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PART 27 MEASUREMENT REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
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Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
4/11/2022 - 6/18/2022
Test Report Issue Date:
07/08/2022
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2204110052-04.A3L

FCC ID:	**A3LSMF936B**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-F936B/DS
Additional Model(s):	SM-F936B
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	27
Test Procedure(s):	ANSI C63.26-2015, KDB 648474 D03 v01r04

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.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

TABLE OF CONTENTS

PART 27 MEASUREMENT REPORT

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 41(PC2)	20 MHz	QPSK	2506.0 - 2680.0	0.377	25.76	18M1G7D
		16QAM	2506.0 - 2680.0	0.318	25.02	18M1W7D
	15 MHz	QPSK	2503.5 - 2682.5	0.404	26.07	13M5G7D
		16QAM	2503.5 - 2682.5	0.310	24.91	13M6W7D
	10 MHz	QPSK	2501.0 - 2685.0	0.413	26.16	9M07G7D
		16QAM	2501.0 - 2685.0	0.290	24.62	9M09W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.391	25.93	4M53G7D
		16QAM	2498.5 - 2687.5	0.298	24.74	4M53W7D
NR Band n41	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.201	23.04	96M6G7D
		QPSK	2546.0 - 2640.0	0.219	23.41	97M3G7D
		16QAM	2546.0 - 2640.0	0.163	22.13	97M5W7D
	90 MHz	π/2 BPSK	2541.0 - 2645.0	0.235	23.72	86M8G7D
		QPSK	2541.0 - 2645.0	0.236	23.73	87M4G7D
		16QAM	2541.0 - 2645.0	0.206	23.14	87M2W7D
	80 MHz	π/2 BPSK	2536.0 - 2650.0	0.235	23.72	77M5G7D
		QPSK	2536.0 - 2650.0	0.245	23.89	77M5G7D
		16QAM	2536.0 - 2650.0	0.200	23.01	77M7W7D
	60 MHz	π/2 BPSK	2526.0 - 2660.0	0.231	23.64	57M9G7D
		QPSK	2526.0 - 2660.0	0.241	23.81	57M8G7D
		16QAM	2526.0 - 2660.0	0.193	22.85	58M0W7D
	50 MHz	π/2 BPSK	2521.0 - 2665.0	0.219	23.40	46M0G7D
		QPSK	2521.0 - 2665.0	0.250	23.98	47M6G7D
		16QAM	2521.0 - 2665.0	0.186	22.69	47M6W7D
	40 MHz	π/2 BPSK	2516.0 - 2670.0	0.237	23.76	36M0G7D
		QPSK	2516.0 - 2670.0	0.245	23.89	38M0G7D
		16QAM	2516.0 - 2670.0	0.167	22.23	37M9W7D
	30 MHz	π/2 BPSK	2511.0 - 2675.0	0.245	23.89	27M0G7D
		QPSK	2511.0 - 2675.0	0.167	22.23	28M0G7D
		16QAM	2511.0 - 2675.0	0.165	22.17	28M0W7D
	20 MHz	π/2 BPSK	2506.0 - 2680.0	0.198	22.96	18M0G7D
		QPSK	2506.0 - 2680.0	0.257	24.10	18M5G7D
		16QAM	2506.0 - 2680.0	0.187	22.72	18M4W7D

EUT Overview – Ant F

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n41	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.082	19.12	96M6G7D
		QPSK	2546.0 - 2640.0	0.082	19.14	97M3G7D
		16QAM	2546.0 - 2640.0	0.072	18.56	97M5W7D

EUT Overview – Ant B

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n41	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.020	12.98	96M6G7D
		QPSK	2546.0 - 2640.0	0.020	13.01	97M3G7D
		16QAM	2546.0 - 2640.0	0.017	12.41	97M5W7D

EUT Overview – Ant E

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n41	100 MHz	π/2 BPSK	2546.0 - 2640.0	0.006	7.87	96M6G7D
		QPSK	2546.0 - 2640.0	0.006	7.90	97M3G7D
		16QAM	2546.0 - 2640.0	0.006	7.41	97M5W7D

EUT Overview – Ant C

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 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element Lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC 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.

- Element Washington DC LLC 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).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF936B**. 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.: 0137M, 0423M, 0819M, 0571S, 0267M, 0773M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5, 6GHz), Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

The device has 1 Tx antenna for n41 data (Ant F) and 3 Rx antennas (Ant B, E, C). With SRS operations, all 4 antennas can transmit the SRS signal to check for the channel quality of n41. The antennas cannot simultaneously transmit. Only the single TX/RX antenna is used for Data transmission.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal s in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

This device supports two configurations: one is with screen open and one is with screen closed. Open, half opened and closed configurations are tested, and the worst case radiated emissions data is shown in this report.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version F936BXXU0AVD9 installed on the EUT.

2.5 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 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) were used in the measurement of the EUT**.**

Deviation from Measurement Procedure……..……None

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 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.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is 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, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ 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 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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
-	AP2	EMC Cable and Switch System	1/4/2022	Annual	1/4/2023	AP2
-	AP1	EMC Cable and Switch System	12/12/2021	Annual	12/12/2022	AP1
-	ETS	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS
-	LTx4	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx4
-	LTx5	LIcensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx5
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/20/2021	Biennial	7/20/2023	9203-2178
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/3/2021	Annual	8/3/2022	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	5/25/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/28/2022	Annual	3/28/2023	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	4/14/2022	Annual	4/14/2023	103187
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	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

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

Example: Spurious emission at 3700.40 MHz

The receive 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 analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMF936B

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

Mode(s): LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (LTE Band 41; NR Band n41)	2.1051, 27.53(m)(4)	Undesirable emissions must meet the limits detailed in 27.53(m)(4)	PASS	Sections 7.4, 7.5
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Equivalent Isotropic Radiated Power (LTE Band 41; NR Band n41)	27.50(h)(2)	≤ 2 Watts max. EIRP	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 41; NR Band n41)	2.1053, 27.53(m)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Section 7.7

Table 7-1. Summary of Test Results (FCC)

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 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) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.0.

7.2 Conducted Output Power Data

Test Overview

All 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.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Span = 2 x OBW to 3 x OBW
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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.

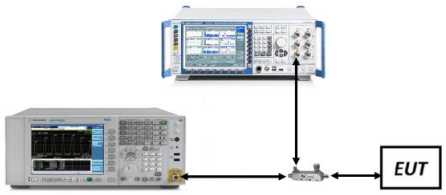


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

NR (SCS 30kHz)						LTE								
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
n41	100	Mid	2593	QPSK	270/0	B66	20	Mid	1745	QPSK	100/0	23.21	21.10	25.29
				QPSK	270/0					QPSK	1/50	23.22	21.08	25.29
				QPSK	1/136					QPSK	100/0	23.51	20.89	25.40
				QPSK	1/136					16Q	1/50	23.45	20.99	25.40
				16Q	1/136					16Q	1/50	23.13	20.67	25.08

Table 7-2. Conducted Power Output Data (EN-DC NR Band n41 – LTE Band 66)

NR (SCS 30kHz)						LTE								
NR Band	NR Bandwidth [MHz]	NR Channel	NR Frequency [MHz]	Mod.	NR RB#/Offset	LTE Band	LTE Bandwidth [MHz]	LTE Channel	LTE Frequency [MHz]	Mod.	LTE RB#/Offset	NR Conducted Power [dBm]	LTE Conducted Power [dBm]	EN-DC Total Tx. Power [dBm]
n41	100	Mid	2593	QPSK	270/0	B12	10	Mid	707.5	QPSK	50/0	23.18	20.98	25.23
				QPSK	270/0					QPSK	1/25	23.18	20.97	25.22
				QPSK	1/136					QPSK	50/0	23.48	20.91	25.39
				QPSK	1/136					QPSK	1/25	23.49	20.92	25.40
				16Q	1/136					16Q	1/25	23.08	20.71	25.07

Table 7-3. Conducted Power Output Data (EN-DC NR Band n41 – LTE Band 12)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	39750	2506.0	1 / 99	25.34
		40620	2593.0	1 / 50	25.65
		41490	2680.0	1 / 50	25.61
	16-QAM	39750	2506.0	1 / 99	24.38
15 MHz	QPSK	39725	2503.5	1 / 0	25.57
		40620	2593.0	1 / 37	25.95
		41515	2682.5	1 / 37	25.26
	16-QAM	39725	2503.5	1 / 0	24.43
10 MHz	QPSK	39700	2501.0	1 / 25	25.85
		40620	2593.0	1 / 25	25.40
		41540	2685.0	1 / 25	25.86
	16-QAM	39700	2501.0	1 / 25	24.29
5 MHz	QPSK	39675	2498.5	1 / 0	25.62
		40620	2593.0	1 / 12	25.79
		41565	2687.5	1 / 24	25.73
	16-QAM	39675	2498.5	1 / 0	24.33

Table 7-4. Conducted Power Output Data (LTE Band 41(PC2) – Ant F)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.0	1 / 204	24.17
		518598	2593.0	1 / 204	24.99
		528000	2640.0	1 / 204	24.24
	QPSK	509202	2546.0	1 / 136	24.11
		518598	2593.0	1 / 68	24.95
		528000	2640.0	1 / 68	24.28
	16-QAM	528000	2640.0	1 / 204	23.09
90 MHz	π/2 BPSK	508200	2541.0	1 / 183	24.72
		518592	2593.0	1 / 122	24.52
		529002	2645.0	1 / 61	24.92
	QPSK	508200	2541.0	1 / 183	24.75
		518592	2593.0	1 / 122	24.81
		529002	2645.0	1 / 61	24.59
	16-QAM	529002	2645.0	1 / 61	24.10
80 MHz	π/2 BPSK	507204	2536.0	1 / 162	24.81
		518598	2593.0	1 / 162	24.94
		529998	2650.0	1 / 54	24.92
	QPSK	507204	2536.0	1 / 108	24.20
		518598	2593.0	1 / 162	24.95
		529998	2650.0	1 / 54	24.75
	16-QAM	529998	2650.0	1 / 54	23.97
60 MHz	π/2 BPSK	505200	2526.0	1 / 40	24.34
		518598	2593.0	1 / 40	24.67
		531996	2660.0	1 / 40	24.84
	QPSK	505200	2526.0	1 / 121	24.41
		518598	2593.0	1 / 40	24.74
		531996	2660.0	1 / 81	24.68
	16-QAM	531996	2660.0	1 / 40	23.80
50 MHz	π/2 BPSK	504204	2521.0	1 / 99	24.83
		518598	2593.0	1 / 99	24.73
		532998	2665.0	1 / 66	24.61
	QPSK	504204	2521.0	1 / 99	24.71
		518598	2593.0	1 / 99	24.84
		532998	2665.0	1 / 99	24.85
	16-QAM	532998	2665.0	1 / 66	23.64
40 MHz	π/2 BPSK	503202	2516.0	1 / 79	25.43
		518598	2593.0	106 / 0	24.14
		534000	2670.0	1 / 79	24.83
	QPSK	503202	2516.0	1 / 79	24.84
		518598	2593.0	1 / 79	24.50
		534000	2670.0	1 / 26	24.76
	16-QAM	534000	2670.0	1 / 79	23.18
30 MHz	π/2 BPSK	502203	2511.0	1 / 58	24.73
		518598	2593.0	1 / 19	24.69
		534999	2675.0	1 / 19	24.40
	QPSK	502203	2511.0	1 / 19	24.83
		518598	2593.0	1 / 19	24.65
		534999	2675.0	1 / 19	24.87
	16-QAM	534999	2675.0	1 / 19	23.84
20 MHz	π/2 BPSK	501204	2506.0	1 / 37	23.88
		518598	2593.0	1 / 25	24.71
		535998	2680.0	1 / 37	24.16
	QPSK	501204	2506.0	1 / 25	24.85
		518598	2593.0	1 / 13	24.71
		535998	2680.0	1 / 25	24.97
	16-QAM	535998	2680.0	1 / 25	23.67

Table 7-5. Conducted Power Output Data (NR Band n41(PC2) – Ant F)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.0	1 / 68	16.47
		518598	2593.0	1 / 204	16.40
		528000	2640.0	1 / 68	16.52
	QPSK	509202	2546.0	1 / 68	16.55
		518598	2593.0	1 / 204	16.42
		528000	2640.0	1 / 68	16.62
	16-QAM	509202	2546.0	1 / 68	16.60

Table 7-6. Conducted Power Output Data (NR Band n41(PC2) – Ant B)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.0	1 / 136	19.98
		518598	2593.0	1 / 204	19.83
		528000	2640.0	1 / 68	19.80
	QPSK	509202	2546.0	1 / 136	19.98
		518598	2593.0	1 / 136	19.86
		528000	2640.0	1 / 68	19.77
	16-QAM	528000	2640.0	1 / 136	19.55

Table 7-7. Conducted Power Output Data (NR Band n41(PC2) – Ant E)

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
100 MHz	π/2 BPSK	509202	2546.0	1 / 68	14.74
		518598	2593.0	1 / 204	13.57
		528000	2640.0	273 / 0	13.78
	QPSK	509202	2546.0	1 / 68	14.82
		518598	2593.0	273 / 0	13.47
		528000	2640.0	273 / 0	13.80
	16-QAM	528000	2640.0	1 / 136	14.11

Table 7-8. Conducted Power Output Data (NR Band n41(PC2) – Ant C)

7.3 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

ANSI C63.26-2015 – Section 5.4.4

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.

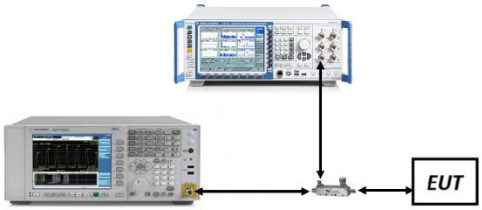
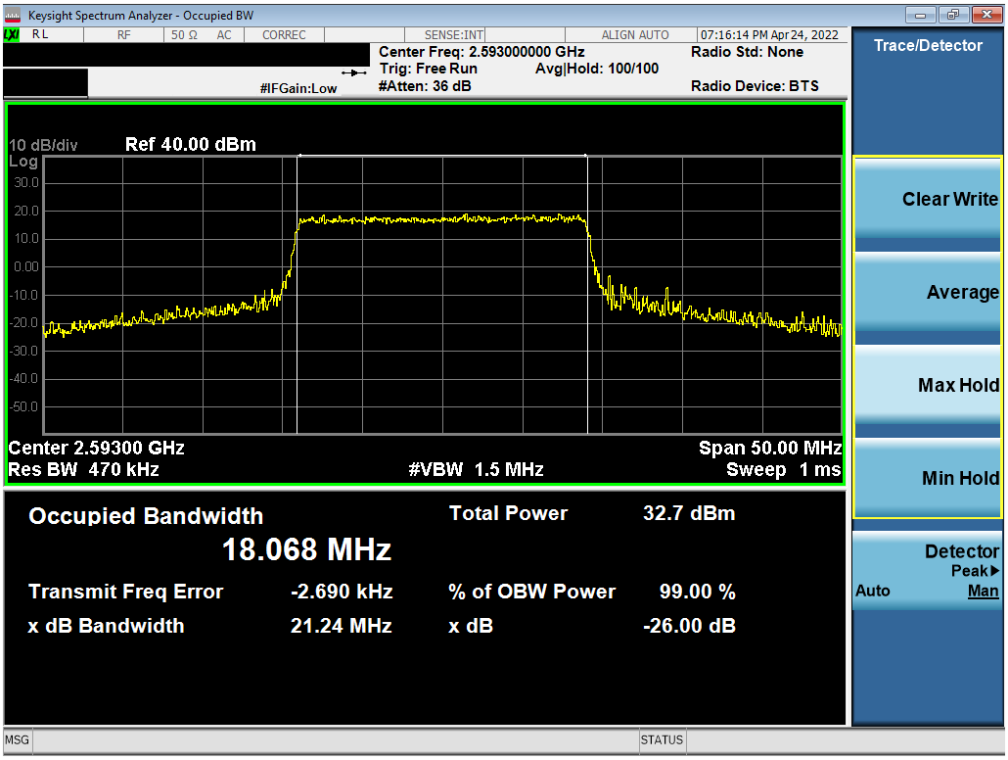


Figure 7-2. Test Instrument & Measurement Setup

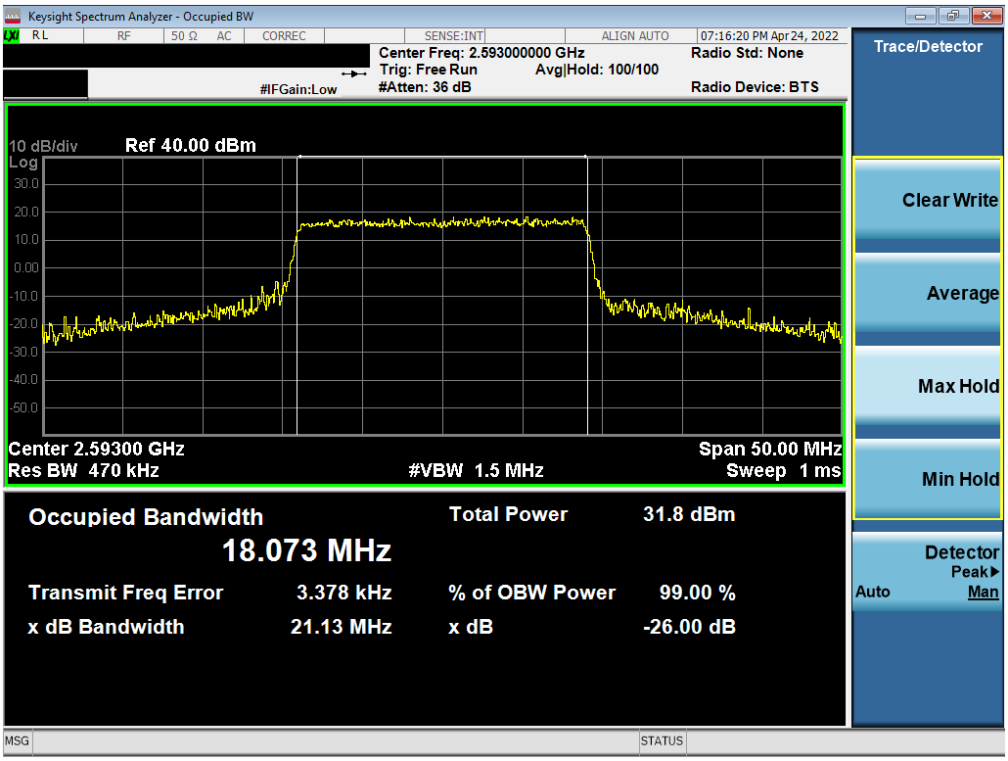
Test Notes

None.

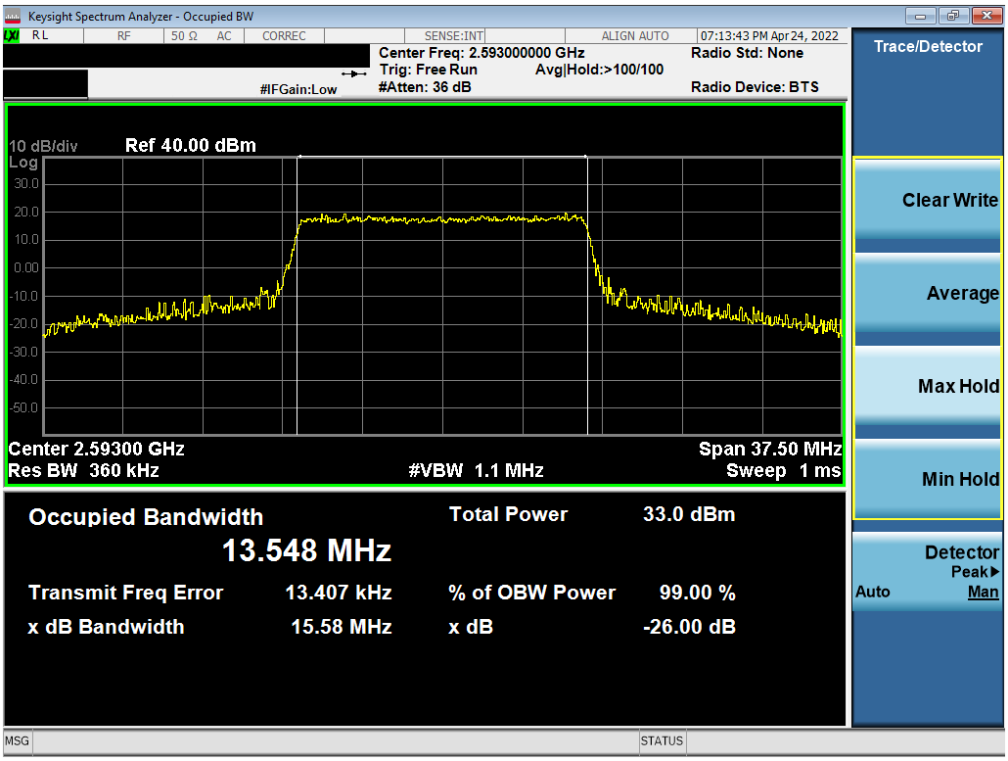
LTE Band 41(PC2) – Ant F



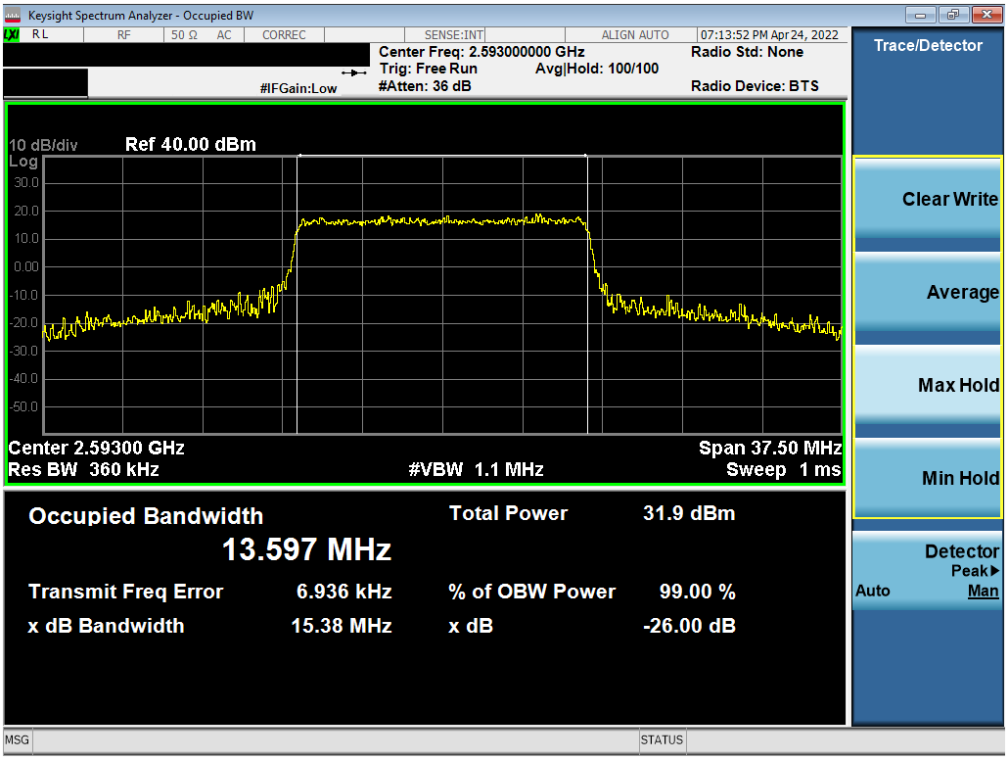
Plot 7-1. Occupied Bandwidth Plot (LTE Band 41(PC2) - 20MHz QPSK - Full RB - Ant F)



