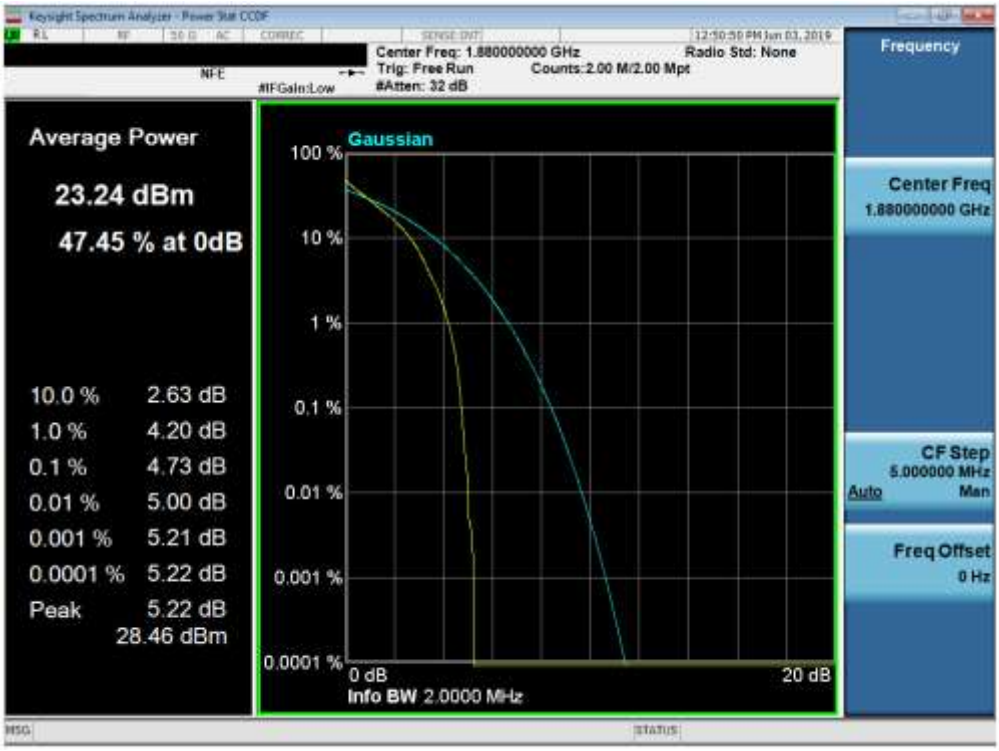
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-4. Test Instrument & Measurement Setup

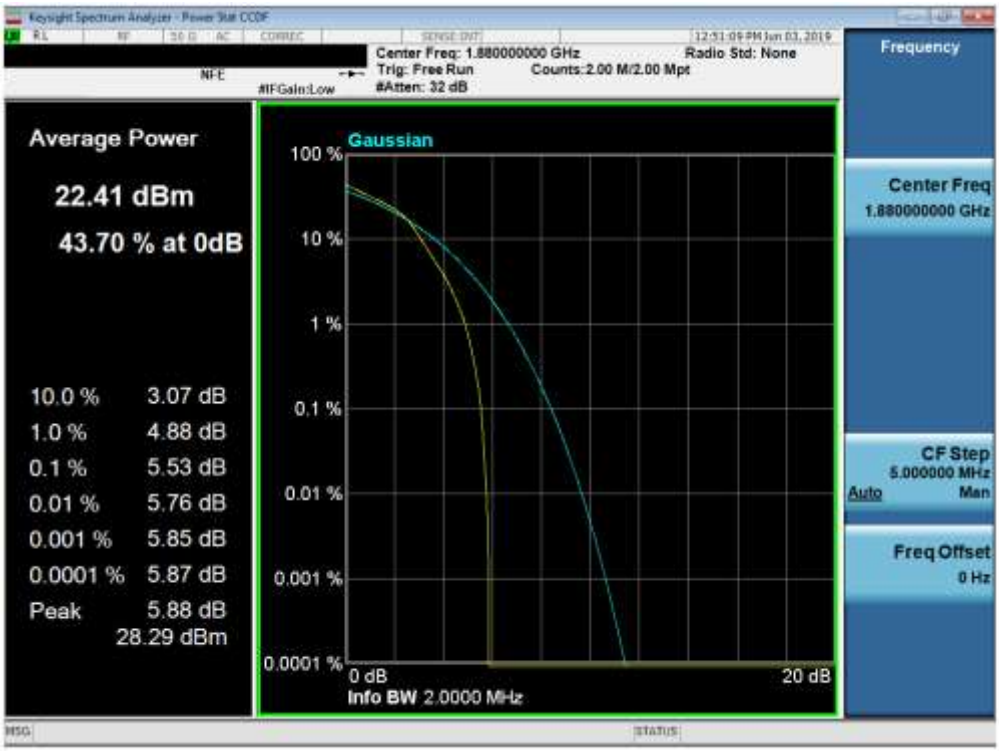
Test Notes

None.

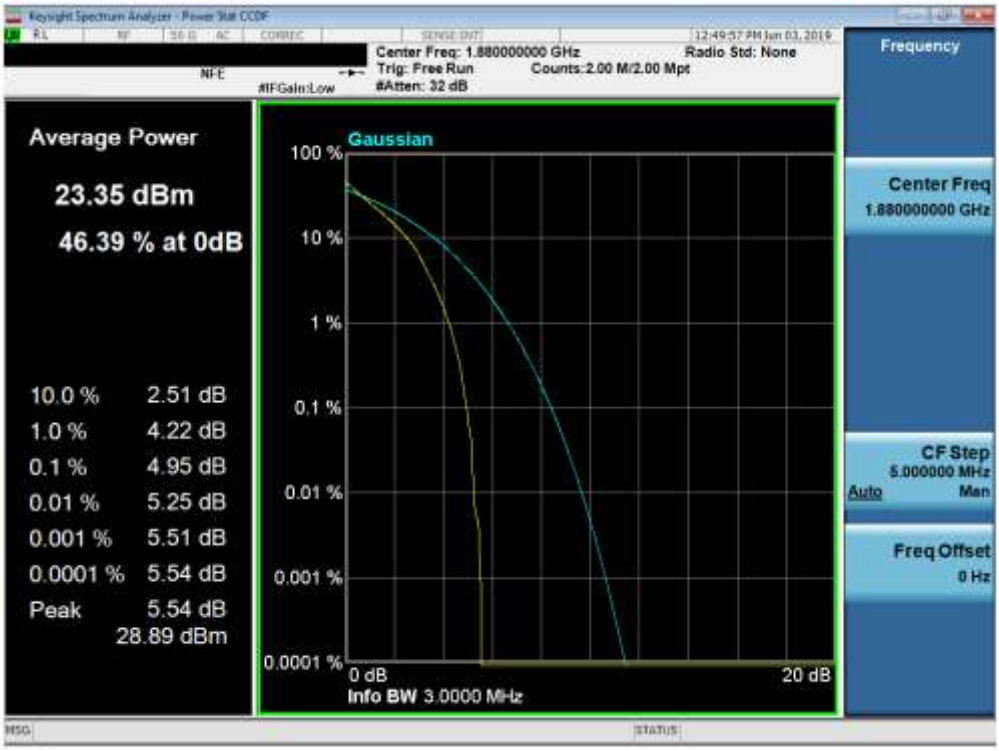
Band 2



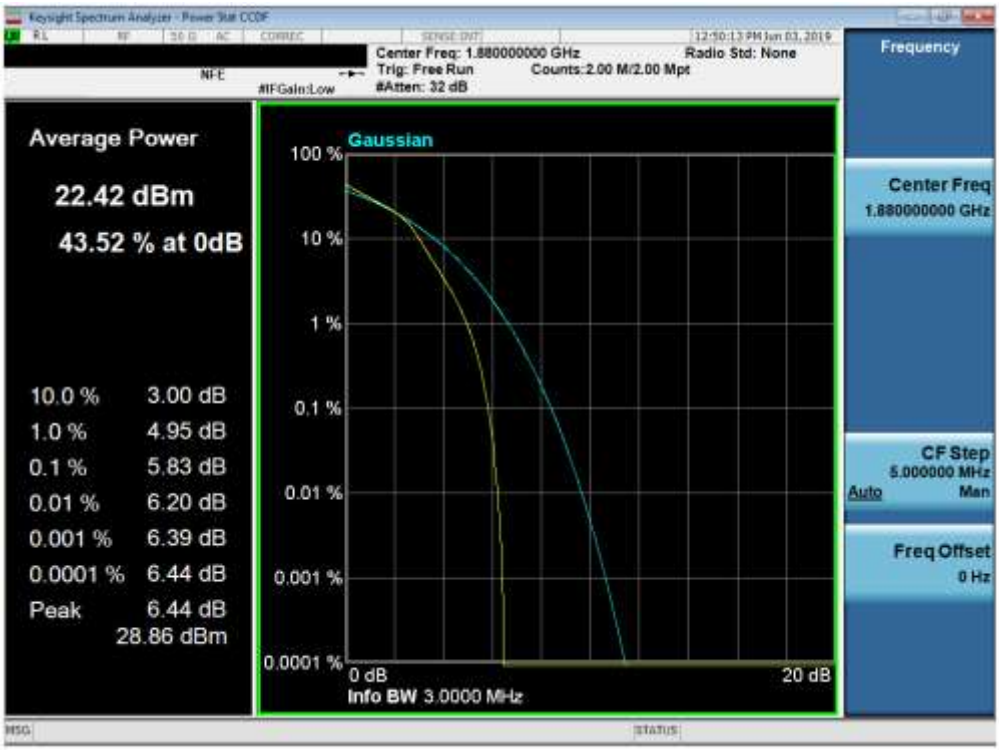
Plot 7-141. PAR Plot (Band 2 - 1.4MHz QPSK - Full RB Configuration)