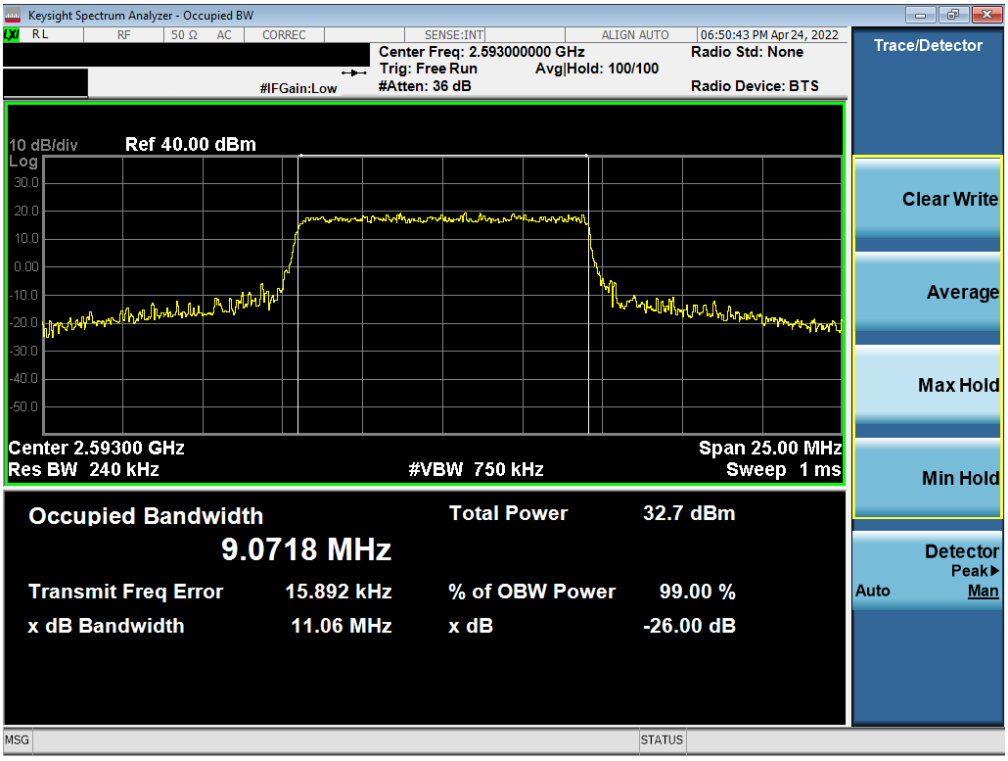
Plot 7-2. Occupied Bandwidth Plot (LTE Band 41(PC2) - 20MHz 16-QAM - Full RB - Ant F)



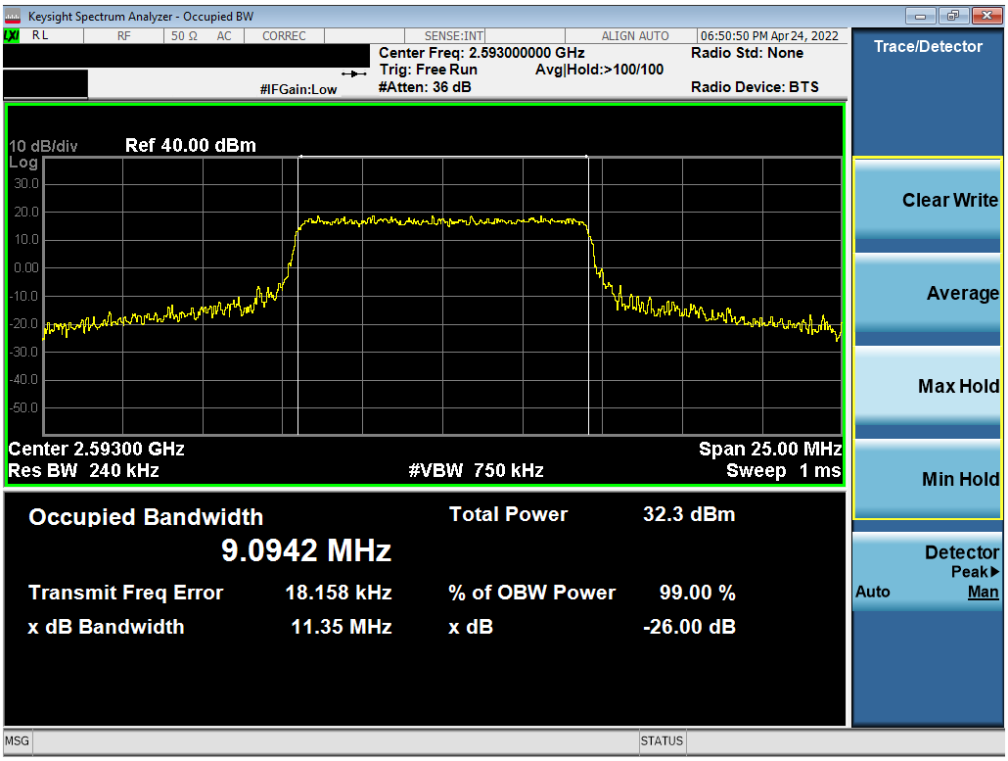
Plot 7-3. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz QPSK - Full RB - Ant F)



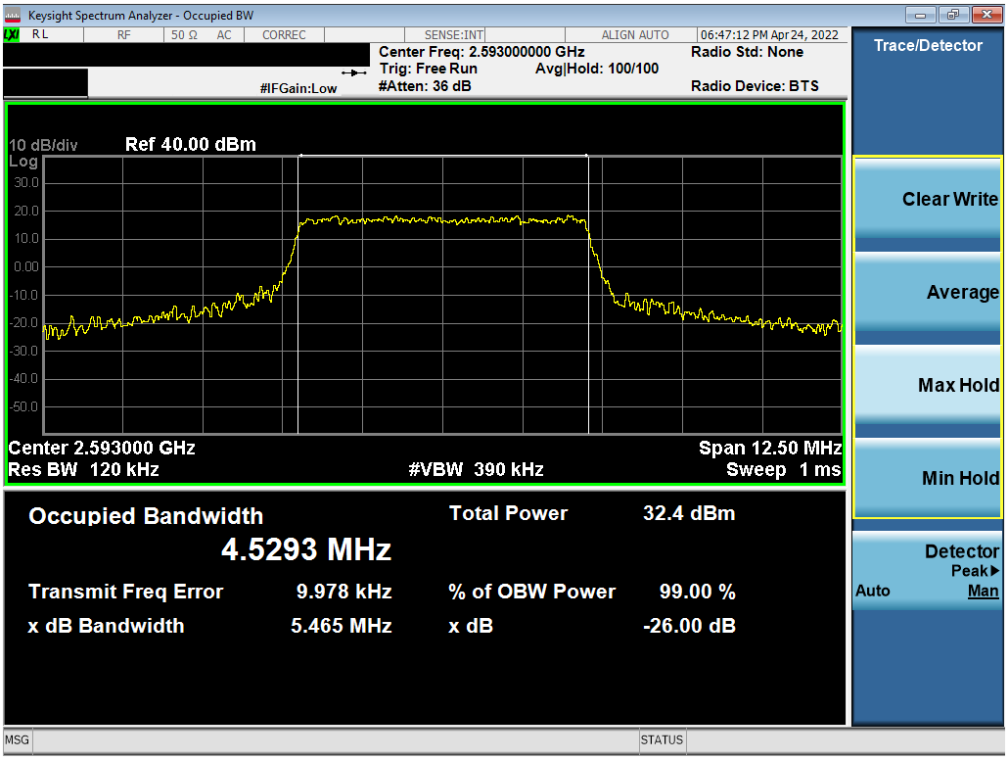
Plot 7-4. Occupied Bandwidth Plot (LTE Band 41(PC2) - 15MHz 16-QAM - Full RB - Ant F)



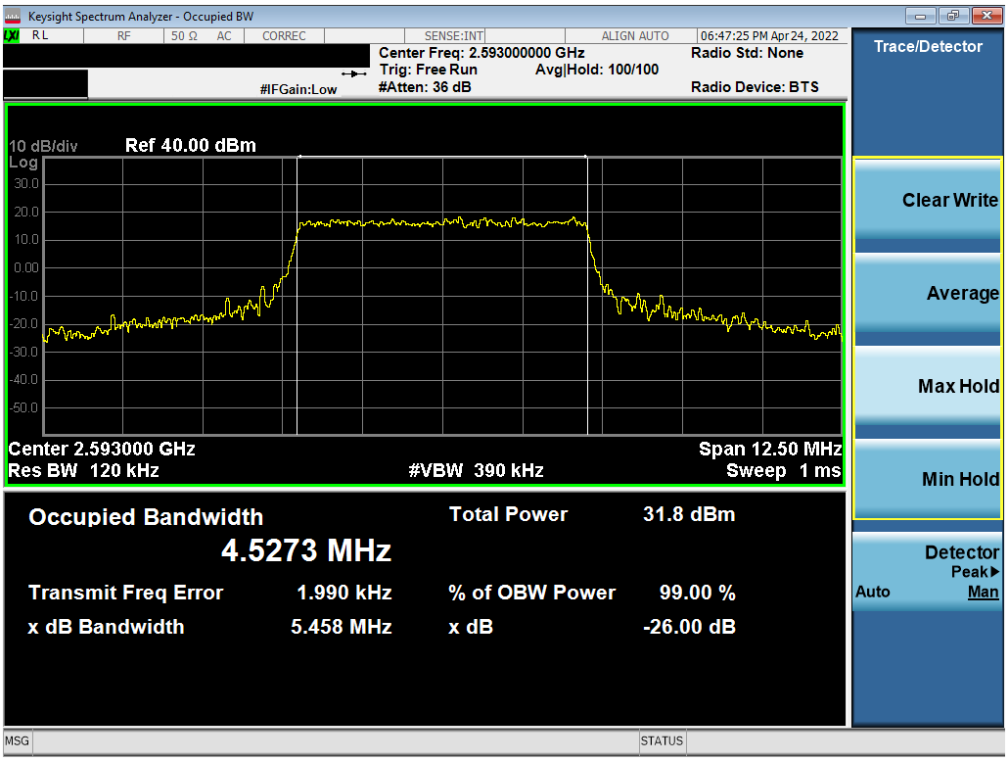
Plot 7-5. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz QPSK - Full RB - Ant F)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 41(PC2) - 10MHz 16-QAM - Full RB - Ant F)

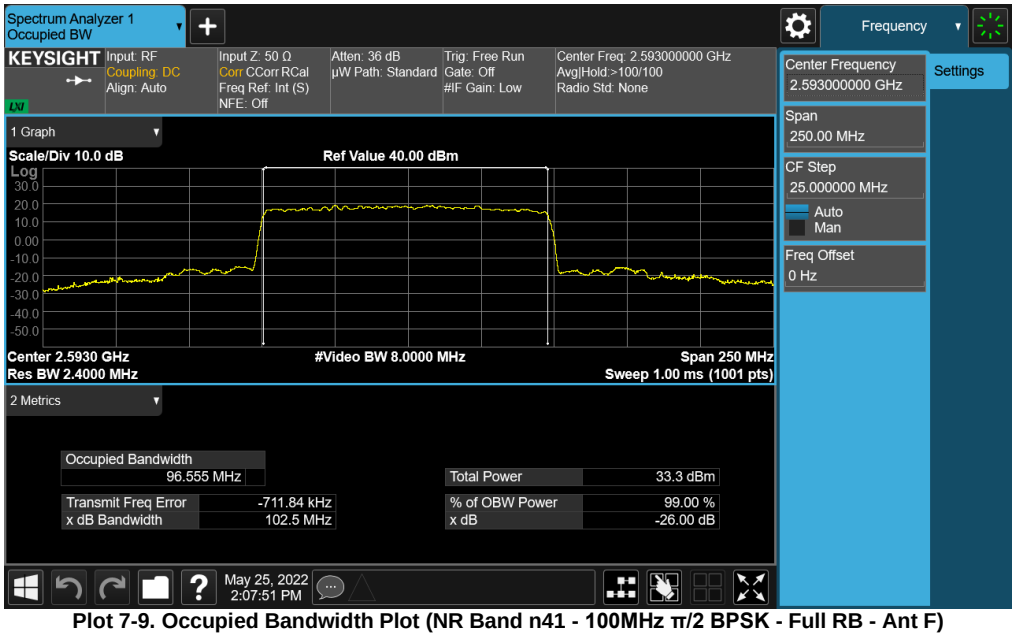


Plot 7-7. Occupied Bandwidth Plot (LTE Band 41(PC2) - 5MHz QPSK - Full RB - Ant F)



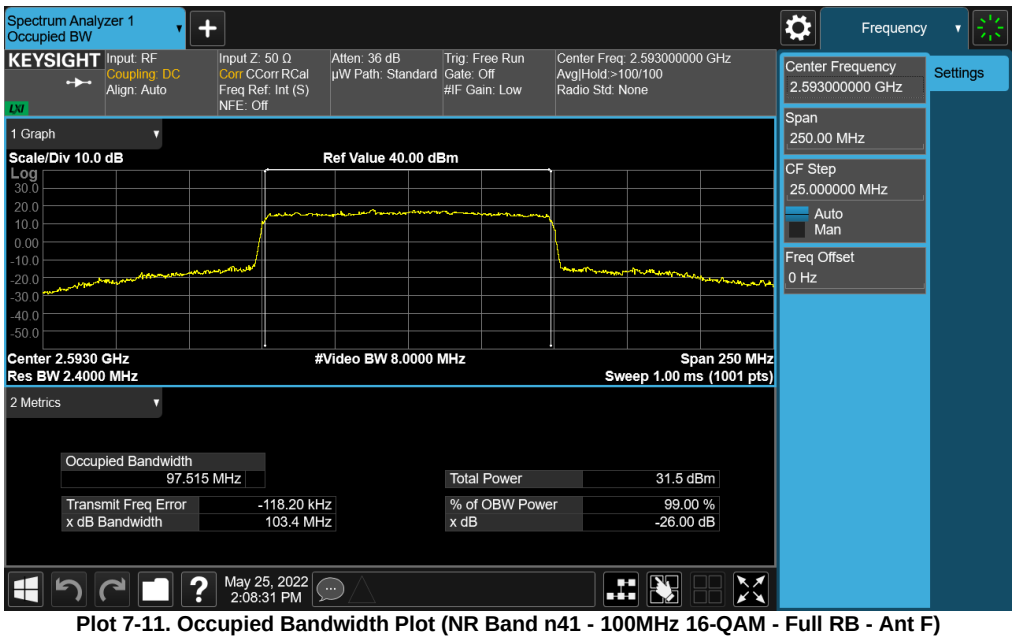
Plot 7-8. Occupied Bandwidth Plot (LTE Band 41(PC2) - 5MHz 16-QAM - Full RB - Ant F)

NR Band n41 – Ant F



Plot 7-9. Occupied Bandwidth Plot (NR Band n41 - 100MHz π/2 BPSK - Full RB - Ant F)

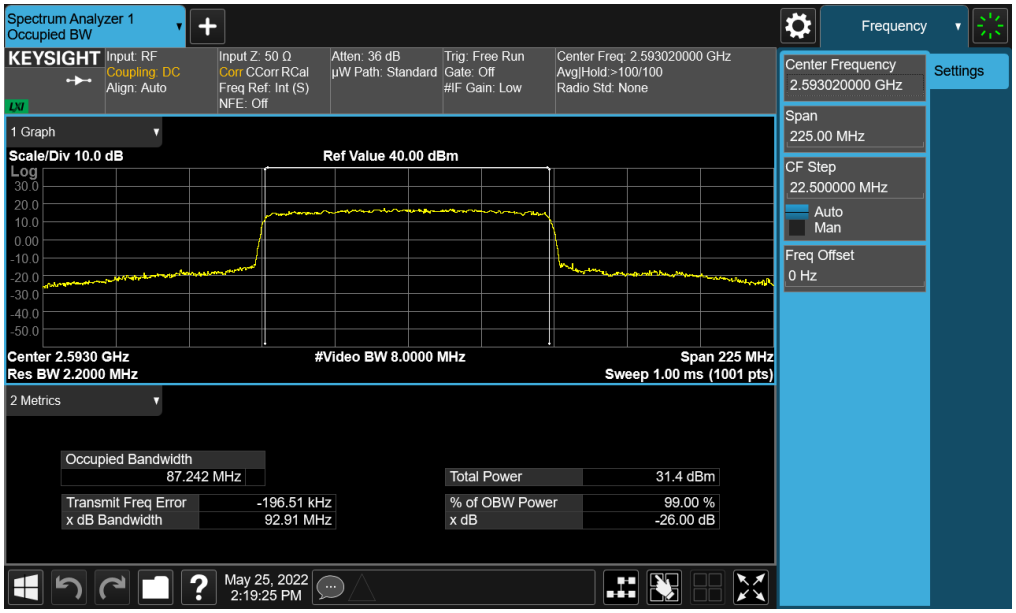
Plot 7-10. Occupied Bandwidth Plot (NR Band n41 - 100MHz QPSK - Full RB - Ant F)



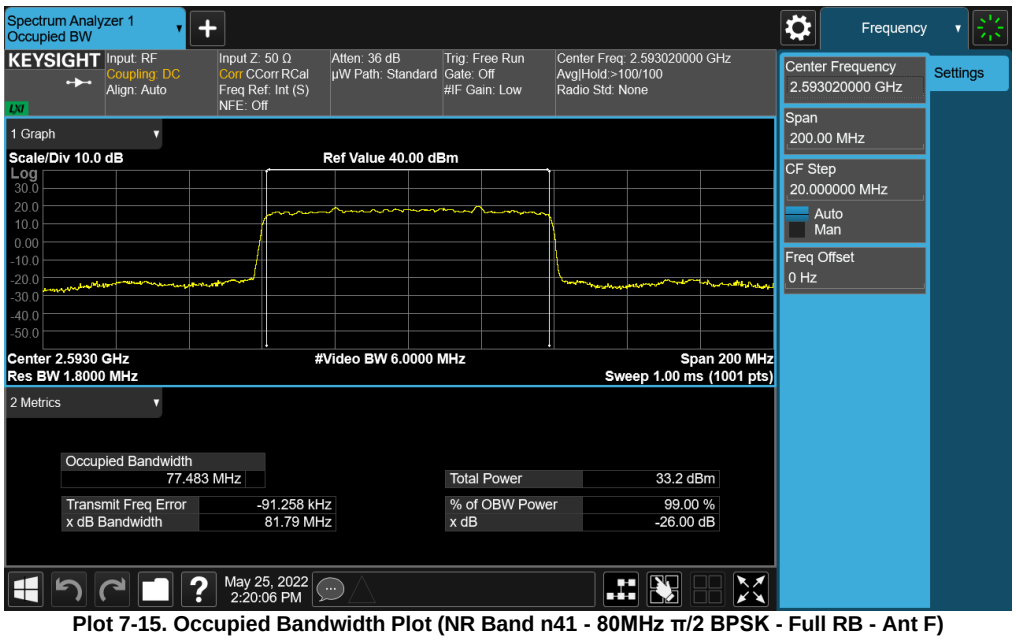
Plot 7-11. Occupied Bandwidth Plot (NR Band n41 - 100MHz 16-QAM - Full RB - Ant F)

Plot 7-12. Occupied Bandwidth Plot (NR Band n41 - 90MHz π/2 BPSK - Full RB - Ant F)

Plot 7-13. Occupied Bandwidth Plot (NR Band n41 - 90MHz QPSK - Full RB - Ant F)