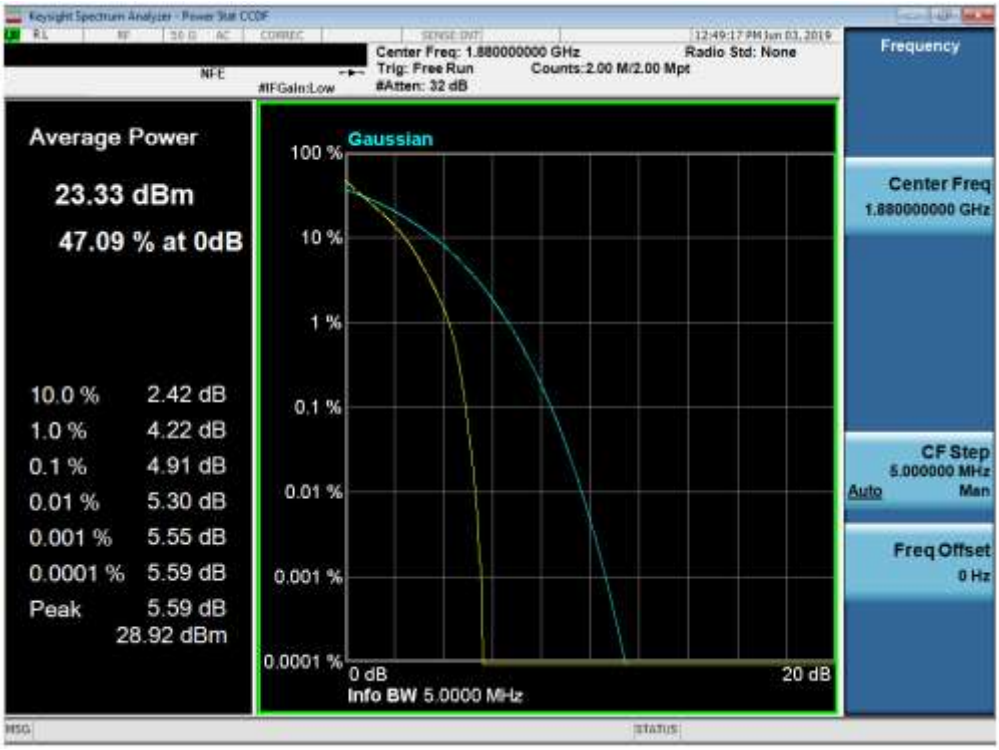
Plot 7-142. PAR Plot (Band 2 - 1.4MHz 16-QAM - Full RB Configuration)



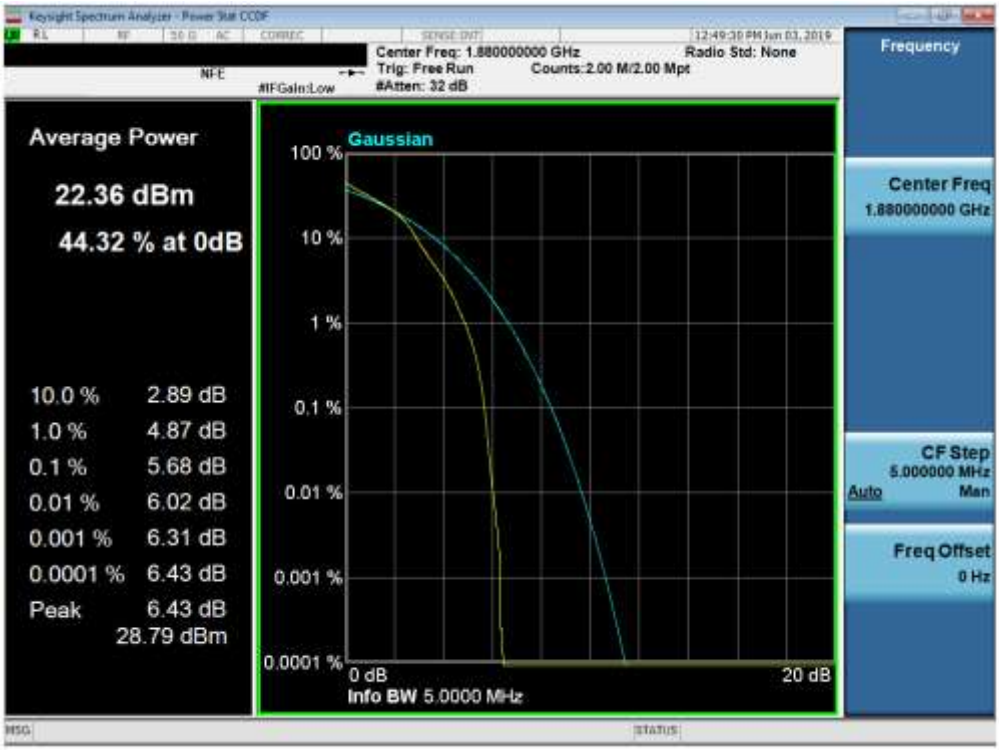
Plot 7-143. PAR Plot (Band 2 - 3.0MHz QPSK - Full RB Configuration)



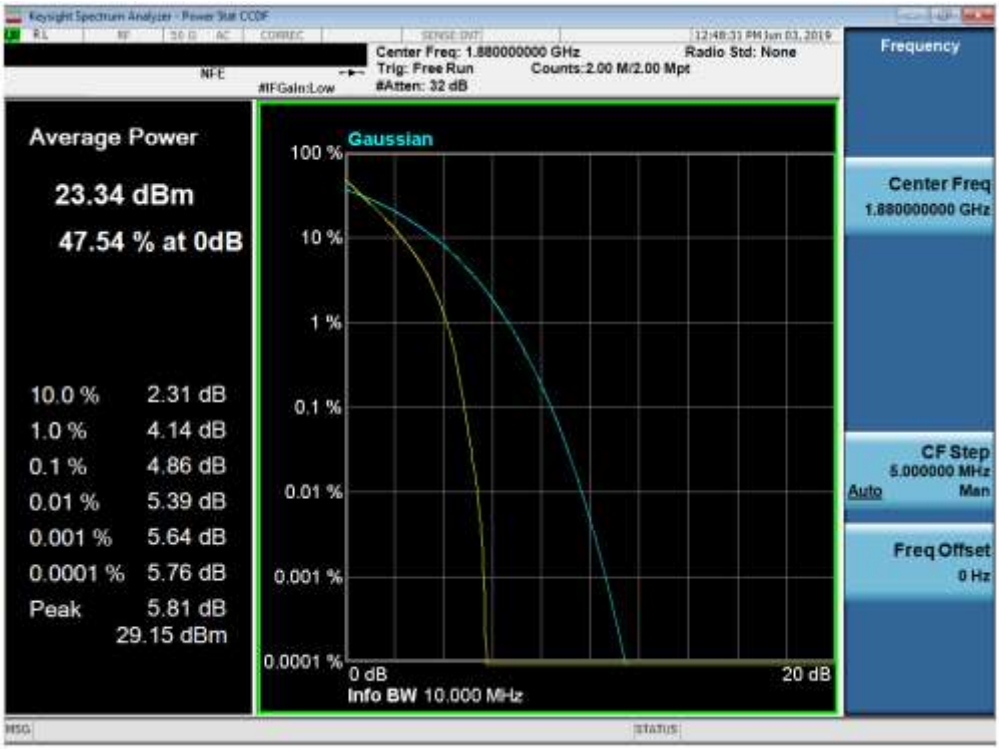
Plot 7-144. PAR Plot (Band 2 - 3.0MHz 16-QAM - Full RB Configuration)



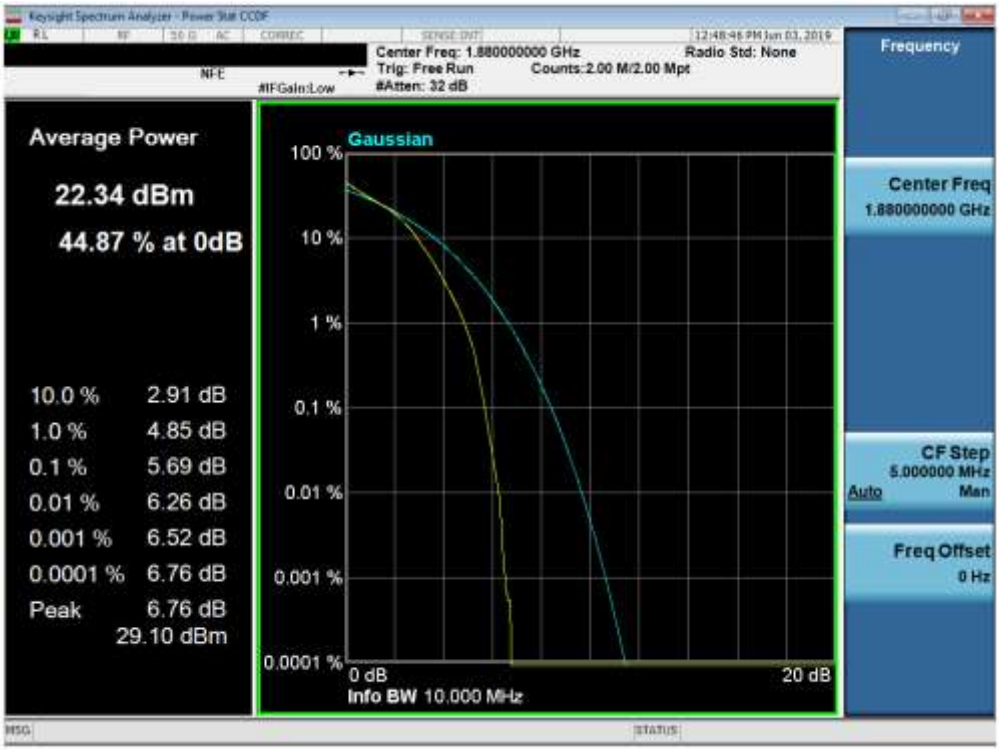
Plot 7-145. PAR Plot (Band 2 - 5.0MHz QPSK - Full RB Configuration)



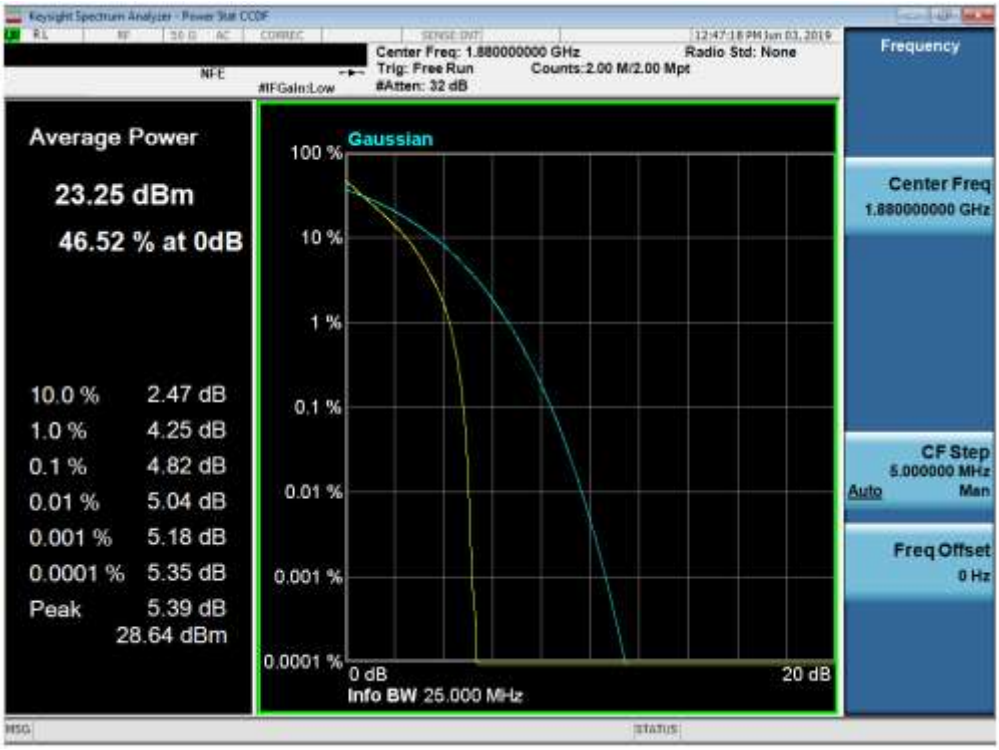
Plot 7-146. PAR Plot (Band 2 - 5.0MHz 16-QAM - Full RB Configuration)



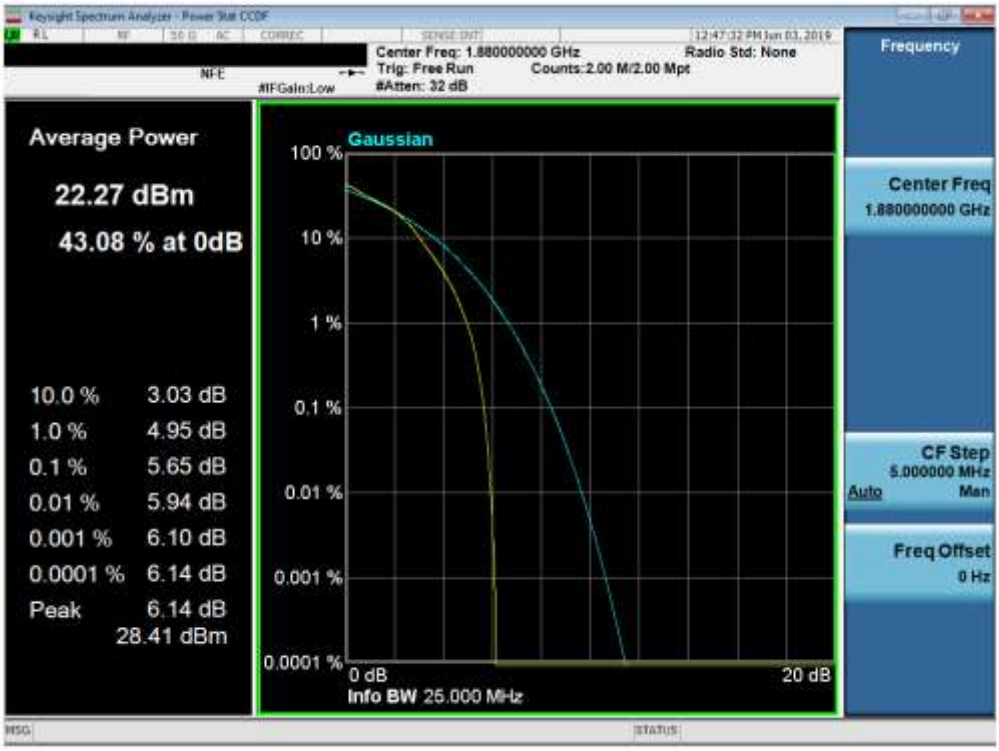
Plot 7-147. PAR Plot (Band 2 - 10.0MHz QPSK - Full RB Configuration)



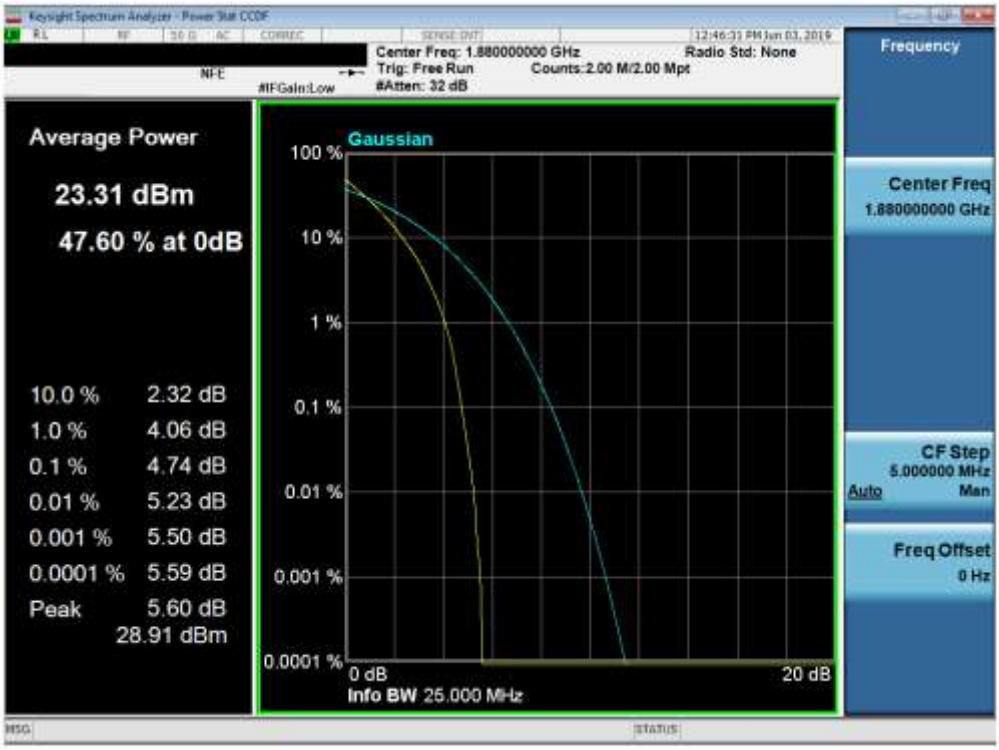
Plot 7-148. PAR Plot (Band 2 - 10.0MHz 16-QAM - Full RB Configuration)