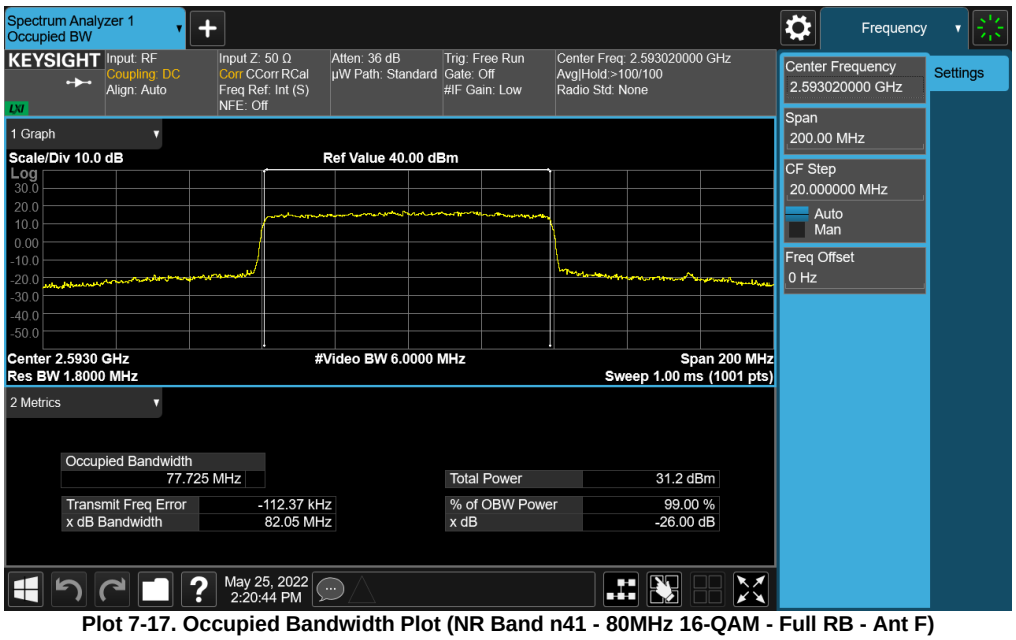


Plot 7-14. Occupied Bandwidth Plot (NR Band n41 - 90MHz 16-QAM - Full RB - Ant F)



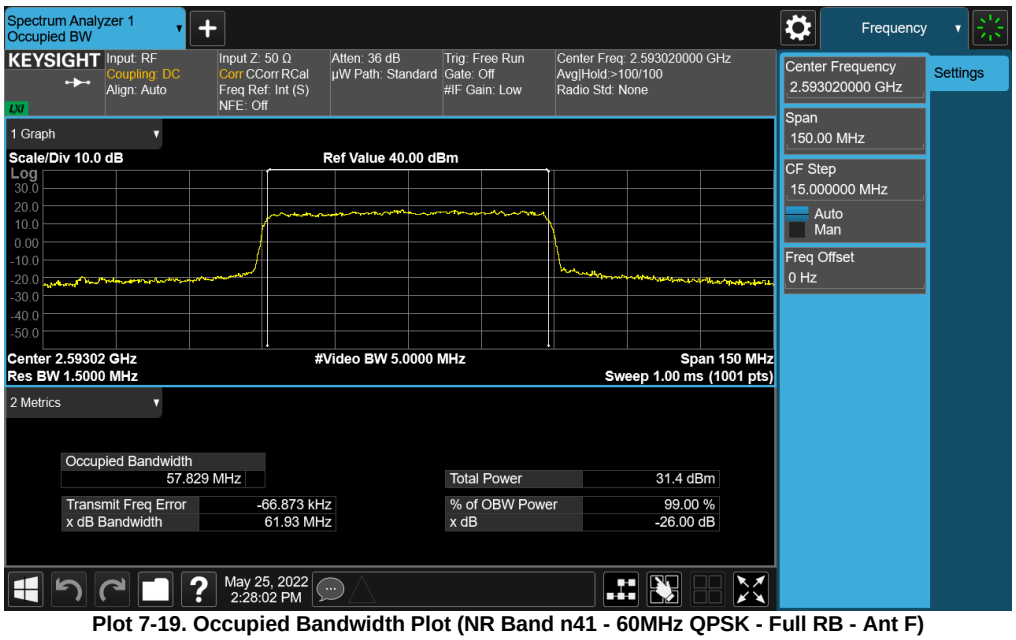
Plot 7-15. Occupied Bandwidth Plot (NR Band n41 - 80MHz π/2 BPSK - Full RB - Ant F)

Plot 7-16. Occupied Bandwidth Plot (NR Band n41 - 80MHz QPSK - Full RB - Ant F)



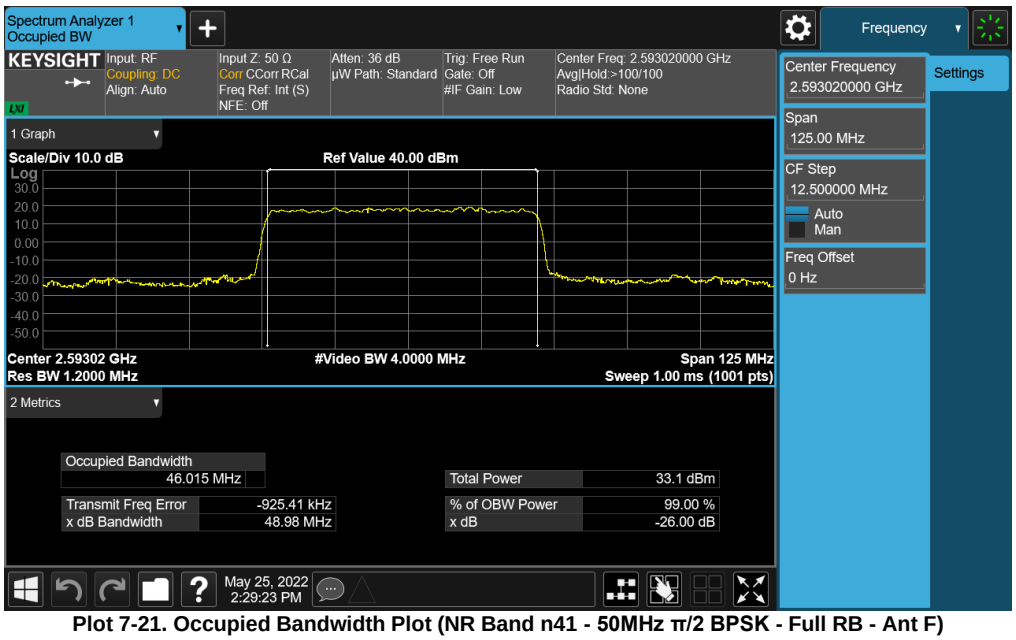
Plot 7-17. Occupied Bandwidth Plot (NR Band n41 - 80MHz 16-QAM - Full RB - Ant F)

Plot 7-18. Occupied Bandwidth Plot (NR Band n41 - 60MHz π/2 BPSK - Full RB - Ant F)



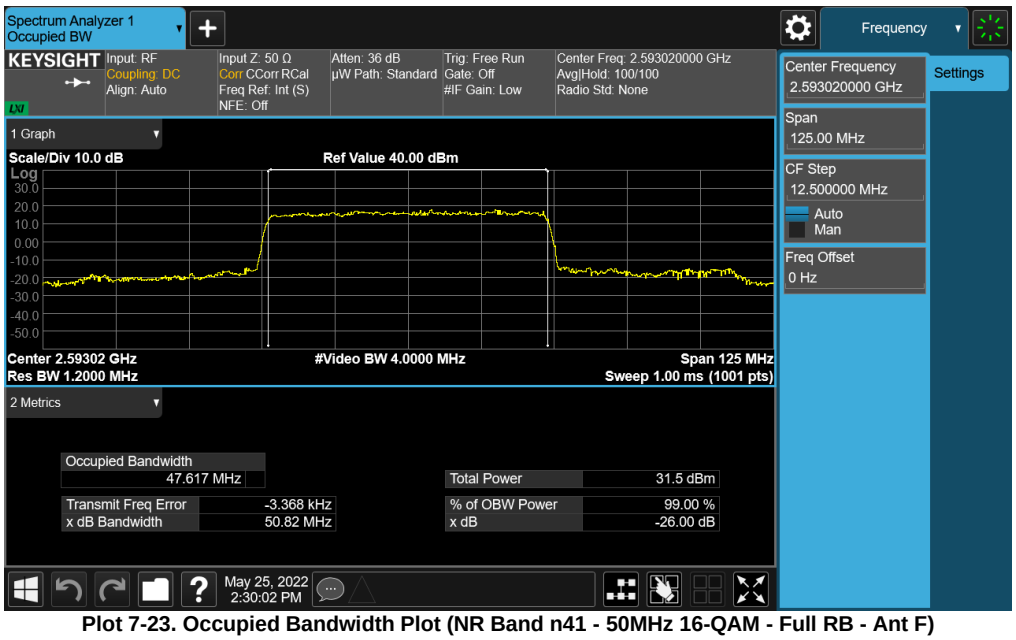
Plot 7-19. Occupied Bandwidth Plot (NR Band n41 - 60MHz QPSK - Full RB - Ant F)

Plot 7-20. Occupied Bandwidth Plot (NR Band n41 - 60MHz 16-QAM - Full RB - Ant F)

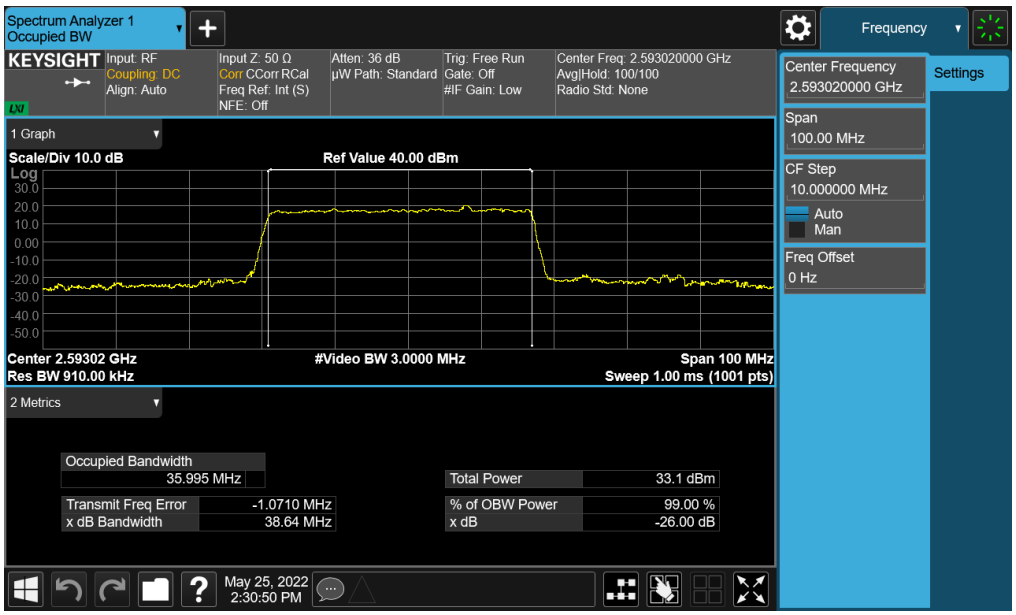


Plot 7-21. Occupied Bandwidth Plot (NR Band n41 - 50MHz π/2 BPSK - Full RB - Ant F)

Plot 7-22. Occupied Bandwidth Plot (NR Band n41 - 50MHz QPSK - Full RB - Ant F)



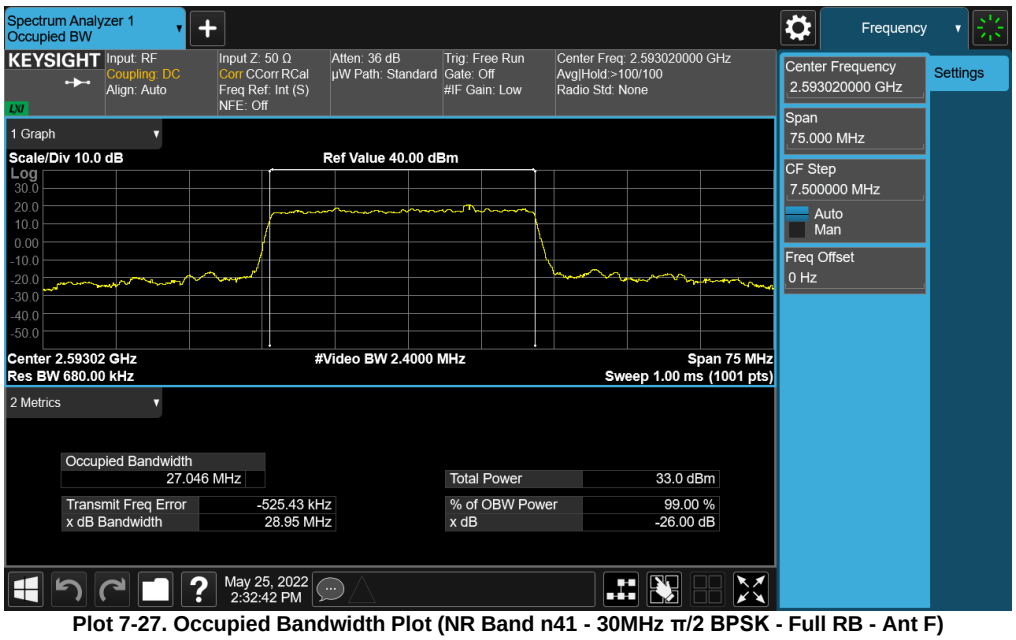
Plot 7-23. Occupied Bandwidth Plot (NR Band n41 - 50MHz 16-QAM - Full RB - Ant F)



Plot 7-24. Occupied Bandwidth Plot (NR Band n41 - 40MHz π/2 BPSK - Full RB - Ant F)

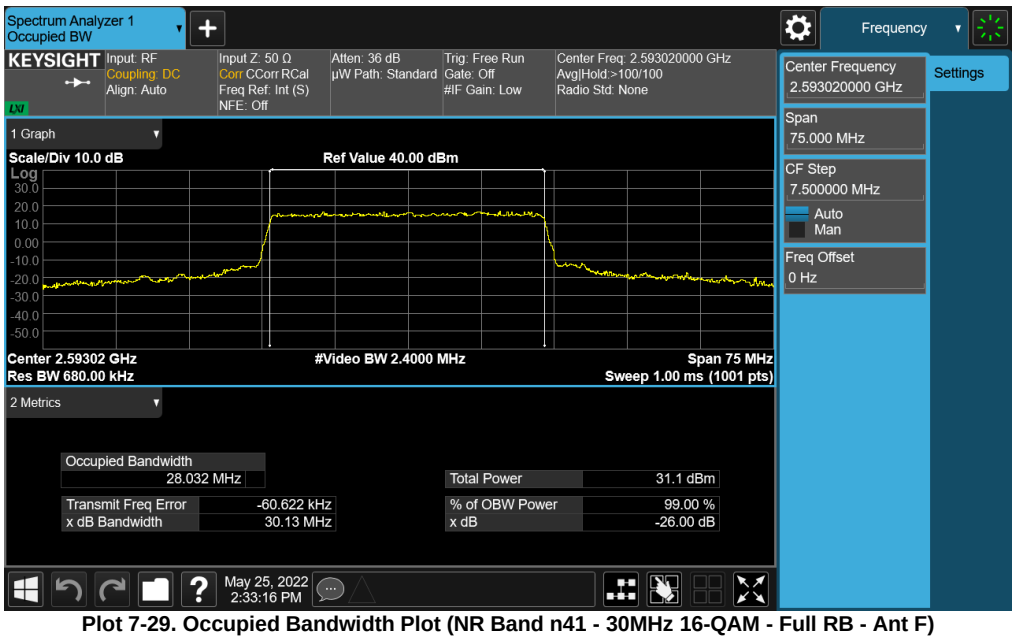
Plot 7-25. Occupied Bandwidth Plot (NR Band n41 - 40MHz QPSK - Full RB - Ant F)

Plot 7-26. Occupied Bandwidth Plot (NR Band n41 - 40MHz 16-QAM - Full RB - Ant F)



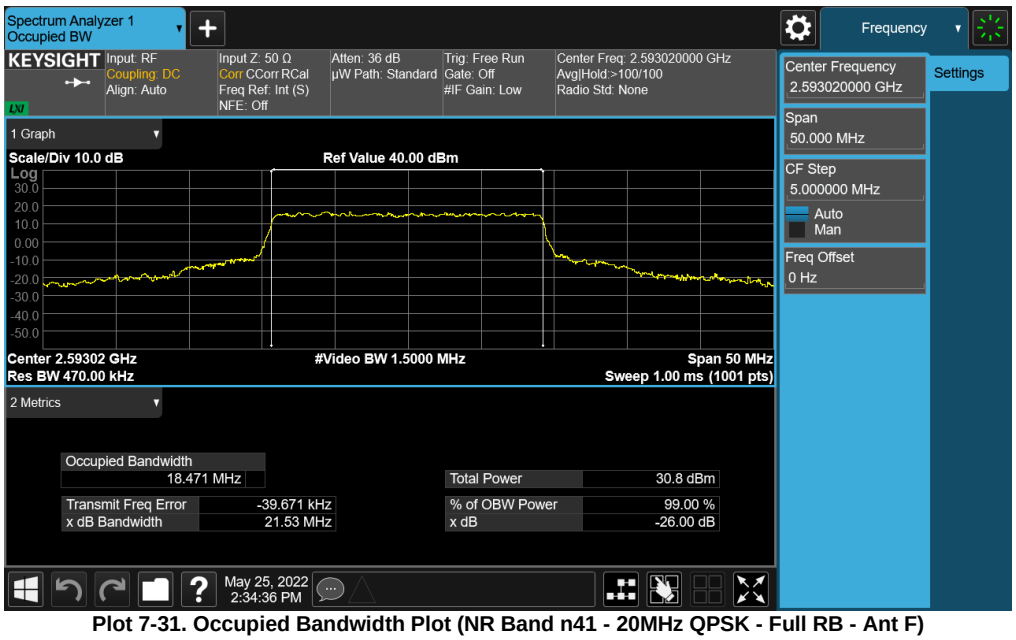
Plot 7-27. Occupied Bandwidth Plot (NR Band n41 - 30MHz π/2 BPSK - Full RB - Ant F)

Plot 7-28. Occupied Bandwidth Plot (NR Band n41 - 30MHz QPSK - Full RB - Ant F)



Plot 7-29. Occupied Bandwidth Plot (NR Band n41 - 30MHz 16-QAM - Full RB - Ant F)

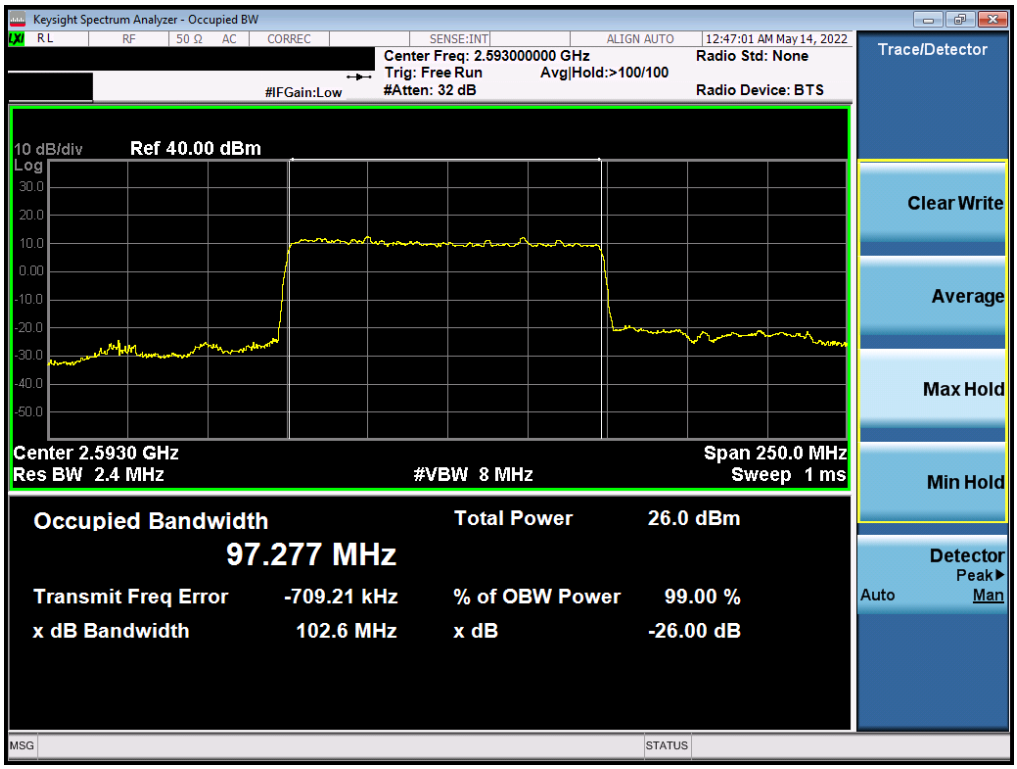
Plot 7-30. Occupied Bandwidth Plot (NR Band n41 - 20MHz π/2 BPSK - Full RB - Ant F)



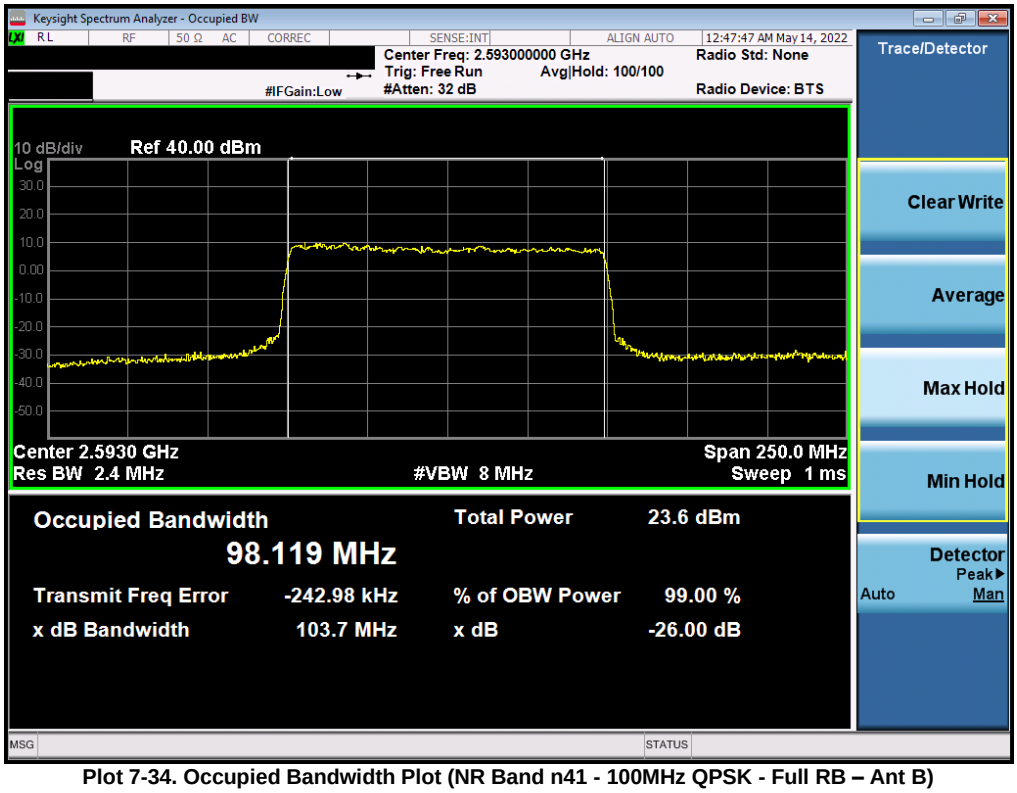
Plot 7-31. Occupied Bandwidth Plot (NR Band n41 - 20MHz QPSK - Full RB - Ant F)