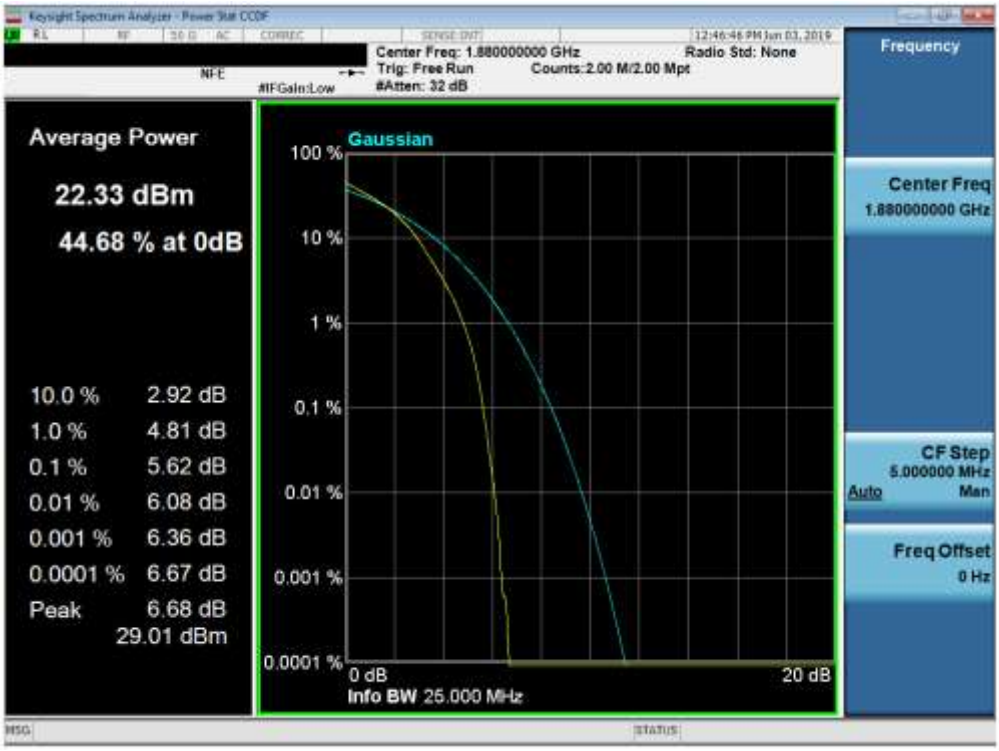
Plot 7-149. PAR Plot (Band 2 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-150. PAR Plot (Band 2 - 15.0MHz 16-QAM - Full RB Configuration)



Plot 7-151. PAR Plot (Band 2 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-152. PAR Plot (Band 2 - 20.0MHz 16-QAM - Full RB Configuration)

7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

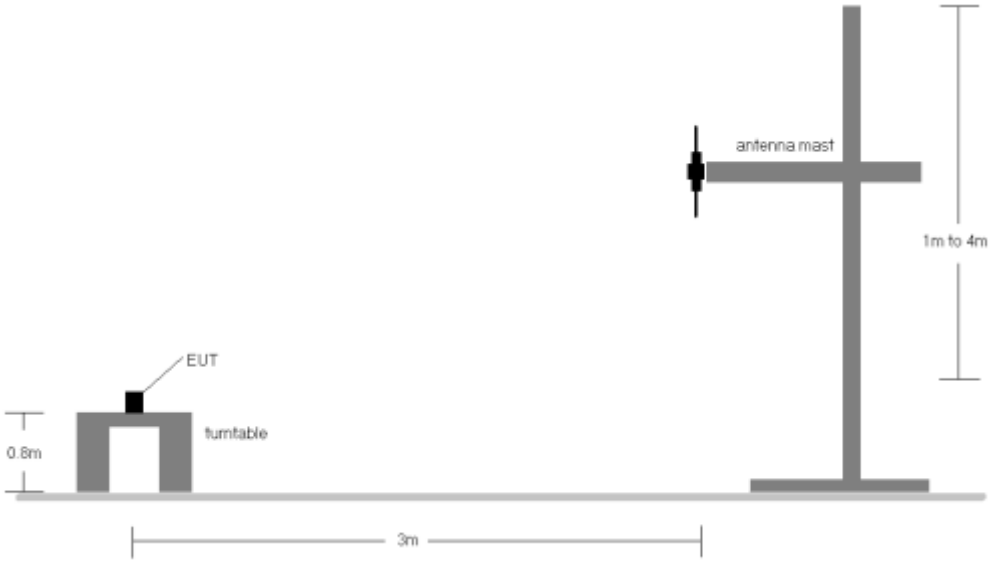


Figure 7-5. Radiated Test Setup <1GHz

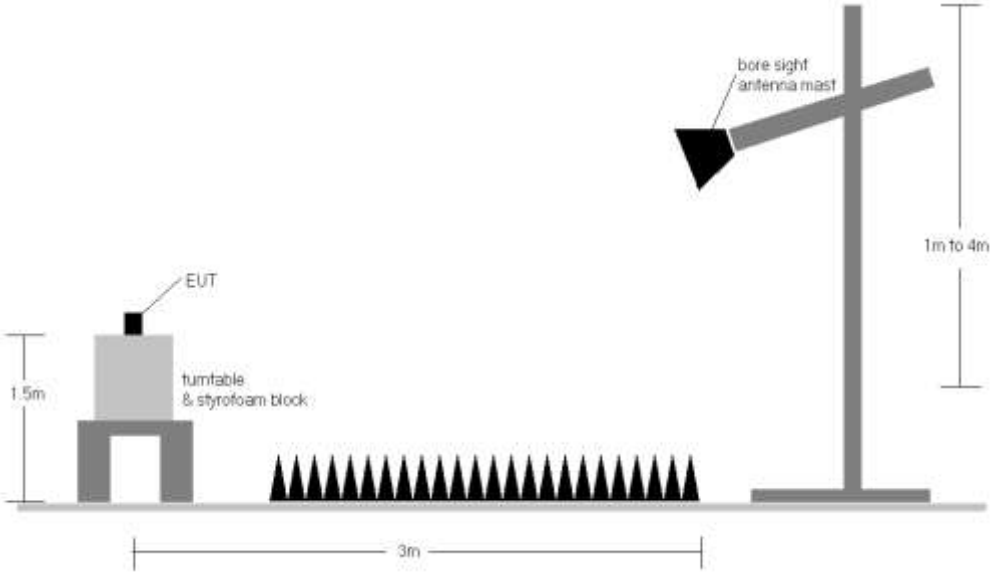


Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
699.70	1.4	QPSK	H	190	296	1 / 3	12.86	3.40	16.26	0.042	34.77	-18.51
707.50	1.4	QPSK	H	163	291	1 / 3	12.66	3.65	**16.31**	0.043	34.77	-18.46
715.30	1.4	QPSK	H	182	295	1 / 3	12.54	3.70	16.24	0.042	34.77	-18.53
707.50	1.4	16-QAM	H	163	291	1 / 3	11.48	3.65	15.13	0.033	34.77	-19.64
700.50	3	QPSK	H	190	296	1 / 7	12.86	3.40	16.26	0.042	34.77	-18.51
707.50	3	QPSK	H	163	291	1 / 7	12.61	3.65	16.26	0.042	34.77	-18.51
714.50	3	QPSK	H	182	295	1 / 7	12.58	3.70	**16.28**	0.042	34.77	-18.49
714.50	3	16-QAM	H	182	295	1 / 7	11.45	3.70	15.15	0.033	34.77	-19.62
701.50	5	QPSK	H	190	296	1 / 12	12.88	3.40	**16.28**	0.042	34.77	-18.49
707.50	5	QPSK	H	163	291	1 / 12	12.58	3.65	16.23	0.042	34.77	-18.54
713.50	5	QPSK	H	182	295	1 / 12	12.55	3.70	16.25	0.042	34.77	-18.52
701.50	5	16-QAM	H	190	296	1 / 12	11.60	3.40	15.00	0.032	34.77	-19.77
704.00	10	QPSK	H	190	296	1 / 25	15.02	3.50	16.37	0.043	34.77	-18.40
707.50	10	QPSK	H	163	291	1 / 25	14.84	3.65	16.34	0.043	34.77	-18.43
711.00	10	QPSK	H	182	295	1 / 25	15.19	3.70	**16.74**	**0.047**	34.77	-18.03
711.00	10	16-QAM	H	182	295	1 / 25	13.98	3.70	**15.53**	0.036	34.77	-19.24
711.00	10	QPSK	V	148	196	1 / 25	15.02	3.70	16.57	0.045	34.77	-18.20