Plot 7-32. Occupied Bandwidth Plot (NR Band n41 - 20MHz 16-QAM - Full RB - Ant F)

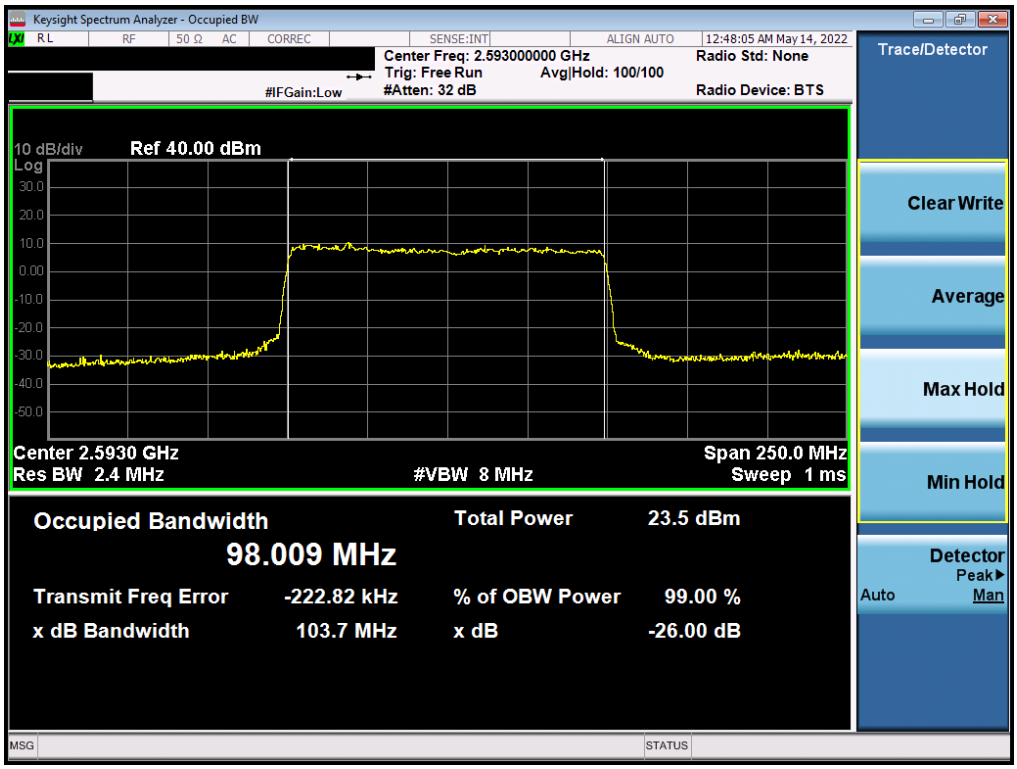
NR Band n41 – Ant B



Plot 7-33. Occupied Bandwidth Plot (NR Band n41 - 100MHz π/2 BPSK - Full RB – Ant B)

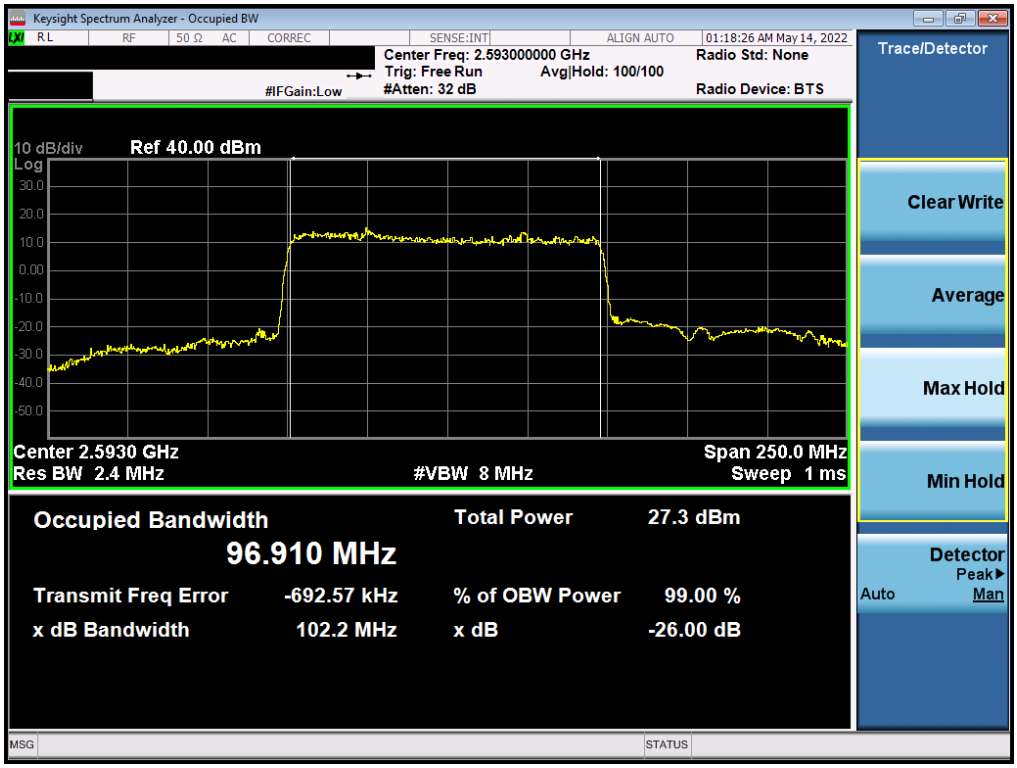


Plot 7-34. Occupied Bandwidth Plot (NR Band n41 - 100MHz QPSK - Full RB – Ant B)

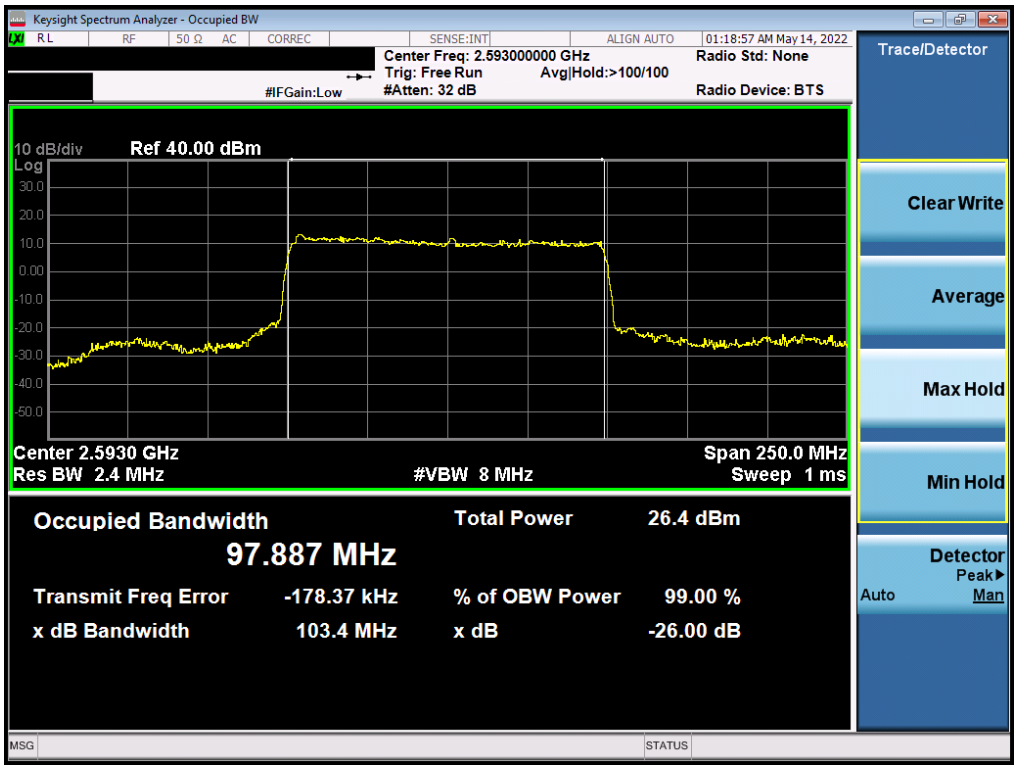


Plot 7-35. Occupied Bandwidth Plot (NR Band n41 - 100MHz 16-QAM - Full RB – Ant B)

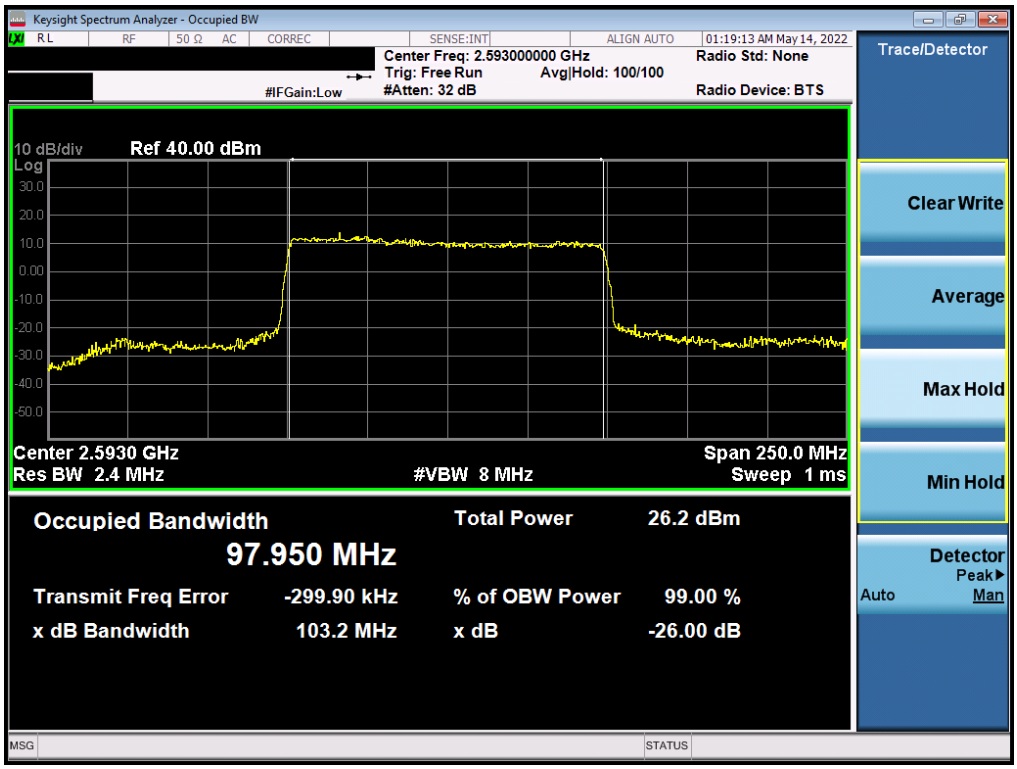
NR Band n41 – Ant E



Plot 7-36. Occupied Bandwidth Plot (NR Band n41 - 100MHz π/2 BPSK - Full RB – Ant E)

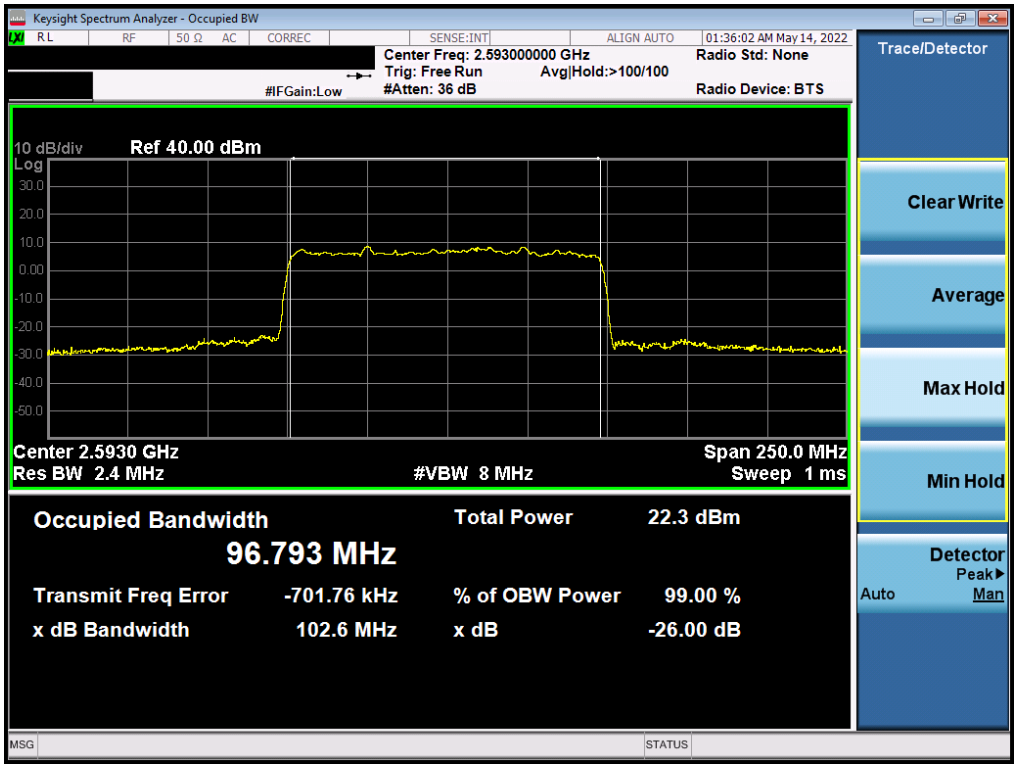


Plot 7-37. Occupied Bandwidth Plot (NR Band n41 - 100MHz QPSK - Full RB – Ant E)

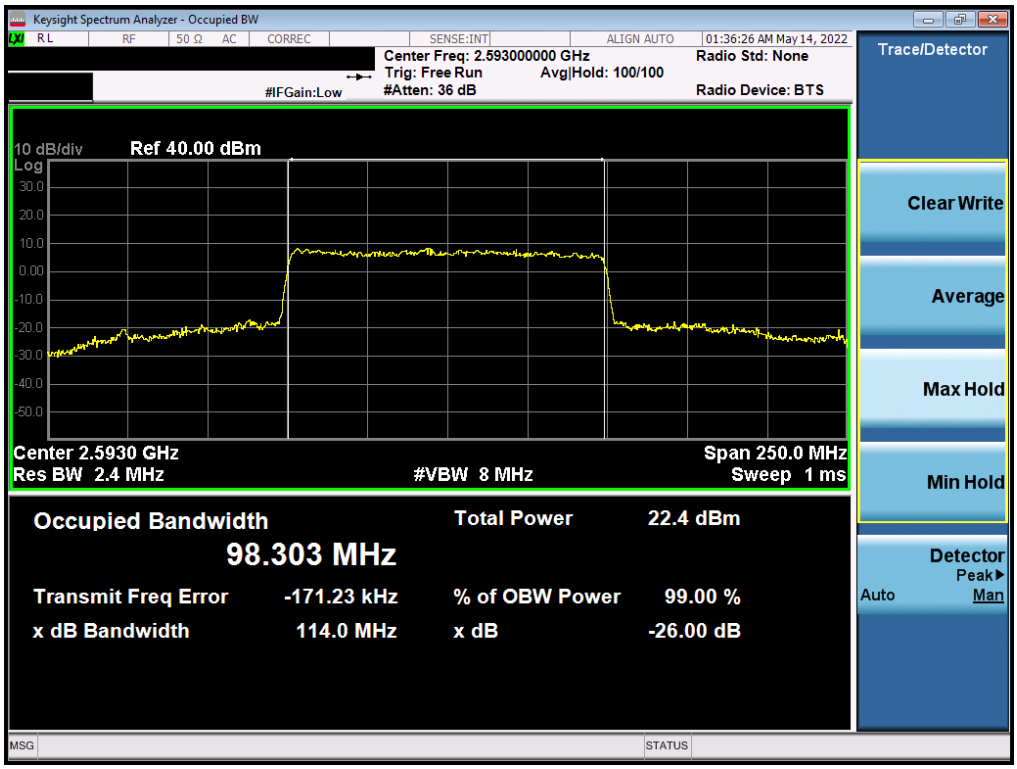


Plot 7-38. Occupied Bandwidth Plot (NR Band n41 - 100MHz 16-QAM - Full RB – Ant E)

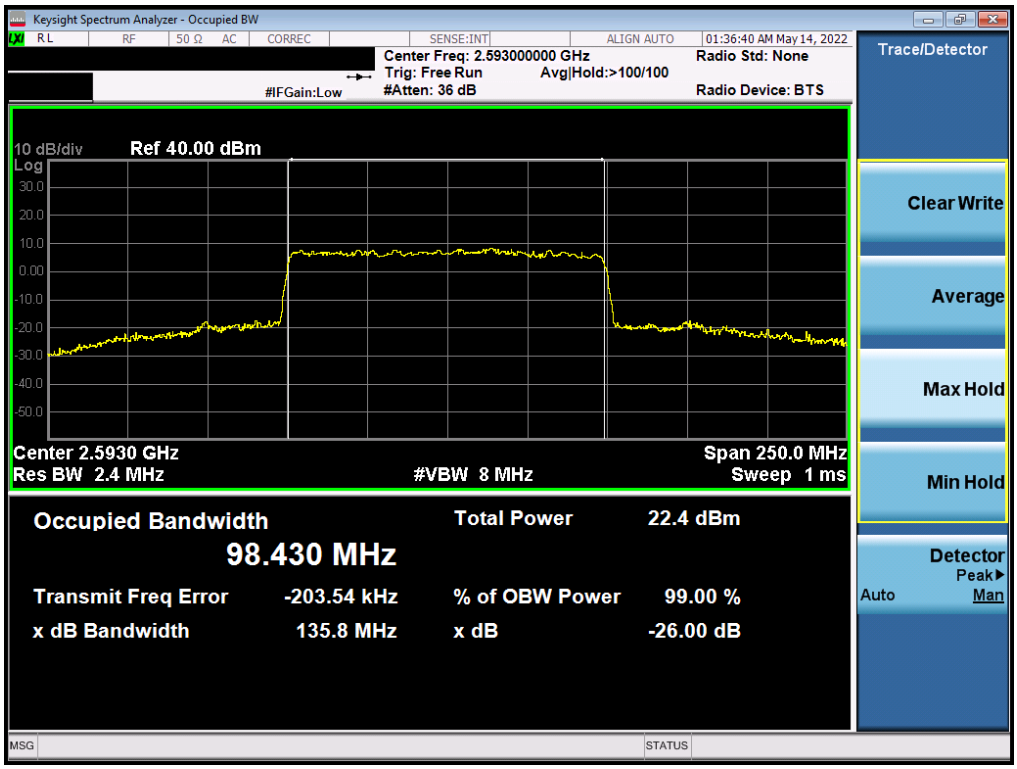
NR Band n41 – Ant C



Plot 7-39. Occupied Bandwidth Plot (NR Band n41 - 100MHz π/2 BPSK - Full RB – Ant C)



Plot 7-40. Occupied Bandwidth Plot (NR Band n41 - 100MHz QPSK - Full RB – Ant C)



Plot 7-41. Occupied Bandwidth Plot (NR Band n41 - 100MHz 16-QAM - Full RB – Ant C)

7.4 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.

For Band 41, the minimum permissible attenuation level of any spurious emission is 55 + 10$log_{10}(P_{[Watts]})$.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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.