Table 7-3. ERP Data (Band 12)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	138	23	1 / 3	11.74	6.70	18.44	0.070	38.45	-20.01
836.50	1.4	QPSK	H	135	33	1 / 0	11.77	6.70	**18.47**	0.070	38.45	-19.98
848.30	1.4	QPSK	H	132	30	1 / 3	11.54	6.70	18.24	0.067	38.45	-20.21
836.50	1.4	16-QAM	H	135	33	1 / 0	9.64	6.70	16.34	0.043	38.45	-22.11
825.50	3	QPSK	H	138	23	1 / 7	11.52	6.70	18.22	0.066	38.45	-20.23
836.50	3	QPSK	H	135	33	1 / 0	11.74	6.70	**18.44**	0.070	38.45	-20.01
847.50	3	QPSK	H	132	30	1 / 7	11.66	6.65	18.31	0.068	38.45	-20.14
836.50	3	16-QAM	H	135	33	1 / 0	9.60	6.70	16.30	0.043	38.45	-22.15
826.50	5	QPSK	H	138	23	1 / 12	11.42	6.70	18.12	0.065	38.45	-20.33
836.50	5	QPSK	H	135	33	1 / 0	11.46	6.70	**18.16**	0.065	38.45	-20.29
846.50	5	QPSK	H	132	30	1 / 12	11.50	6.60	18.10	0.065	38.45	-20.35
836.50	5	16-QAM	H	135	33	1 / 0	9.15	6.70	15.85	0.038	38.45	-22.60
829.00	10	QPSK	H	138	23	1 / 25	13.93	6.70	**18.48**	**0.070**	38.45	-19.97
836.50	10	QPSK	H	135	33	1 / 0	13.77	6.70	18.32	0.068	38.45	-20.13
844.00	10	QPSK	H	132	30	1 / 25	14.02	6.60	18.47	0.070	38.45	-19.98
829.00	10	16-QAM	H	138	23	1 / 25	12.64	6.70	17.19	0.052	38.45	-21.26
829.00	10	QPSK	V	151	189	1 / 25	13.47	6.70	18.02	0.063	38.45	-20.43

Table 7-4. ERP Data (Band 5)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	H	136	202	1 / 3	13.82	9.44	**23.26**	0.212	30.00	-6.74
1732.50	1.4	QPSK	H	129	195	1 / 5	13.33	9.31	22.64	0.184	30.00	-7.36
1754.30	1.4	QPSK	H	131	176	1 / 0	12.63	9.21	21.84	0.153	30.00	-8.16
1710.70	1.4	16-QAM	H	136	202	1 / 3	13.49	9.44	**22.93**	0.197	30.00	-7.07
1711.50	3	QPSK	H	136	202	1 / 7	13.72	9.44	**23.15**	0.207	30.00	-6.85
1732.50	3	QPSK	H	129	195	1 / 14	13.33	9.31	22.64	0.184	30.00	-7.36
1753.50	3	QPSK	H	131	176	1 / 0	12.66	9.21	21.87	0.154	30.00	-8.13
1711.50	3	16-QAM	H	136	202	1 / 7	13.26	9.44	**22.69**	0.186	30.00	-7.31
1712.50	5	QPSK	H	136	202	1 / 12	13.94	9.43	**23.37**	0.218	30.00	-6.63
1732.50	5	QPSK	H	129	195	1 / 24	13.49	9.31	22.80	0.190	30.00	-7.20
1752.50	5	QPSK	H	131	176	1 / 0	12.83	9.21	22.03	0.160	30.00	-7.97
1712.50	5	16-QAM	H	136	202	1 / 12	12.71	9.43	**22.14**	0.164	30.00	-7.86
1715.00	10	QPSK	H	136	202	1 / 25	13.98	9.42	**23.39**	**0.219**	30.00	-6.61
1732.50	10	QPSK	H	129	195	1 / 49	13.57	9.31	22.88	0.194	30.00	-7.12
1750.00	10	QPSK	H	131	176	1 / 0	12.78	9.20	21.98	0.158	30.00	-8.02
1715.00	10	16-QAM	H	136	202	1 / 25	13.46	9.42	**22.87**	0.194	30.00	-7.13
1717.50	15	QPSK	H	136	202	1 / 37	13.94	9.40	**23.34**	0.216	30.00	-6.66
1732.50	15	QPSK	H	129	195	1 / 74	13.28	9.31	22.59	0.181	30.00	-7.41
1747.50	15	QPSK	H	131	176	1 / 0	12.61	9.22	21.82	0.152	30.00	-8.18
1717.50	15	16-QAM	H	136	202	1 / 37	12.92	9.40	**22.32**	0.171	30.00	-7.68
1720.00	20	QPSK	H	136	202	1 / 50	13.92	9.38	**23.30**	0.214	30.00	-6.70
1732.50	20	QPSK	H	129	195	1 / 99	13.50	9.31	22.81	0.191	30.00	-7.19
1745.00	20	QPSK	H	131	176	1 / 0	12.65	9.23	21.88	0.154	30.00	-8.12
1720.00	20	16-QAM	H	136	202	1 / 50	12.55	9.38	**21.93**	0.156	30.00	-8.07
1720.00	20	QPSK	V	144	270	1 / 25	12.59	9.42	22.01	0.159	30.00	-7.99

Table 7-5. EIRP Data (Band 4)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	V	144	265	1 / 3	14.28	9.88	24.16	0.261	33.01	-8.85
1880.00	1.4	QPSK	V	100	245	1 / 3	14.19	10.10	**24.29**	0.269	33.01	-8.72
1909.30	1.4	QPSK	V	111	254	1 / 0	12.34	10.31	22.65	0.184	33.01	-10.36
1880.00	1.4	16-QAM	V	100	245	1 / 3	13.22	10.10	23.32	0.215	33.01	-9.69
1851.50	3	QPSK	V	144	265	1 / 7	14.19	9.88	24.07	0.255	33.01	-8.94
1880.00	3	QPSK	V	100	245	1 / 0	14.10	10.10	**24.20**	0.263	33.01	-8.81
1908.50	3	QPSK	V	111	254	1 / 7	12.34	10.30	22.65	0.184	33.01	-10.36
1880.00	3	16-QAM	V	100	245	1 / 0	13.44	10.10	23.54	0.226	33.01	-9.47
1852.50	5	QPSK	V	144	265	1 / 12	14.29	9.89	24.18	0.262	33.01	-8.83
1880.00	5	QPSK	V	100	245	1 / 12	14.20	10.10	**24.30**	0.269	33.01	-8.71
1907.50	5	QPSK	V	111	254	1 / 12	12.33	10.30	22.63	0.183	33.01	-10.38
1880.00	5	16-QAM	V	100	245	1 / 12	13.35	10.10	23.45	0.222	33.01	-9.56
1855.00	10	QPSK	V	144	265	1 / 25	14.20	9.91	24.11	0.258	33.01	-8.90
1880.00	10	QPSK	V	100	245	1 / 25	14.21	10.10	**24.31**	**0.270**	33.01	-8.70
1905.00	10	QPSK	V	111	254	1 / 25	12.35	10.28	22.64	0.184	33.01	-10.37
1880.00	10	16-QAM	V	100	245	1 / 25	13.19	10.10	23.29	0.214	33.01	-9.72
1857.50	15	QPSK	V	144	265	1 / 36	14.02	9.93	23.95	0.248	33.01	-9.06
1880.00	15	QPSK	V	100	245	1 / 0	14.12	10.10	**24.22**	0.264	33.01	-8.79
1902.50	15	QPSK	V	111	254	1 / 0	12.34	10.27	22.61	0.182	33.01	-10.40
1880.00	15	16-QAM	V	100	245	1 / 0	12.87	10.10	22.97	0.198	33.01	-10.04
1860.00	20	QPSK	V	144	265	1 / 50	14.13	9.95	24.08	0.256	33.01	-8.93
1880.00	20	QPSK	V	100	245	1 / 50	14.21	10.10	**24.31**	**0.270**	33.01	-8.70
1900.00	20	QPSK	V	111	254	1 / 0	12.36	10.26	22.62	0.183	33.01	-10.39
1880.00	20	16-QAM	V	100	245	1 / 50	12.73	10.10	**22.83**	0.192	33.01	-10.18
1880.00	10	QPSK	H	166	342	1 / 25	13.08	10.10	23.18	0.208	33.01	-9.83

Table 7-6. EIRP Data (Band 2)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

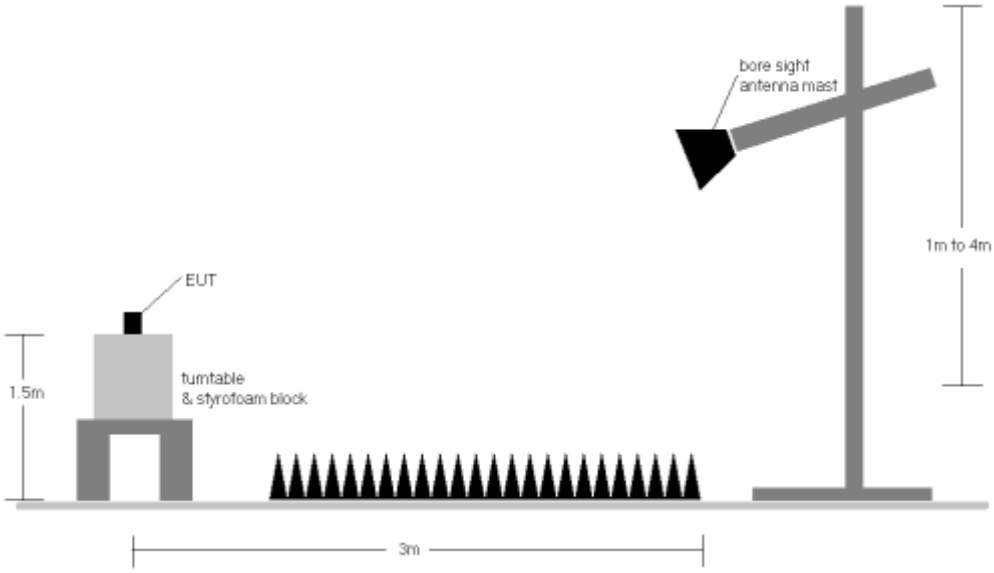


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

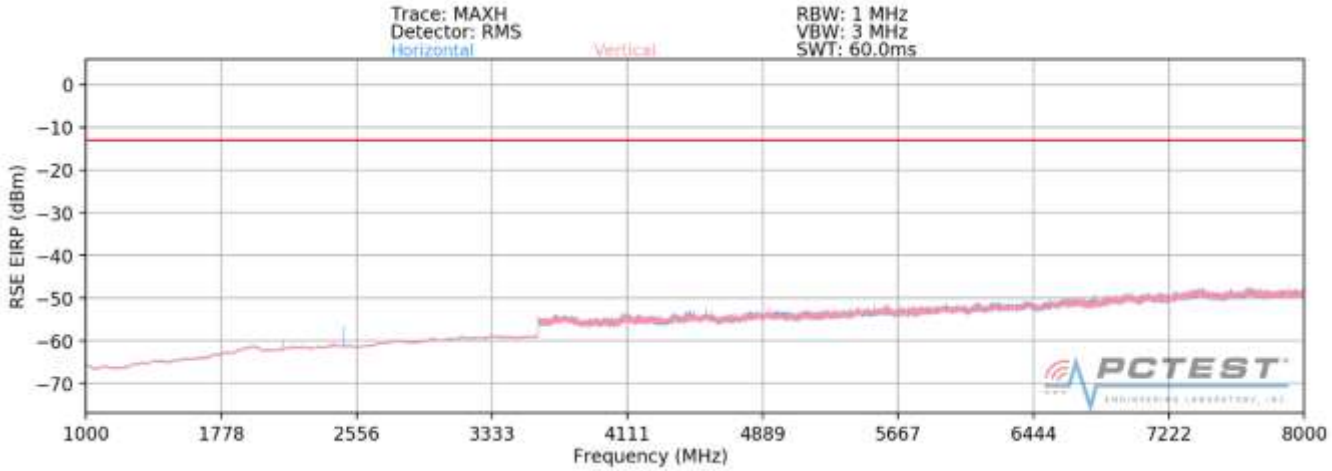
2) This unit was tested with its standard battery.

3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Band 12



Plot 7-153. Radiated Spurious Plot above 1GHz (Band 12)

OPERATING FREQUENCY:	704.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1408.00	H	141	333	-65.19	8.16	-57.02	-44.0
2112.00	H	130	21	-61.12	9.61	-51.51	-38.5
2816.00	H	-	-	-66.08	9.09	-56.98	-44.0

Table 7-7. Radiated Spurious Data (Band 12 – Low Channel)

OPERATING FREQUENCY:	707.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1415.00	H	105	256	-65.31	8.22	-57.10	-44.1
2122.50	H	117	29	-61.62	9.59	-52.03	-39.0
2830.00	H	-	-	-66.18	9.10	-57.08	-44.1

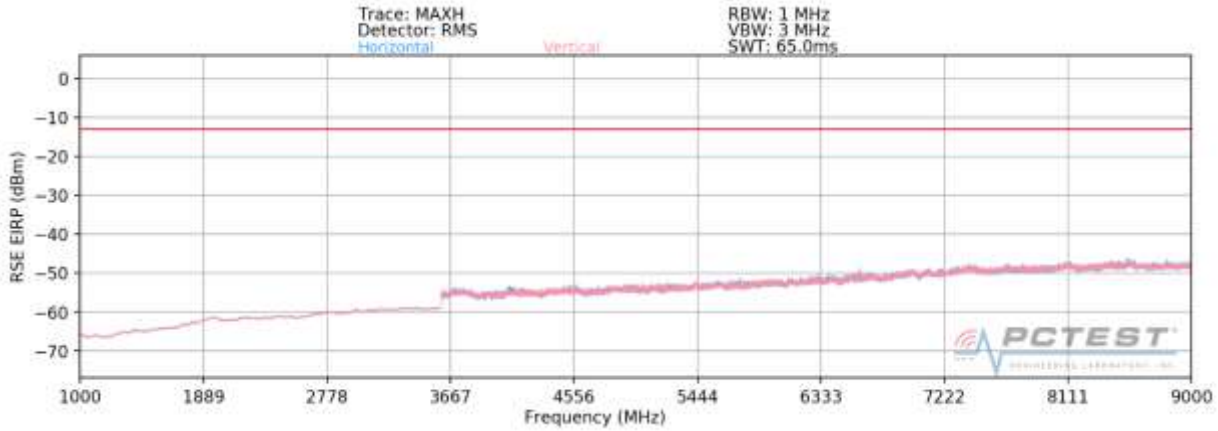
Table 7-8. Radiated Spurious Data (Band 12 – Mid Channel)

OPERATING FREQUENCY:	711.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1422.00	H	163	330	-65.07	8.27	-56.80	-43.8
2133.00	H	348	338	-60.59	9.57	-51.02	-38.0
2844.00	H	-	-	-66.32	9.11	-57.21	-44.2

Table 7-9. Radiated Spurious Data (Band 12 – High Channel)

Band 5



Plot 7-154. Radiated Spurious Plot above 1GHz (Band 5)

OPERATING FREQUENCY:	829.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1658.00	H	105	14	-68.86	9.55	-59.30	-46.3
2487.00	H	-	-	-67.36	9.45	-57.91	-44.9

Table 7-10. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY:	836.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.00	H	152	159	-69.75	9.54	-60.21	-47.2
2509.50	H	-	-	-66.35	9.42	-56.93	-43.9

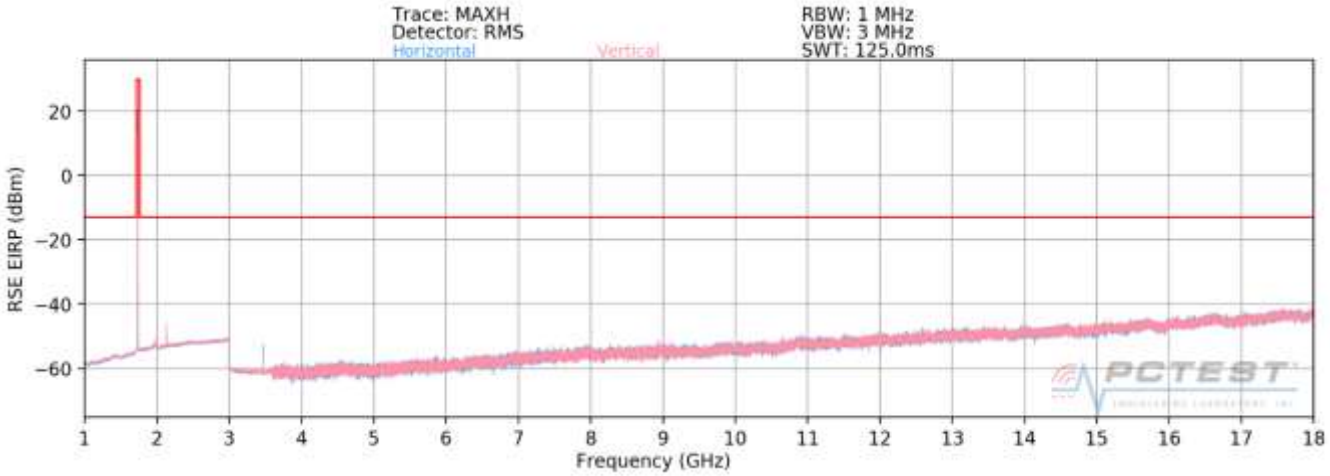
Table 7-11. Radiated Spurious Data (Band 5 – Mid Channel)

OPERATING FREQUENCY:	844.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1688.00	H	143	154	-70.24	9.52	-60.72	-47.7
2532.00	H	-	-	-67.19	9.40	-57.79	-44.8

Table 7-12. Radiated Spurious Data (Band 5 – High Channel)

Band 4



Plot 7-155. Radiated Spurious Plot above 1GHz (Band 4)

OPERATING FREQUENCY:	1715.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3430.00	H	117	128	-54.79	7.46	-47.33	-34.3
5145.00	H	115	225	-68.17	11.07	-57.10	-44.1
6860.00	H	-	-	-69.41	11.71	-57.70	-44.7
8575.00	H	-	-	-65.88	8.86	-57.01	-44.0

Table 7-13. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3465.00	H	100	131	-51.88	7.54	-44.34	-31.3
5197.50	H	130	210	-69.00	11.15	-57.85	-44.8
6930.00	H	-	-	-70.30	11.80	-58.49	-45.5
8662.50	H	-	-	-65.49	8.68	-56.81	-43.8