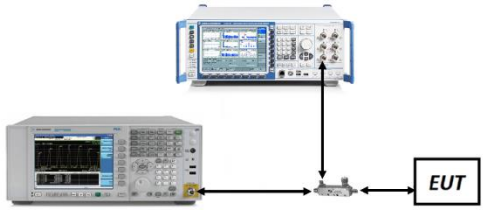


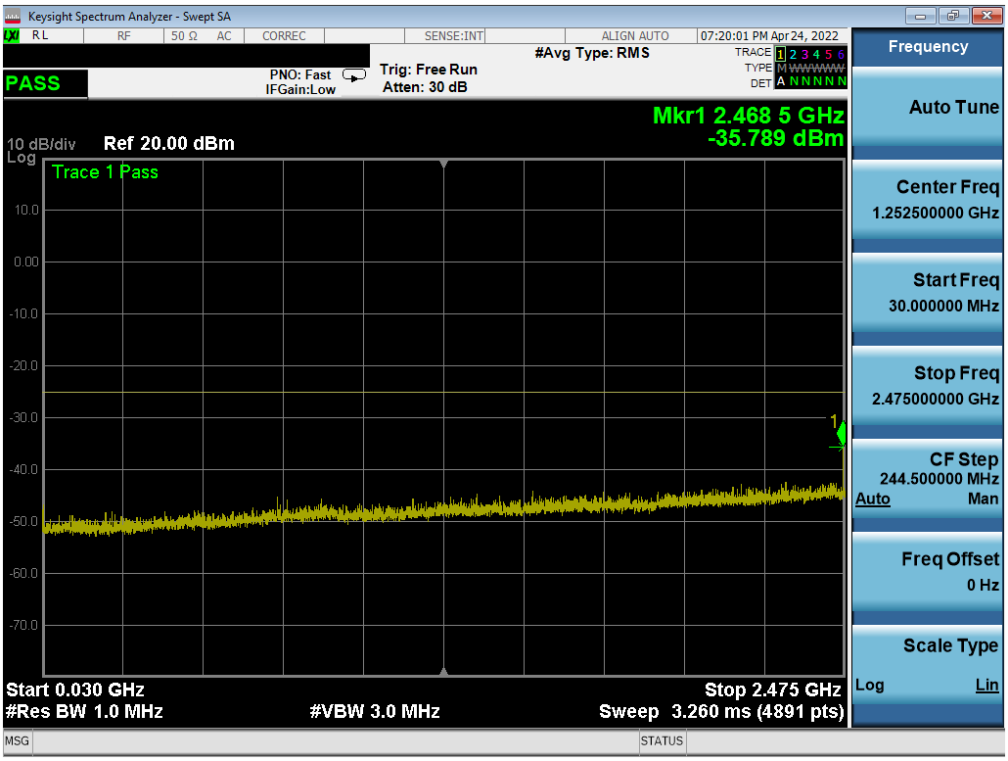
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

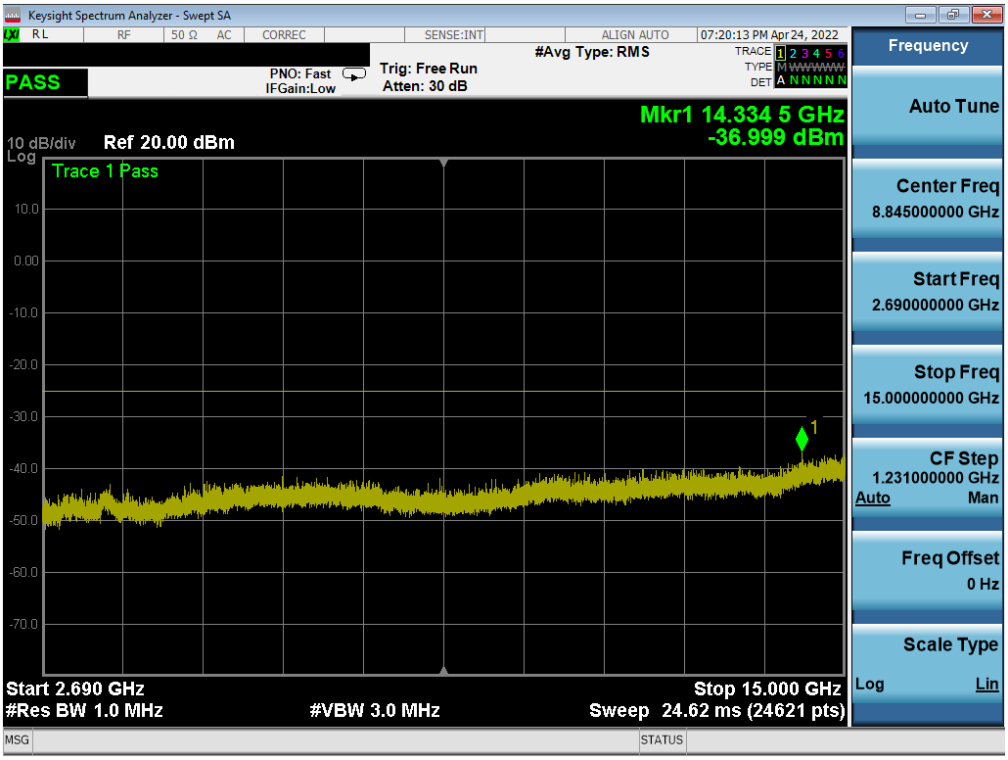
1. Per Part 27, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

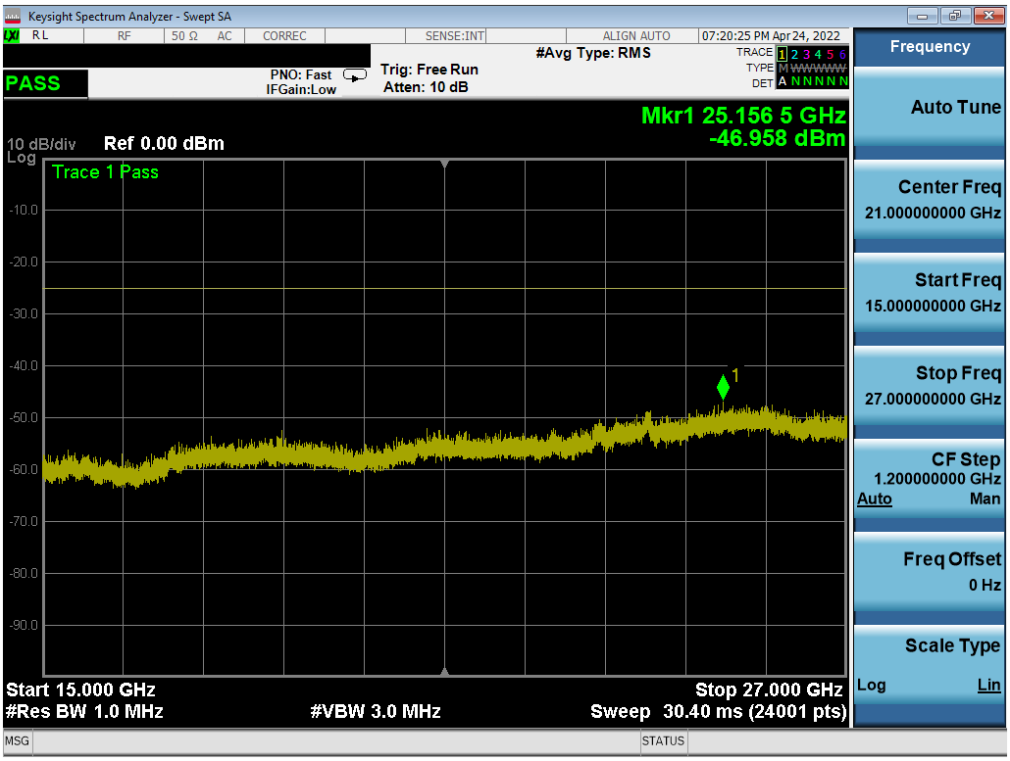
LTE Band 41(PC2) – Ant F



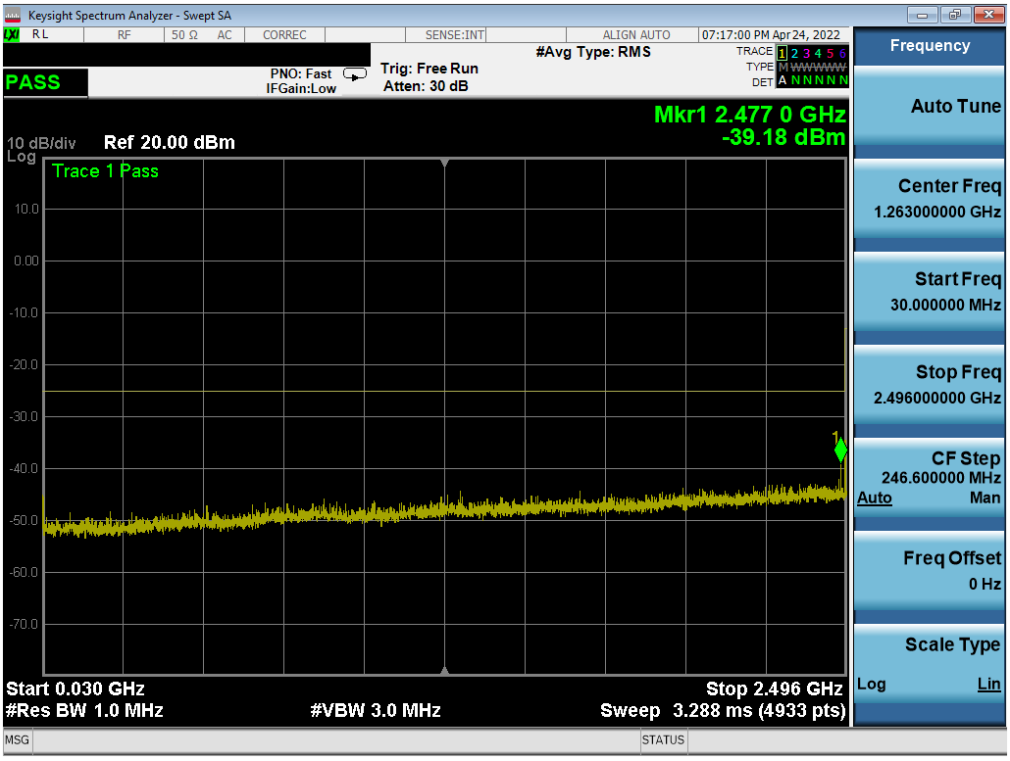
Plot 7-42. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel - Ant F)



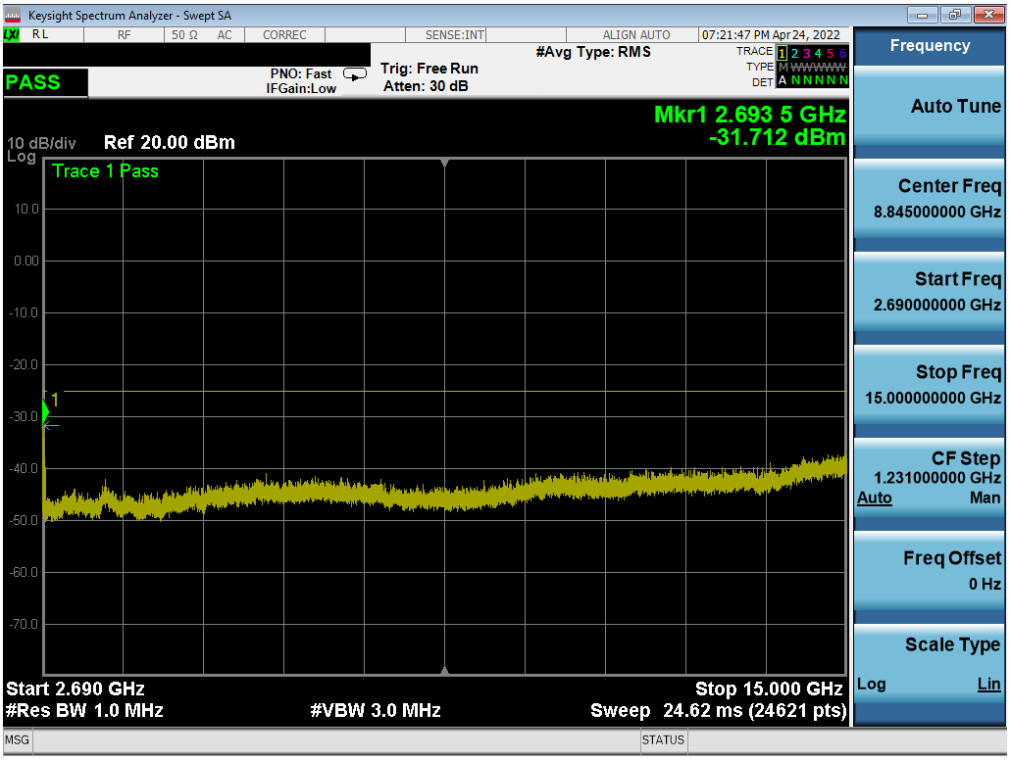
Plot 7-43. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel - Ant F)



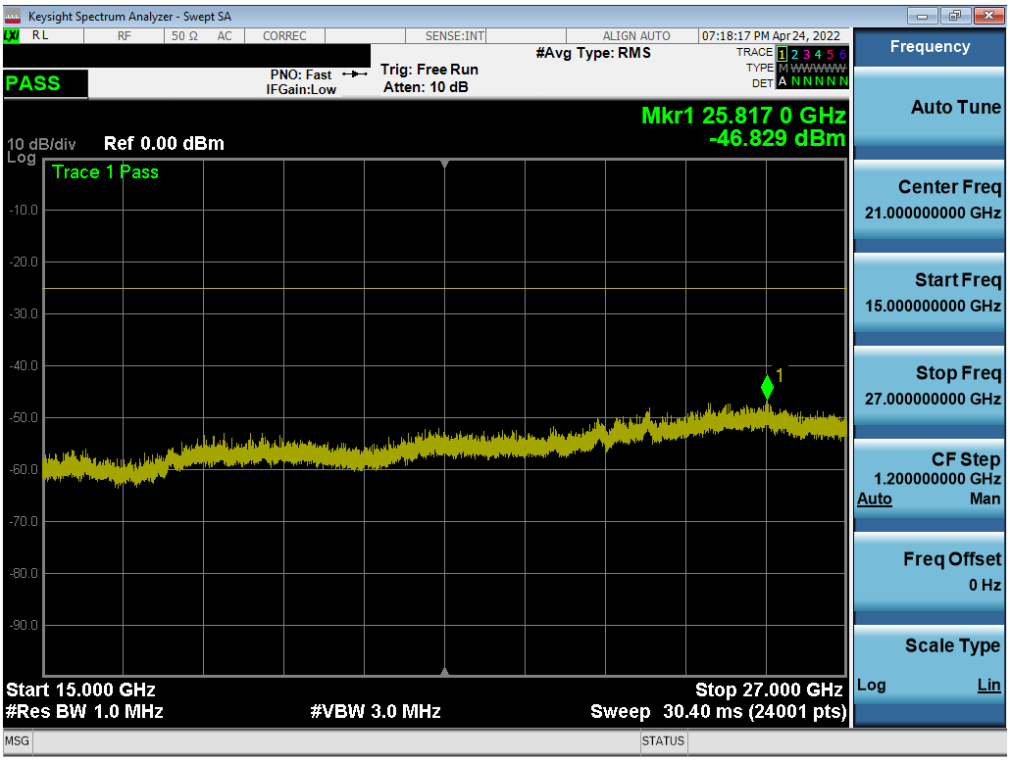
Plot 7-44. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel - Ant F)



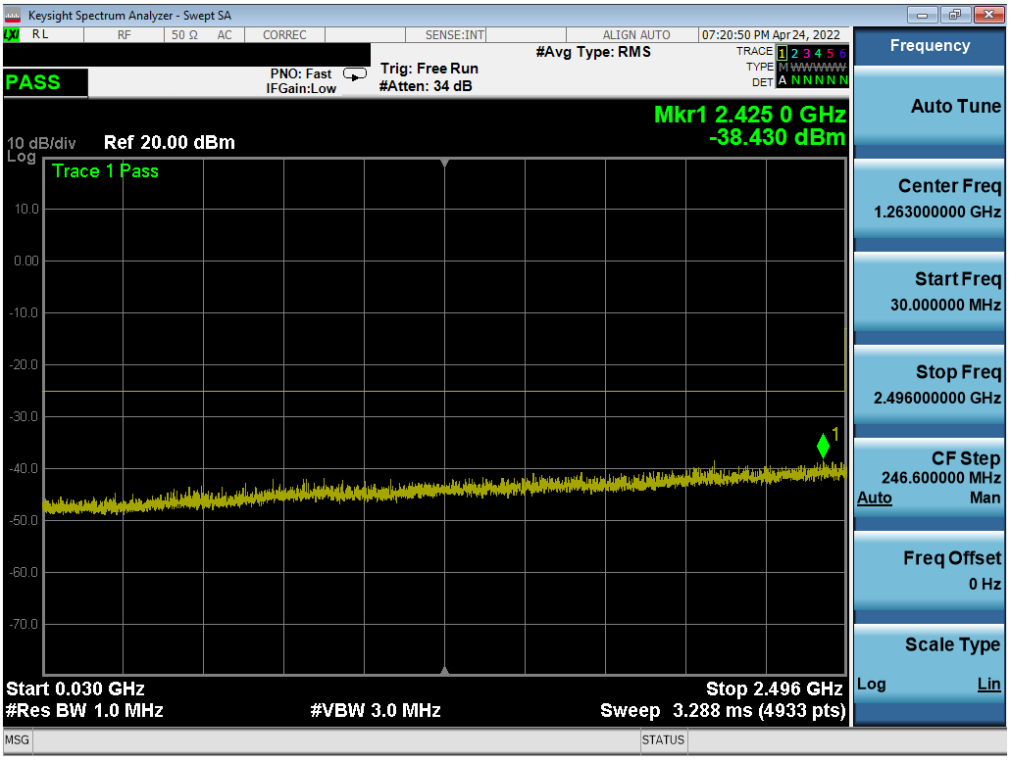
Plot 7-45. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel - Ant F)



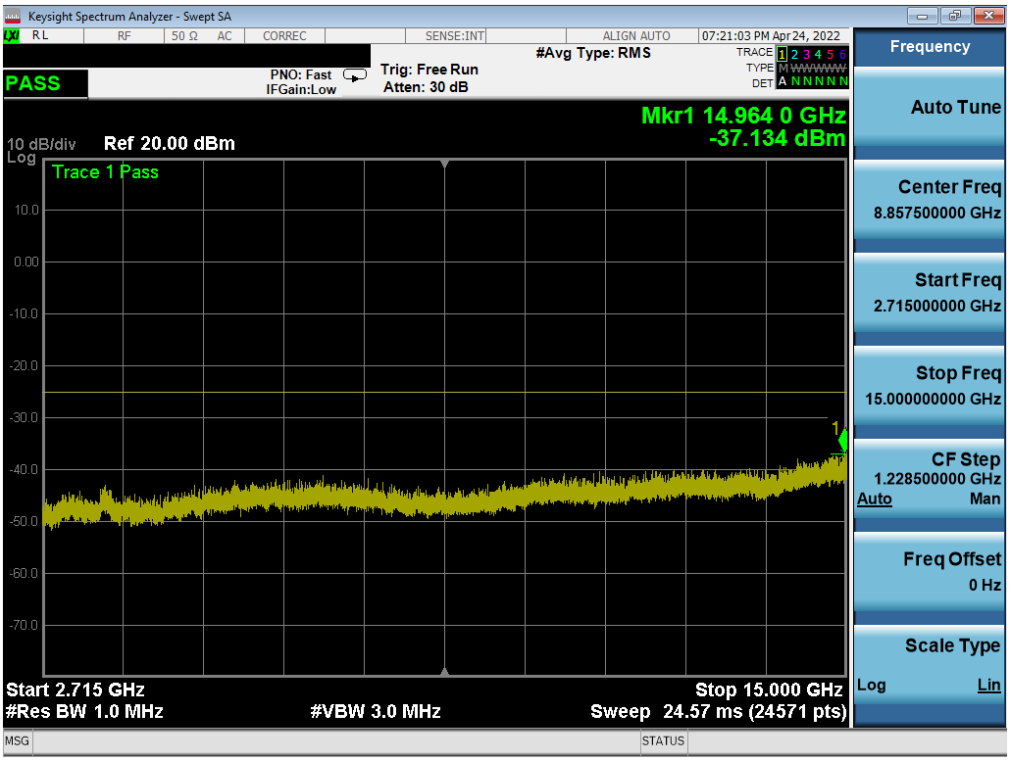
Plot 7-46. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel - Ant F)



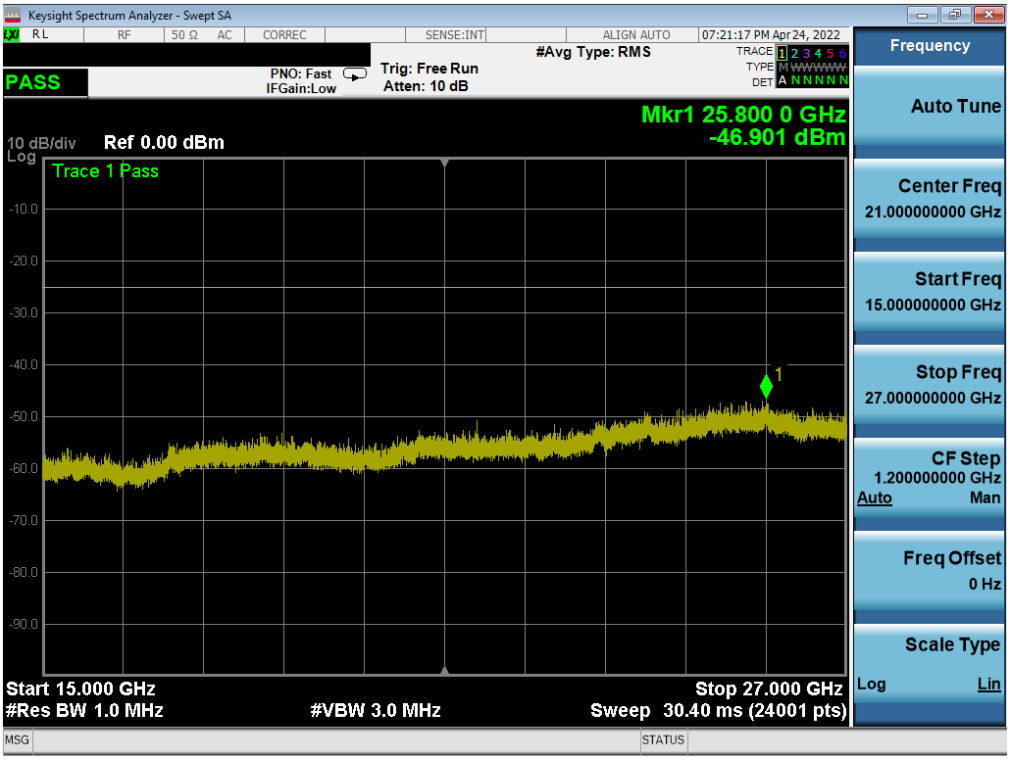
Plot 7-47. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel - Ant F)



Plot 7-48. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel - Ant F)

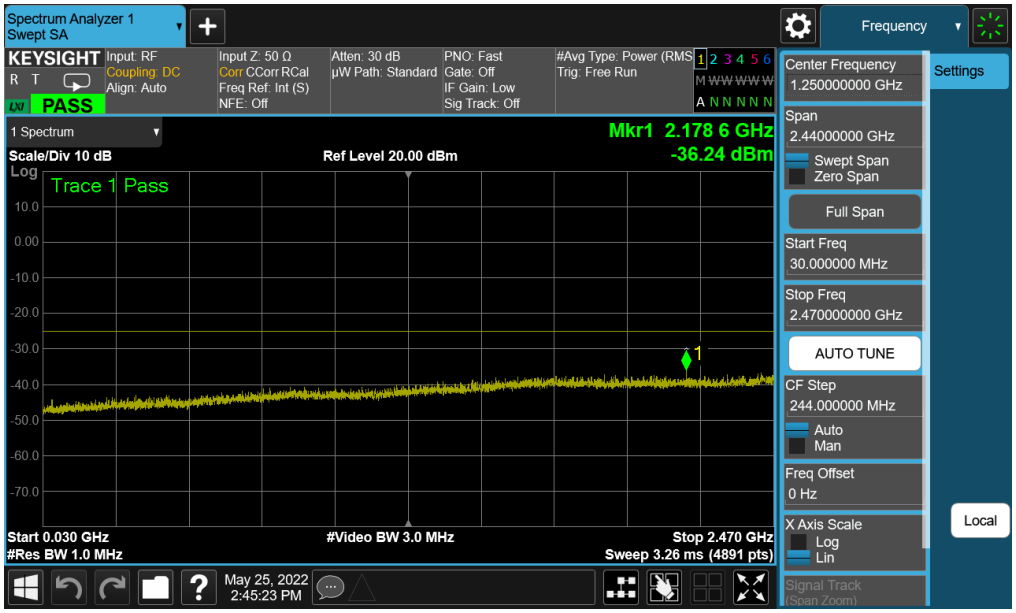


Plot 7-49. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel - Ant F)

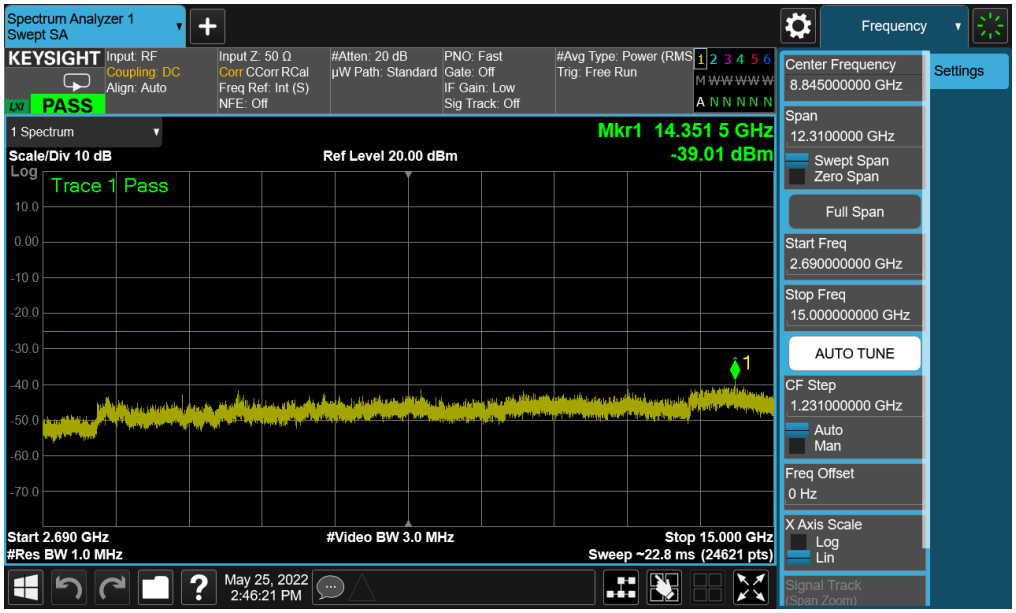


Plot 7-50. Conducted Spurious Plot (LTE Band 41(PC2) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel - Ant F)

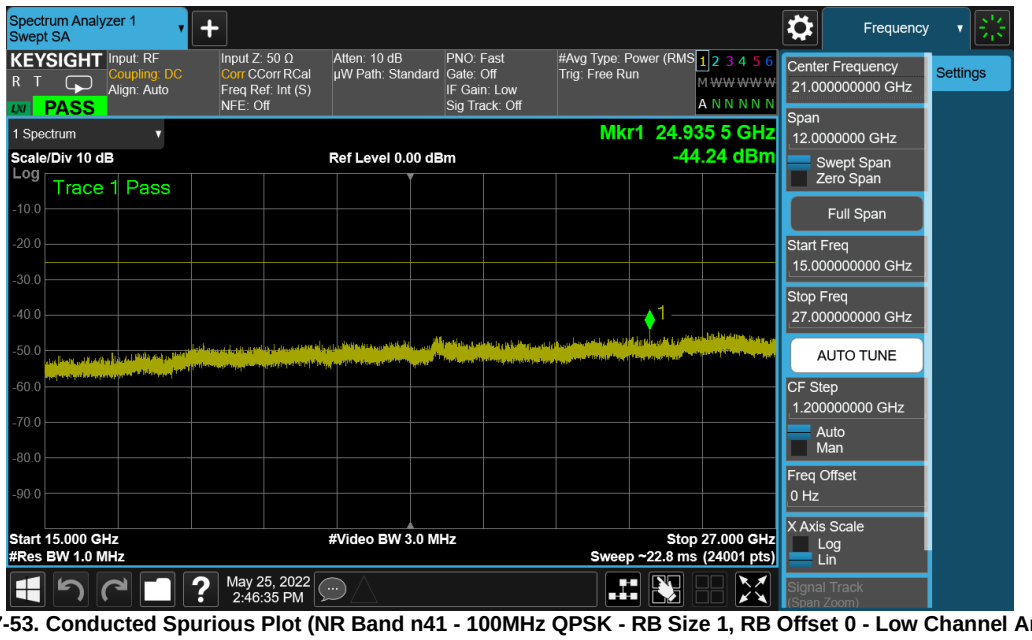
NR Band n41 – Ant F



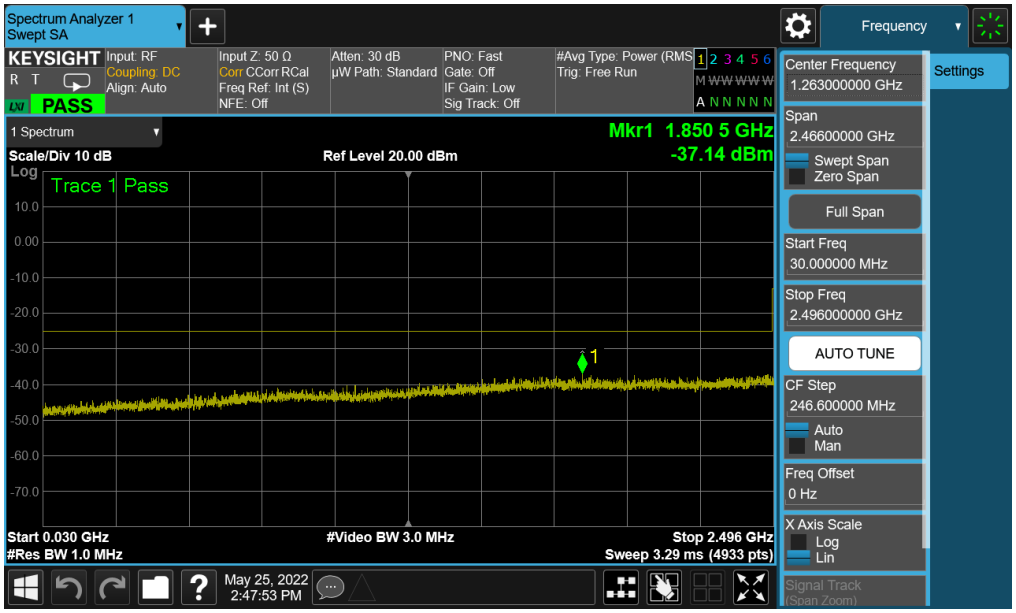
Plot 7-51. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant F)



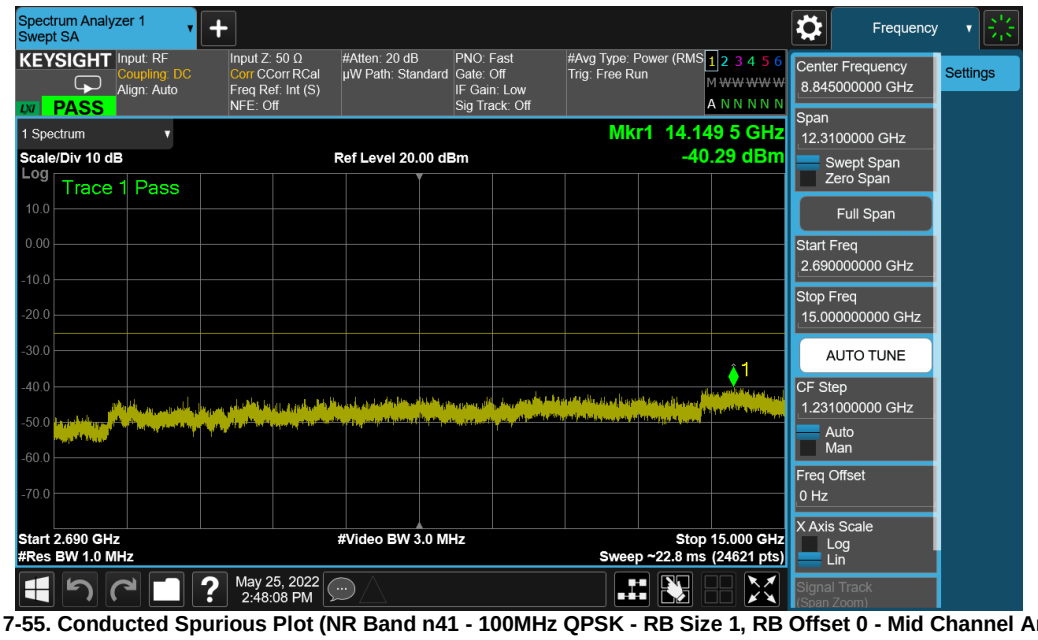
Plot 7-52. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant F)



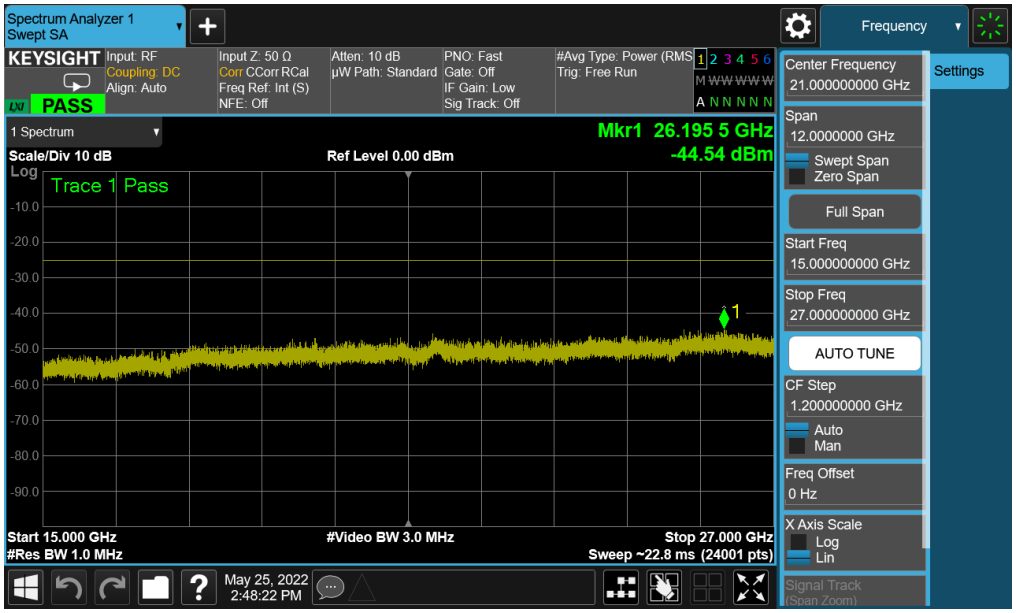
Plot 7-53. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant F)



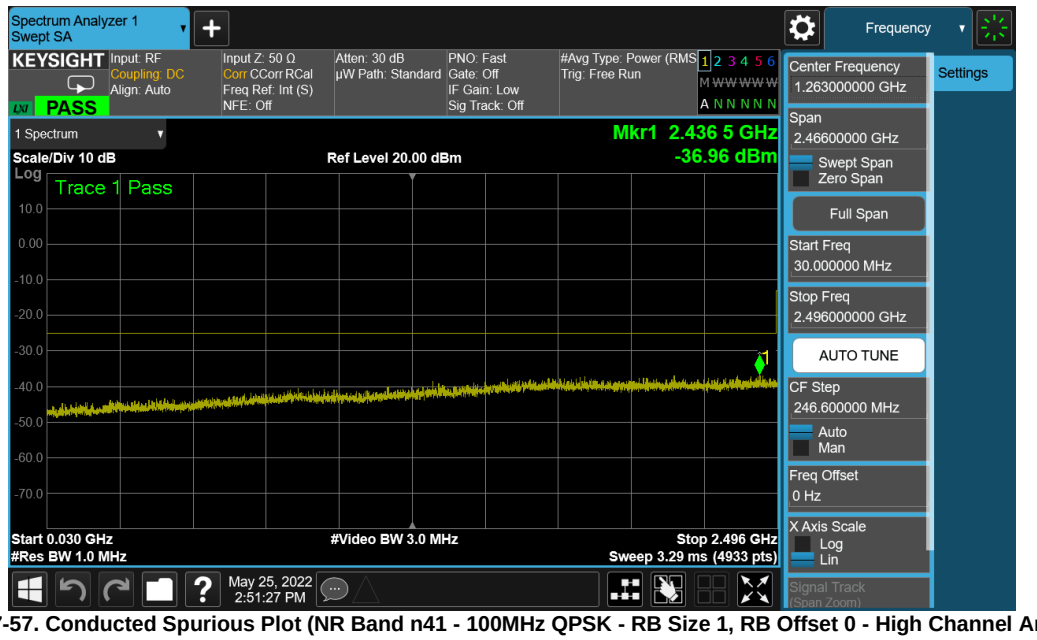
Plot 7-54. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant F)



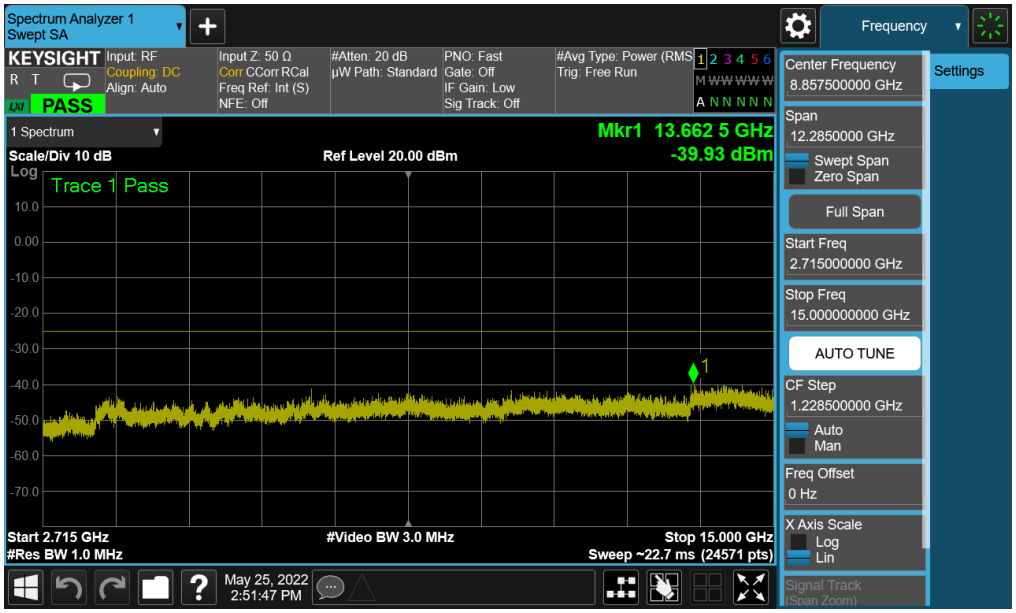
Plot 7-55. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant F)



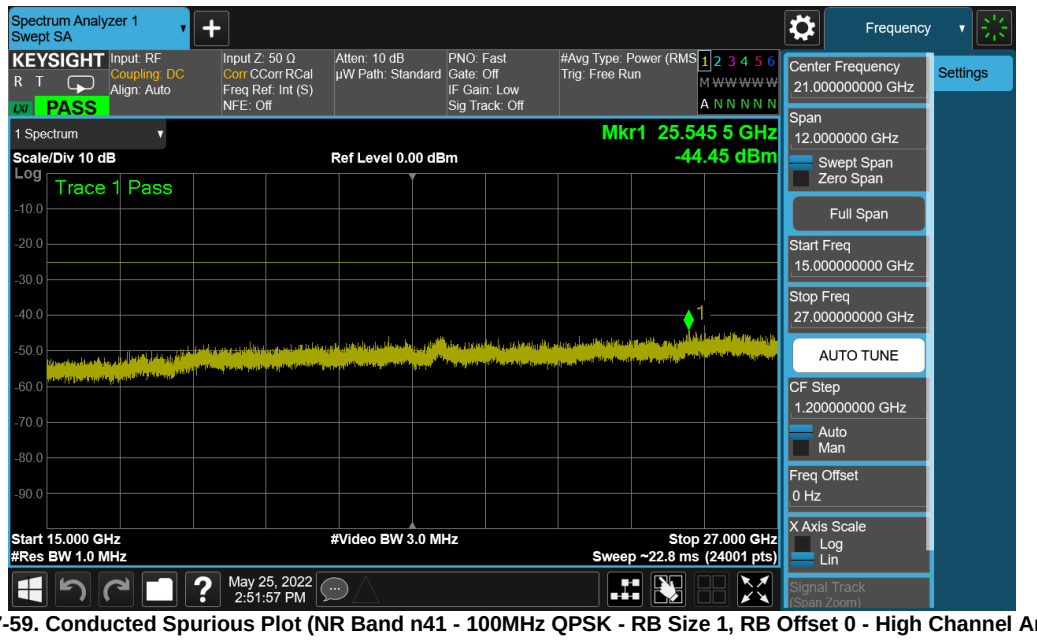
Plot 7-56. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant F)



Plot 7-57. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant F)

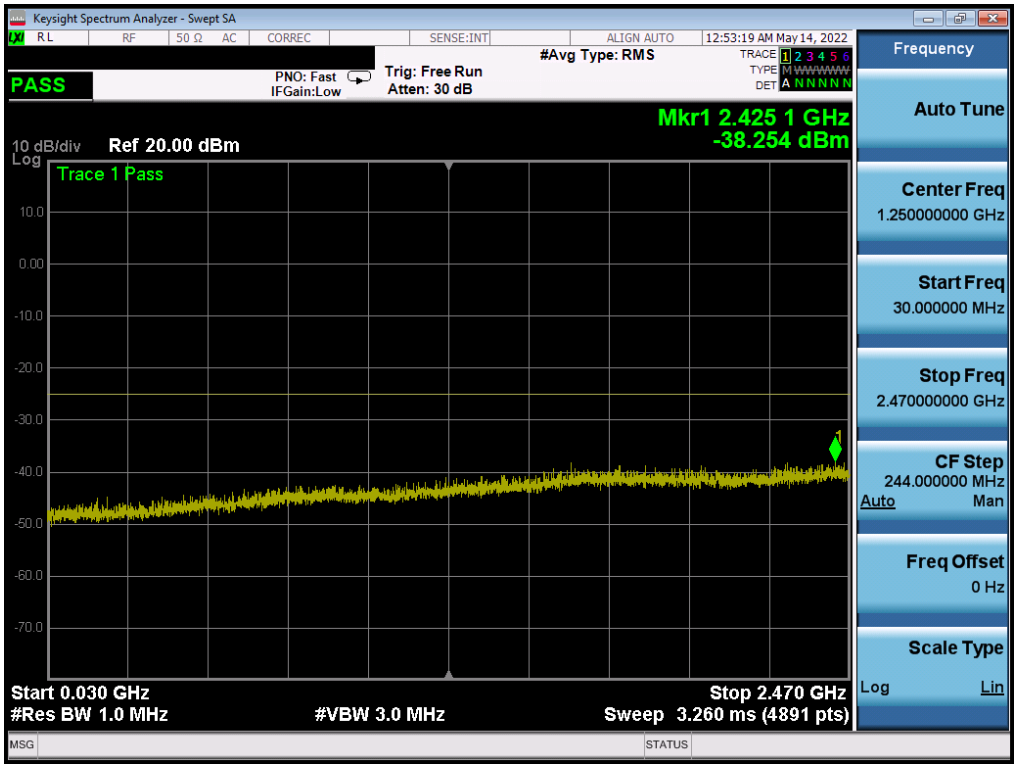


Plot 7-58. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant F)