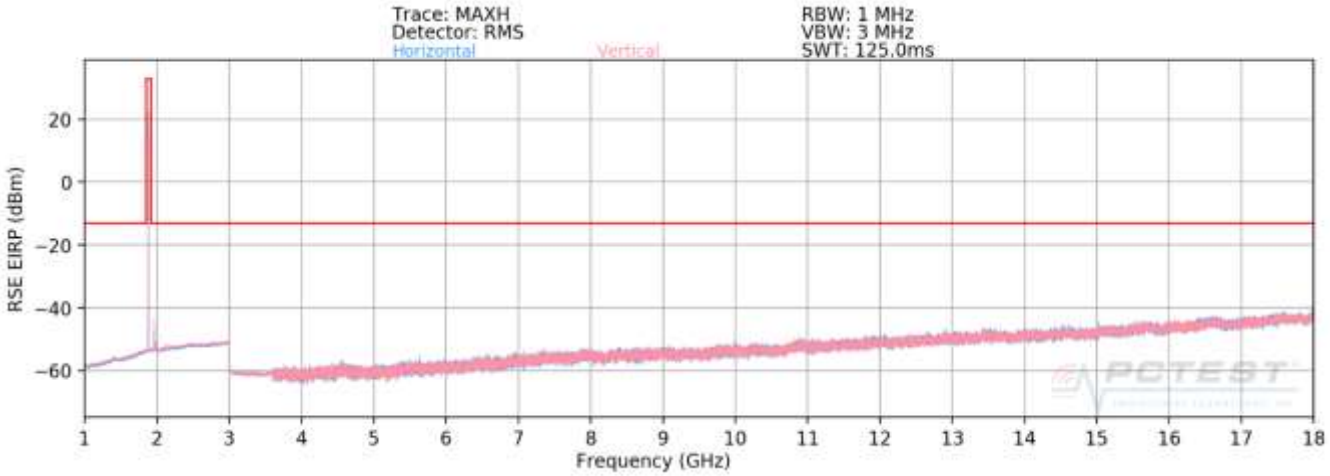
Table 7-14. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1750.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3500.00	H	113	132	-52.20	7.49	-44.71	-31.7
5250.00	H	130	230	-69.49	11.30	-58.19	-45.2
7000.00	H	-	-	-69.41	11.85	-57.56	-44.6
8750.00	H	-	-	-64.94	8.26	-56.68	-43.7

Table 7-15. Radiated Spurious Data (Band 4 – High Channel)

Band 2



Plot 7-156. Radiated Spurious Plot above 1GHz (Band 2)

OPERATING FREQUENCY:	1855.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3710.00	H	125	130	-54.26	6.09	-48.17	-35.2
5565.00	H	110	182	-55.83	12.05	-43.78	-30.8
7420.00	H	-	-	-65.60	12.46	-53.13	-40.1

Table 7-16. Radiated Spurious Data (Band 2 – Low Channel)

OPERATING FREQUENCY:	1880.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3760.00	H	117	32	-59.17	5.90	-53.27	-40.3
5640.00	H	108	2	-58.18	12.27	-45.91	-32.9
7520.00	H	-	-	-65.28	12.56	-52.72	-39.7

Table 7-17. Radiated Spurious Data (Band 2 – Mid Channel)

OPERATING FREQUENCY:	1905.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3810.00	H	116	16	-59.20	5.83	-53.36	-40.4
5715.00	H	138	183	-57.15	12.43	-44.72	-31.7
7620.00	H	-	-	-65.62	12.39	-53.23	-40.2

Table 7-18. Radiated Spurious Data (Band 2 – High Channel)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24, Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

Band 12 Frequency Stability Measurements

OPERATING FREQUENCY:	707,500,000	Hz
CHANNEL:	23790	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	707,499,931	-69	-0.0000098
100 %		- 20	707,500,009	9	0.0000013
100 %		- 10	707,499,915	-85	-0.0000120
100 %		0	707,499,875	-125	-0.0000177
100 %		+ 10	707,499,998	-2	-0.0000003
100 %		+ 20	707,500,018	18	0.0000025
100 %		+ 30	707,499,978	-22	-0.0000031
100 %		+ 40	707,499,643	-357	-0.0000505
100 %		+ 50	707,500,146	146	0.0000206
BATT. ENDPOINT	3.18	+ 20	707,500,230	230	0.0000325

Table 7-19. Frequency Stability Data (Band 12)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 12 Frequency Stability Measurements

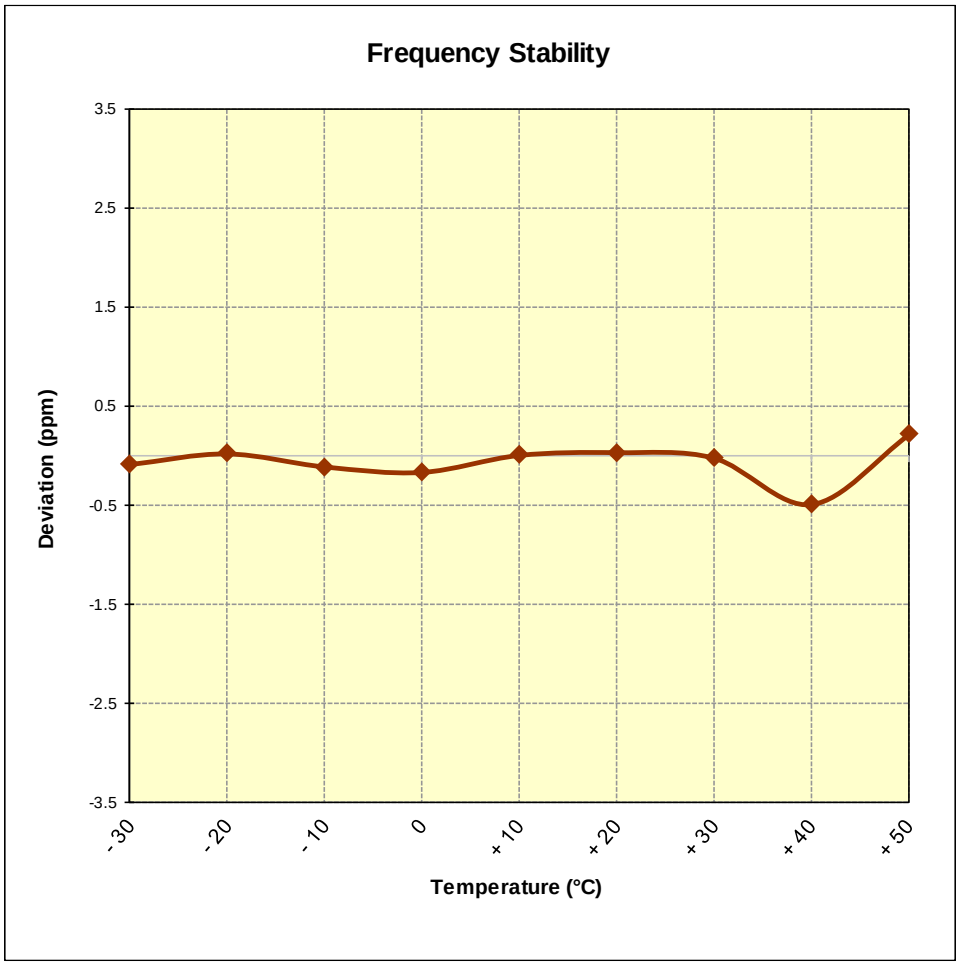


Figure 7-8. Frequency Stability Graph (Band 12)

Band 5 Frequency Stability Measurements

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	836,500,021	21	0.0000025
100 %		- 20	836,500,257	257	0.0000307
100 %		- 10	836,499,828	-172	-0.0000206
100 %		0	836,500,360	360	0.0000430
100 %		+ 10	836,500,144	144	0.0000172
100 %		+ 20	836,500,052	52	0.0000062
100 %		+ 30	836,500,177	177	0.0000212
100 %		+ 40	836,499,695	-305	-0.0000365
100 %		+ 50	836,500,008	8	0.0000010
BATT. ENDPOINT	3.18	+ 20	836,500,033	33	0.0000039

Table 7-20. Frequency Stability Data (Band 5)

Band 5 Frequency Stability Measurements

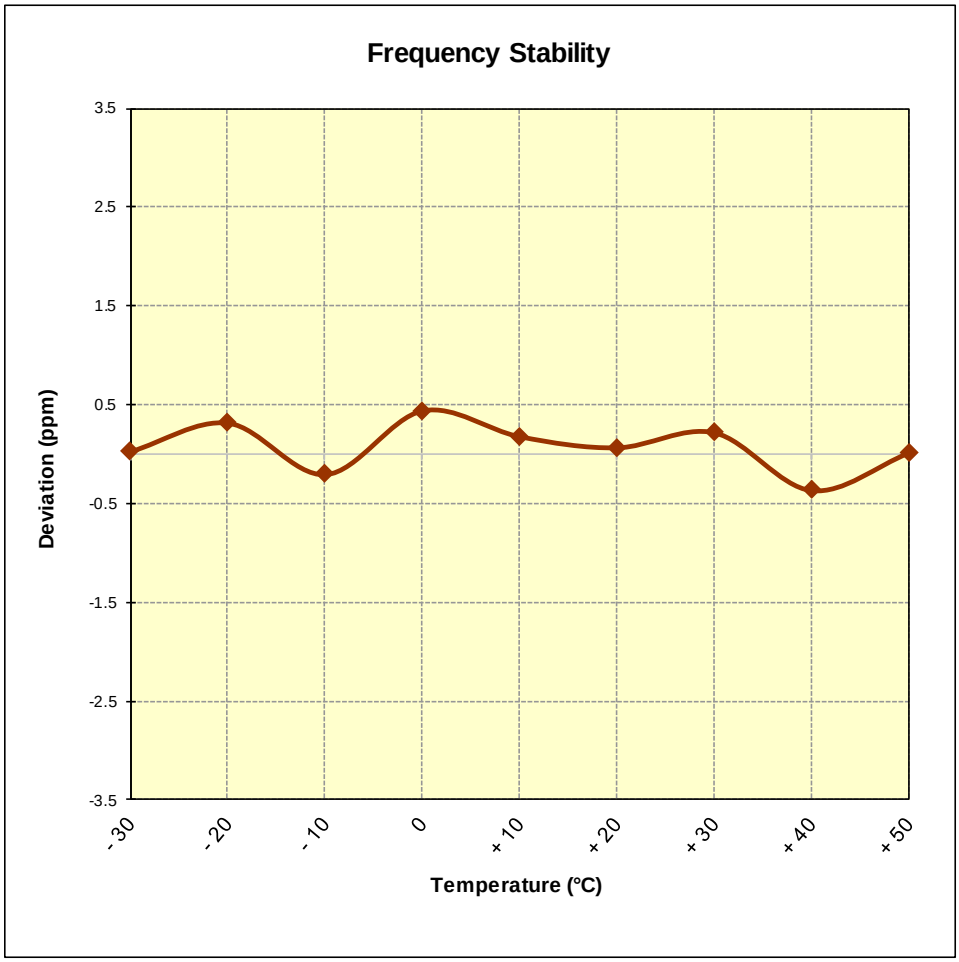


Figure 7-9. Frequency Stability Graph (Band 5)