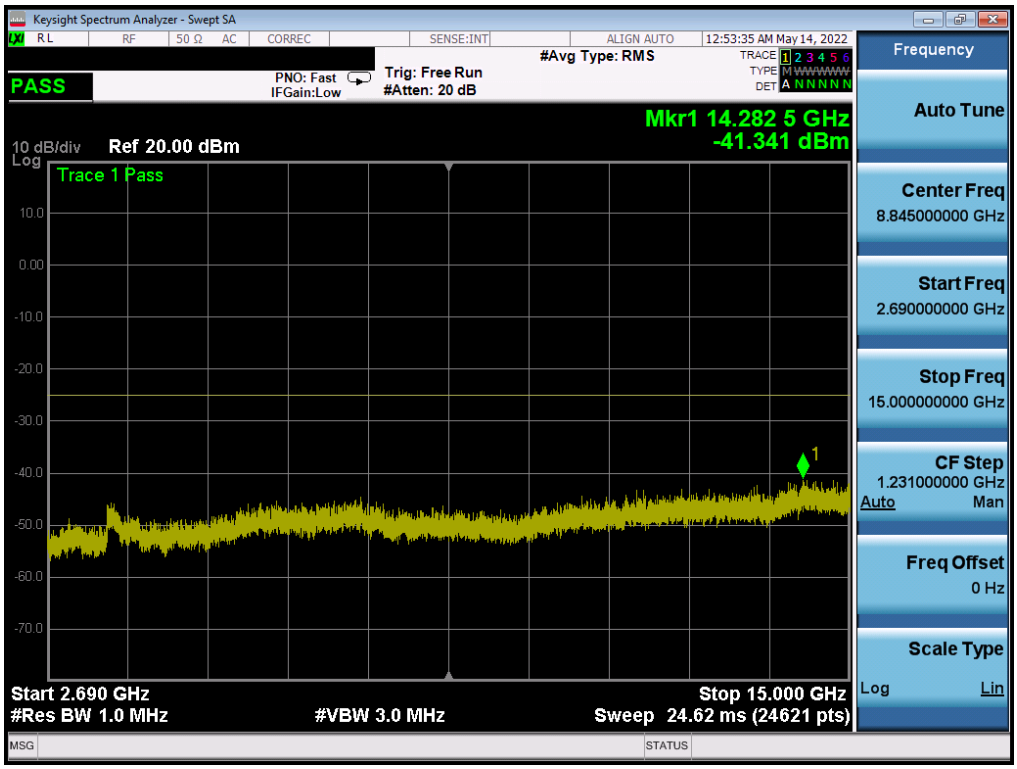


Plot 7-59. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant F)

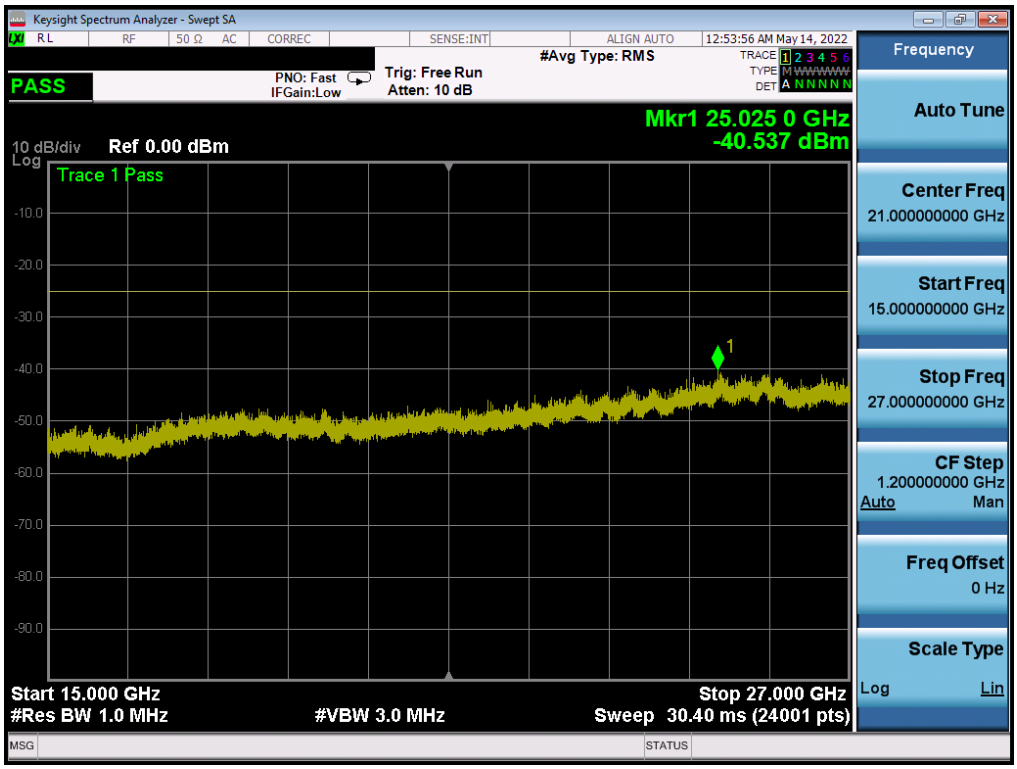
NR Band n41 – Ant B



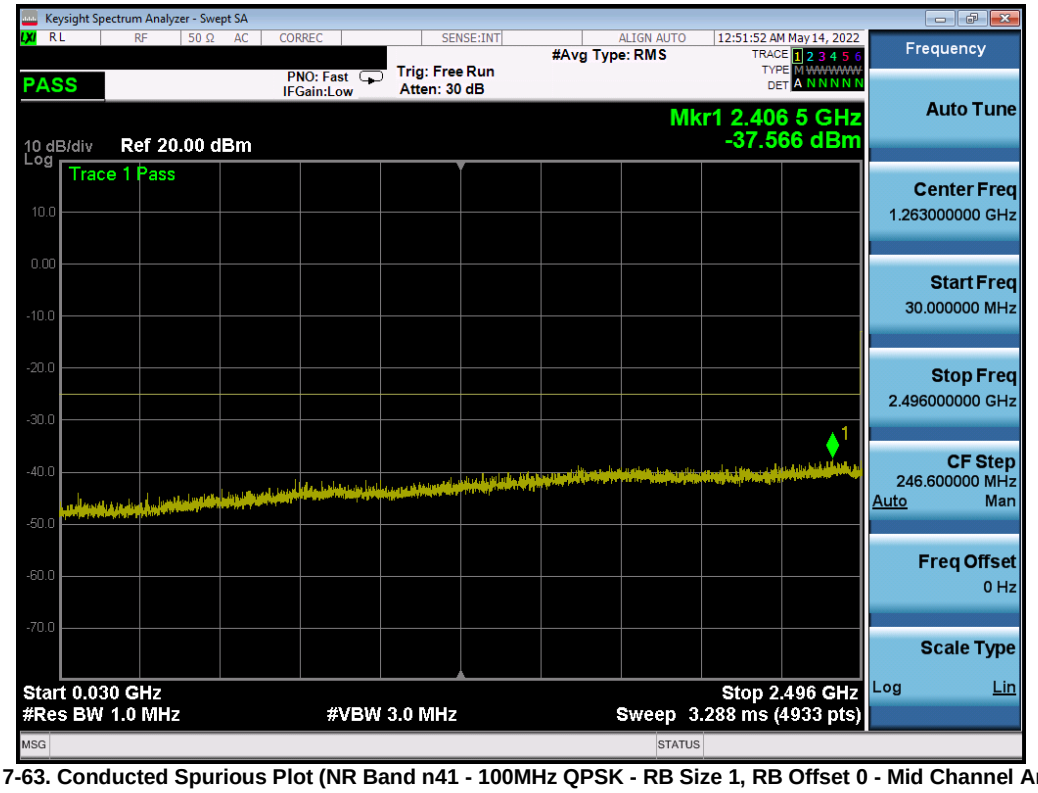
Plot 7-60. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant B)



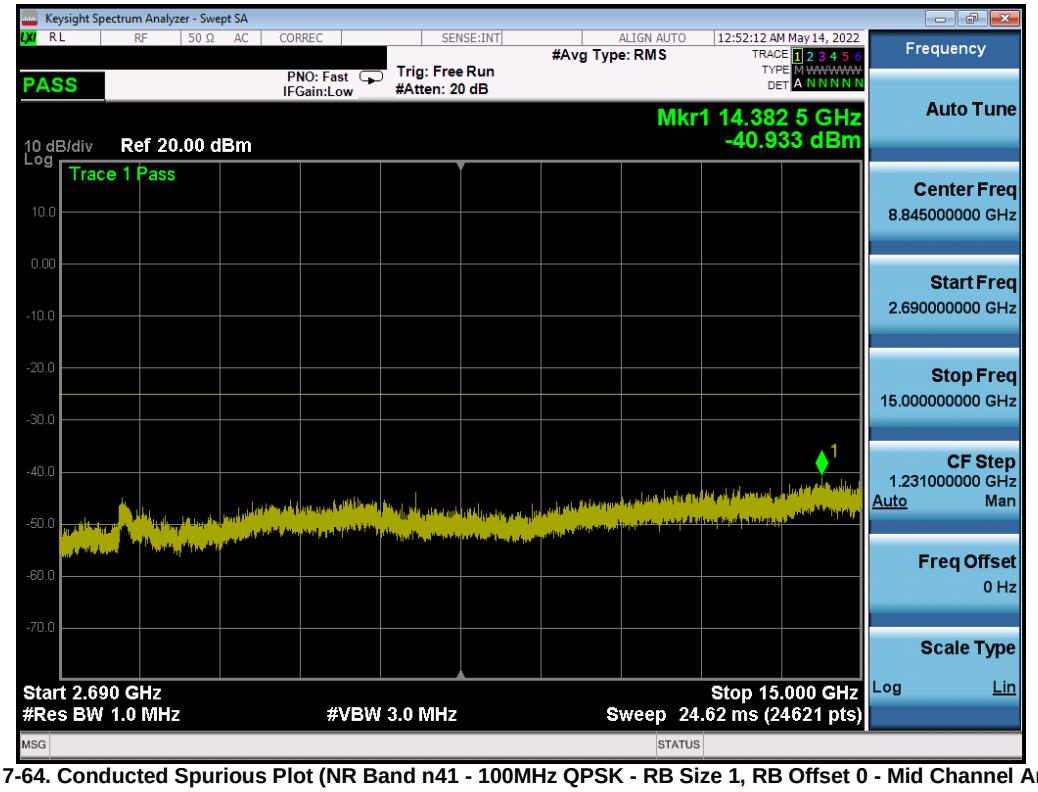
Plot 7-61. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant B)



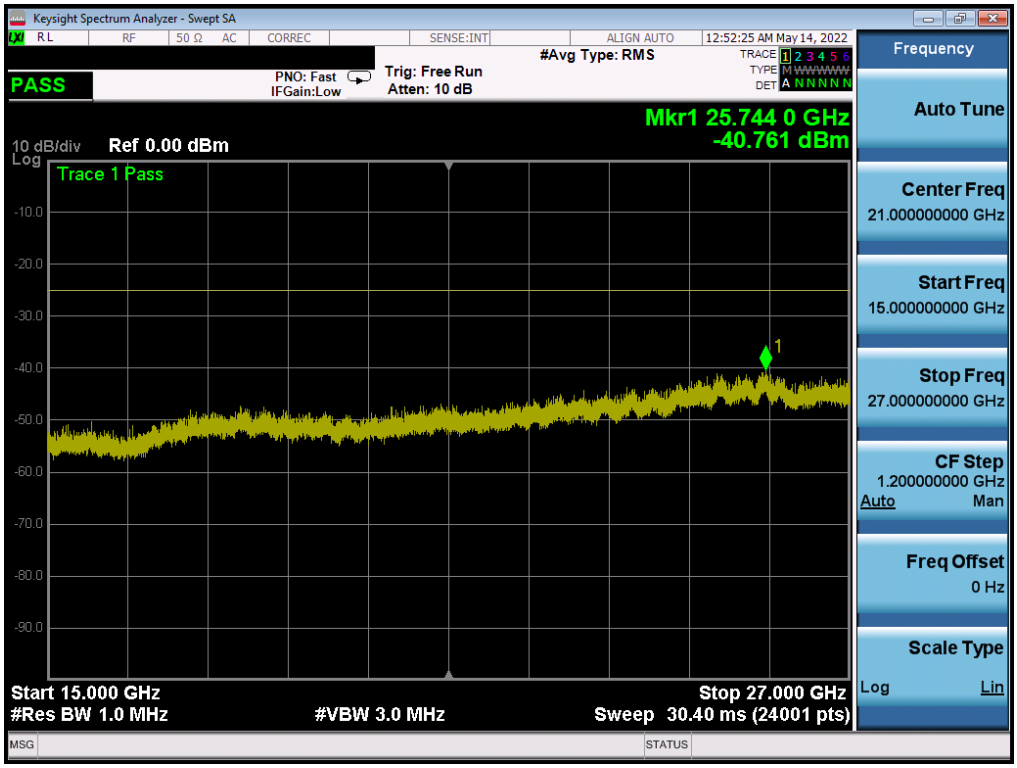
Plot 7-62. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant B)



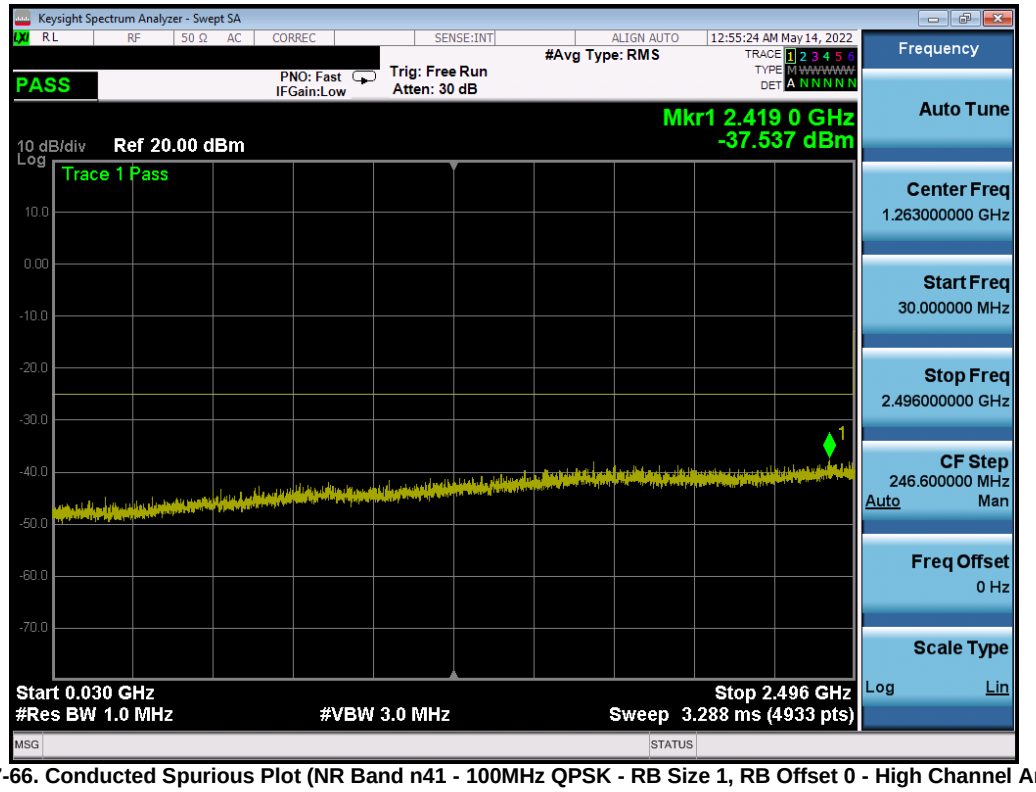
Plot 7-63. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant B)



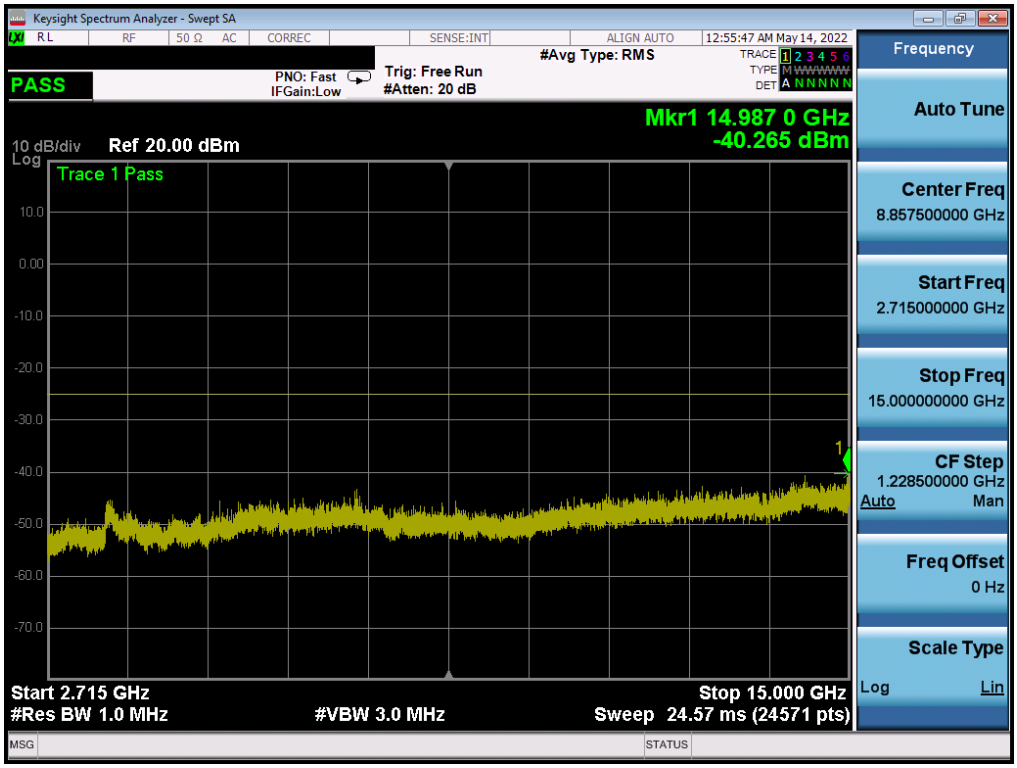
Plot 7-64. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant B)



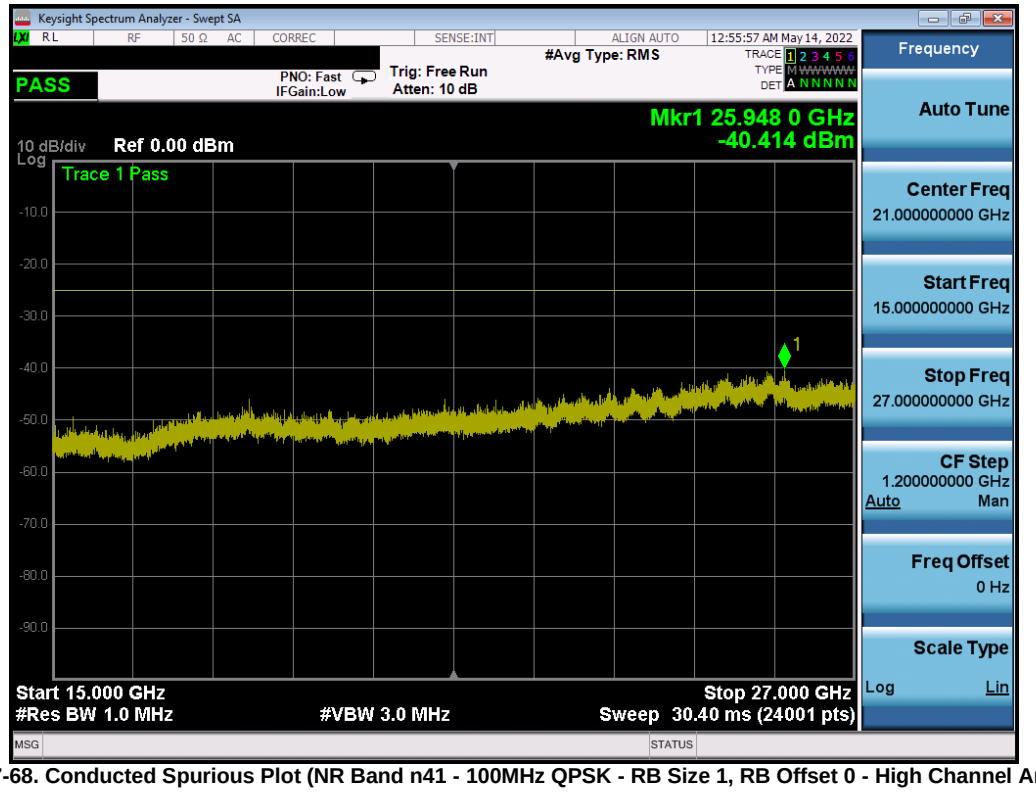
Plot 7-65. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant B)



Plot 7-66. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant B)

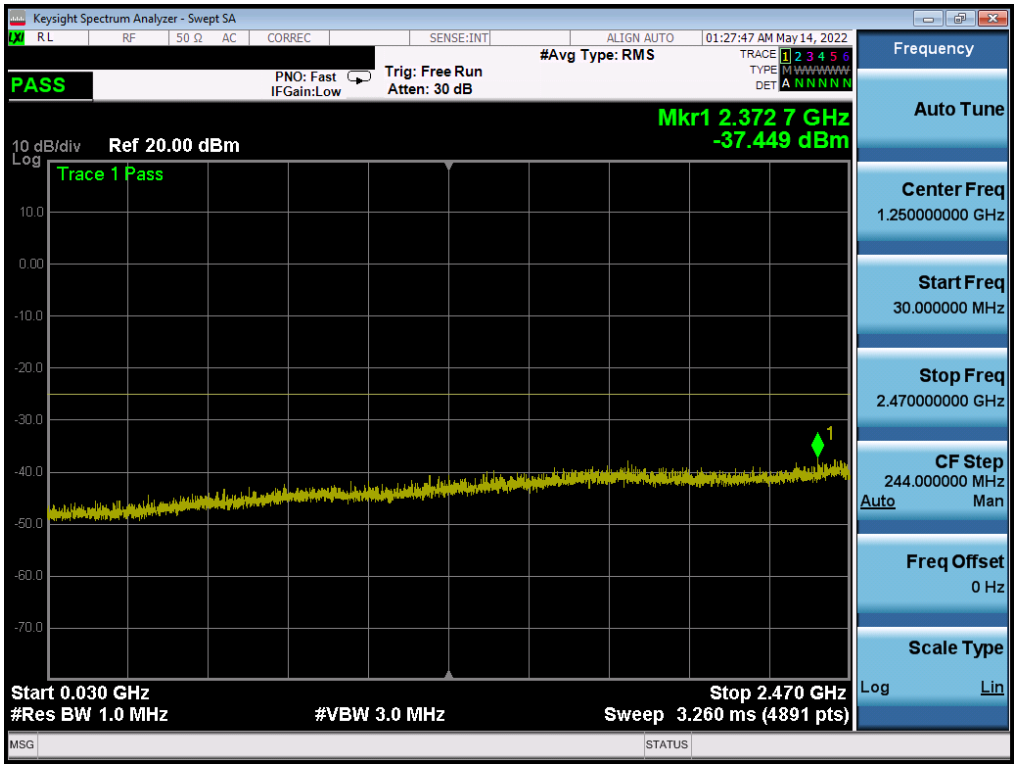


Plot 7-67. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant B)