Band 4 Frequency Stability Measurements

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,732,499,950	-50	-0.0000029
100 %		- 20	1,732,499,969	-31	-0.0000018
100 %		- 10	1,732,499,801	-199	-0.0000115
100 %		0	1,732,500,108	108	0.0000062
100 %		+ 10	1,732,500,185	185	0.0000107
100 %		+ 20	1,732,500,010	10	0.0000006
100 %		+ 30	1,732,500,081	81	0.0000047
100 %		+ 40	1,732,500,222	222	0.0000128
100 %		+ 50	1,732,499,765	-235	-0.0000136
BATT. ENDPOINT	3.18	+ 20	1,732,499,973	-27	-0.0000016

Table 7-21. Frequency Stability Data (Band 4)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

Band 4 Frequency Stability Measurements

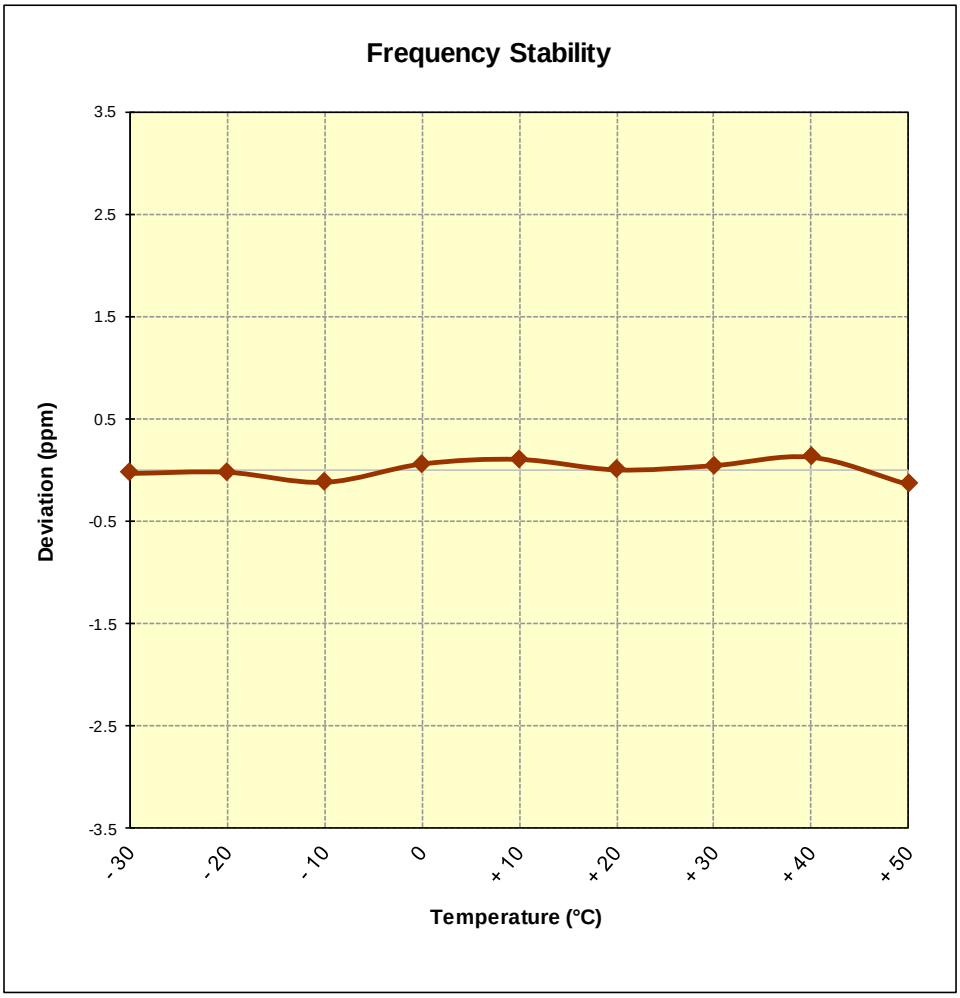


Figure 7-10. Frequency Stability Graph (Band 4)

Band 2 Frequency Stability Measurements

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	- 30	1,880,000,219	219	0.0000116
100 %		- 20	1,879,999,810	-190	-0.0000101
100 %		- 10	1,879,999,597	-403	-0.0000214
100 %		0	1,880,000,090	90	0.0000048
100 %		+ 10	1,880,000,218	218	0.0000116
100 %		+ 20	1,879,999,876	-124	-0.0000066
100 %		+ 30	1,880,000,323	323	0.0000172
100 %		+ 40	1,879,999,954	-46	-0.0000024
100 %		+ 50	1,880,000,135	135	0.0000072
BATT. ENDPOINT	3.18	+ 20	1,880,000,003	3	0.0000002

Table 7-22. Frequency Stability Data (Band 2)

Band 2 Frequency Stability Measurements

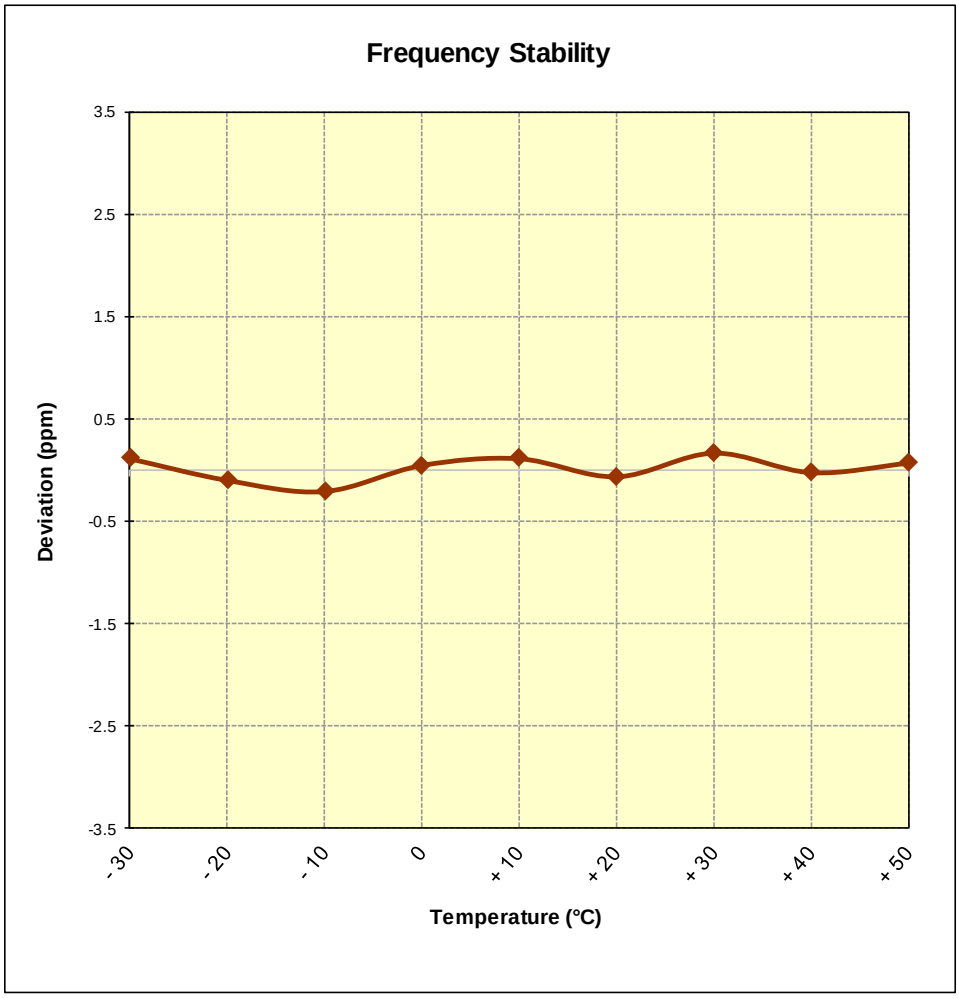


Figure 7-11. Frequency Stability Graph (Band 2)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFX320AA** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE operation only.