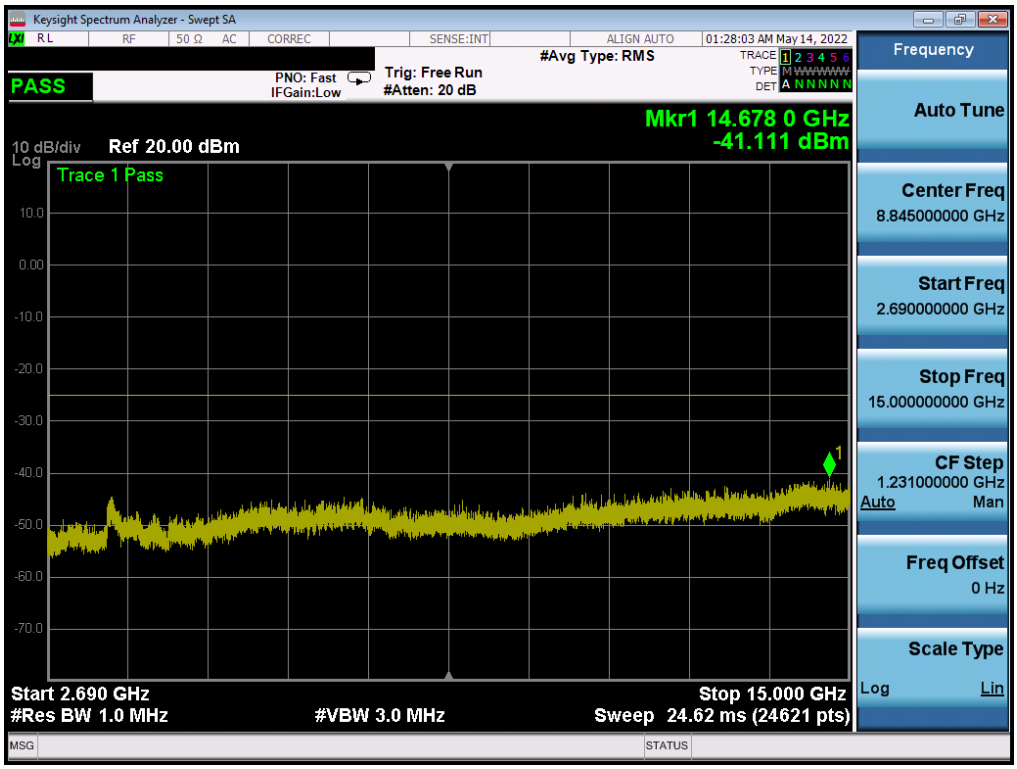


Plot 7-68. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant B)

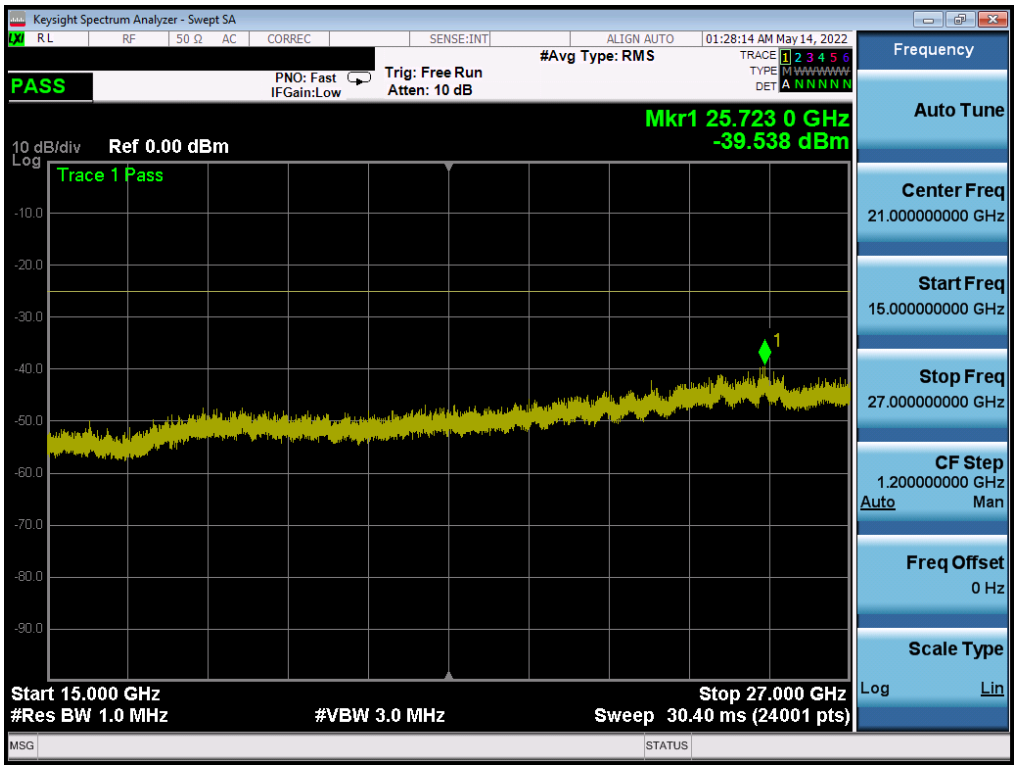
NR Band n41 – Ant E



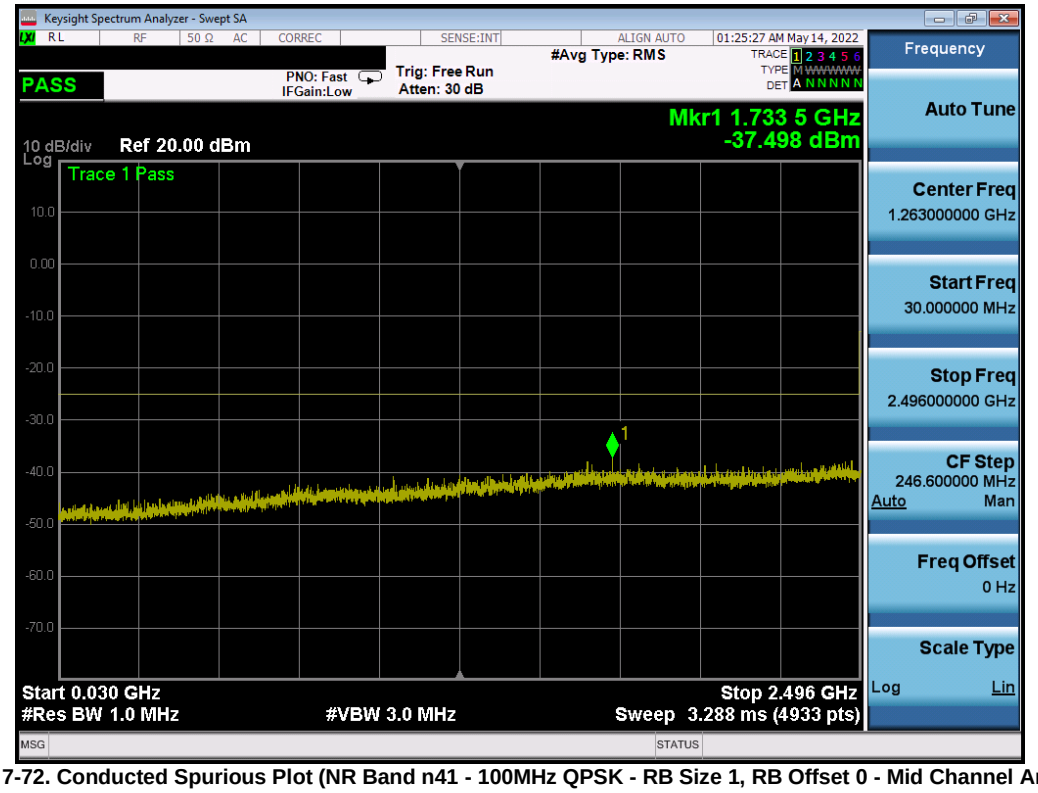
Plot 7-69. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant E)



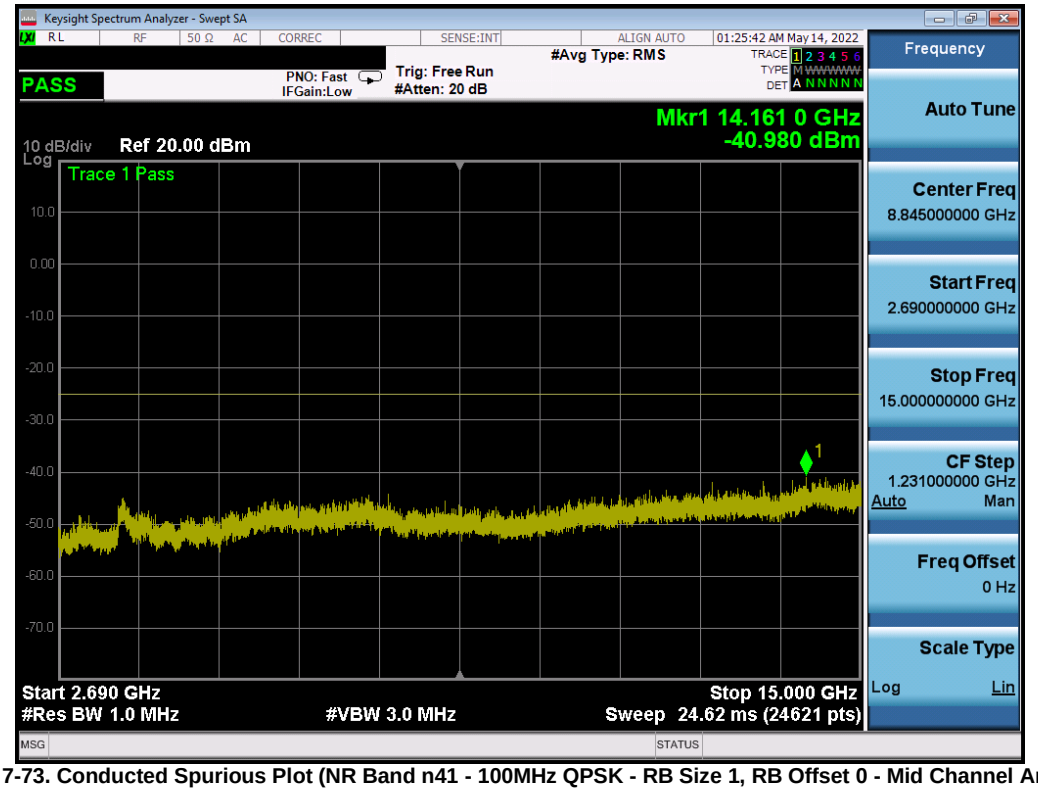
Plot 7-70. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant E)



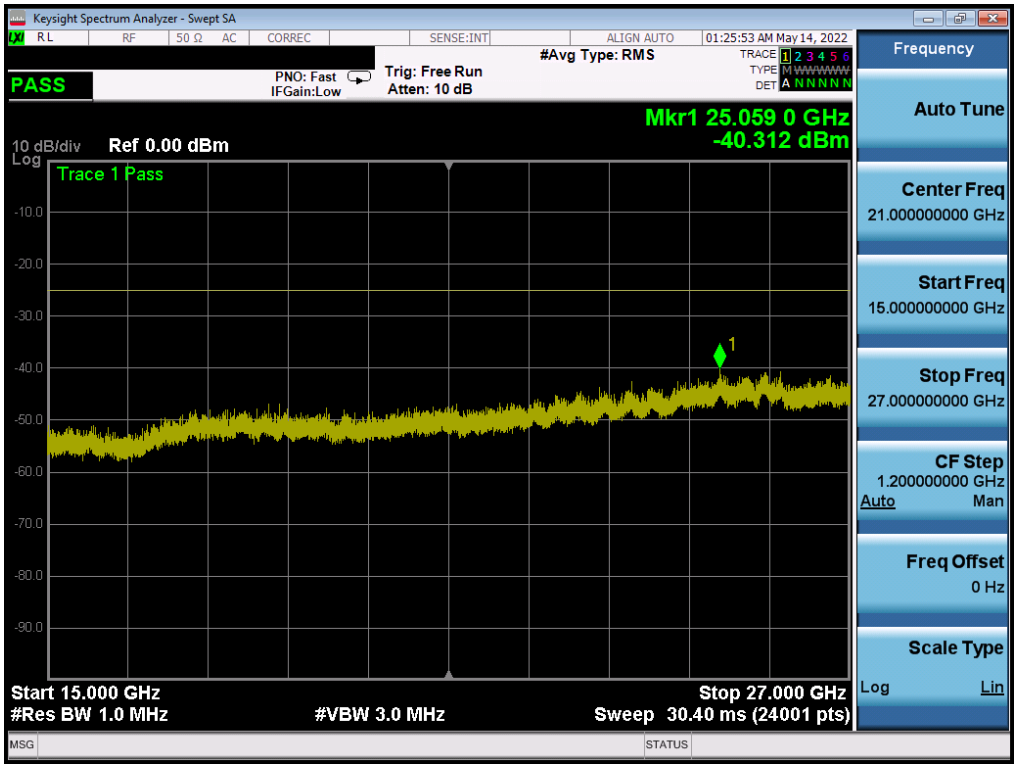
Plot 7-71. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant E)



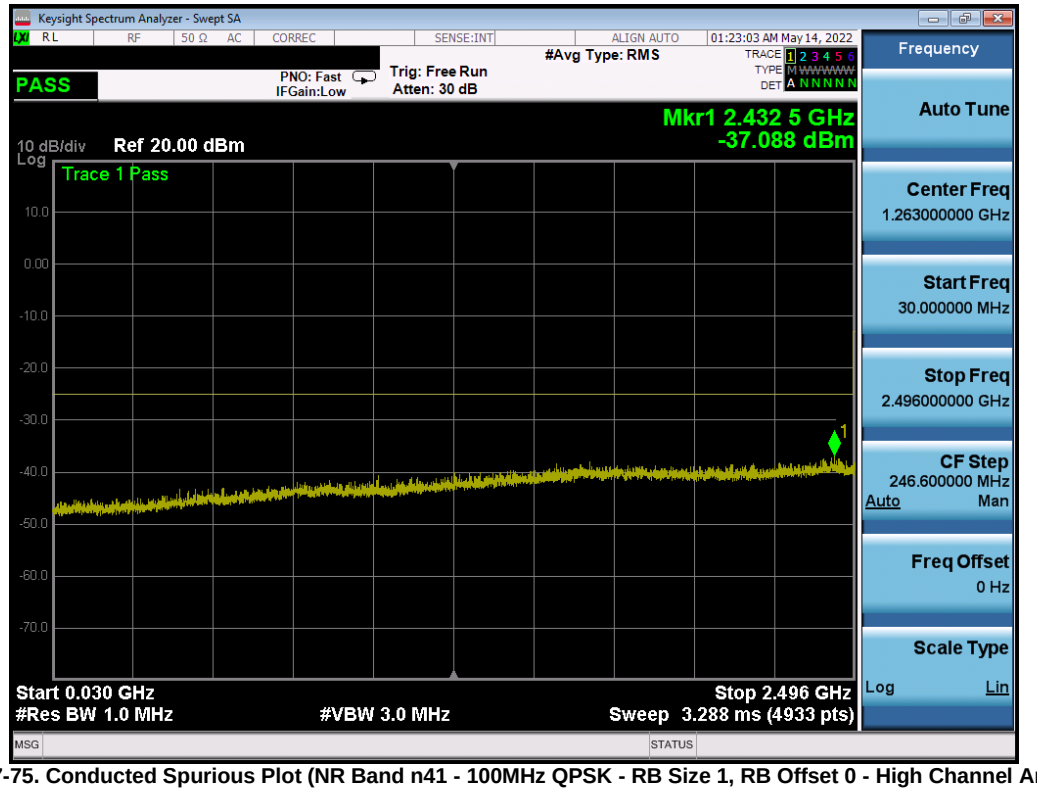
Plot 7-72. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant E)



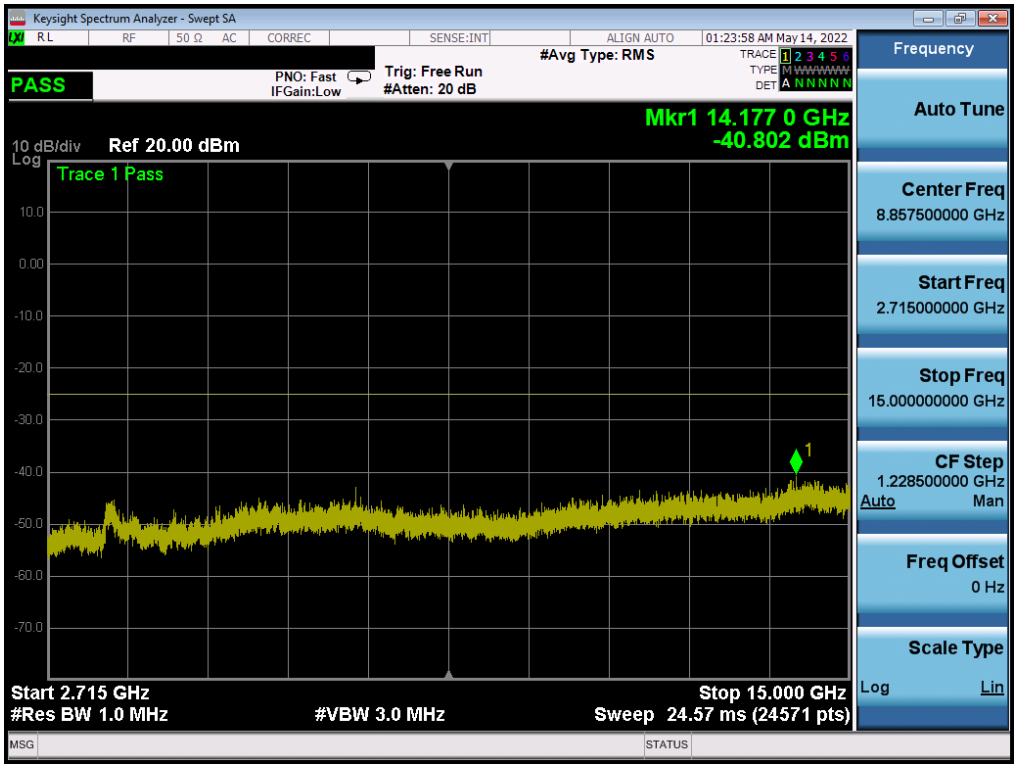
Plot 7-73. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant E)



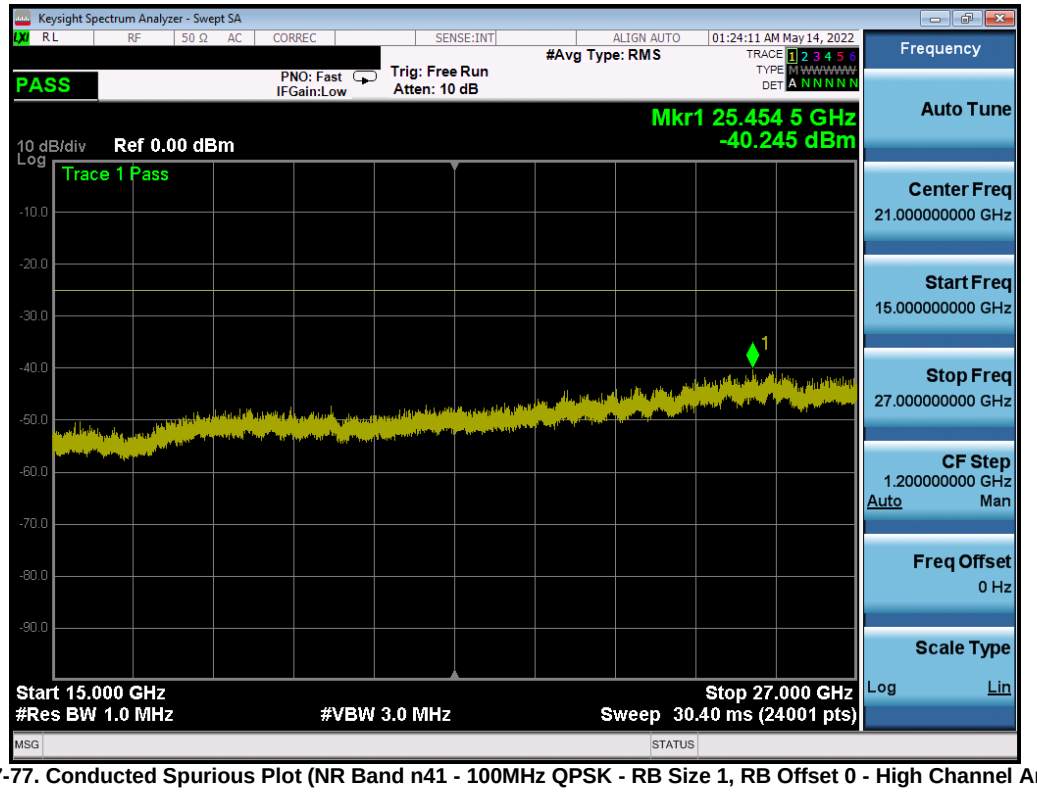
Plot 7-74. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant E)



Plot 7-75. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant E)

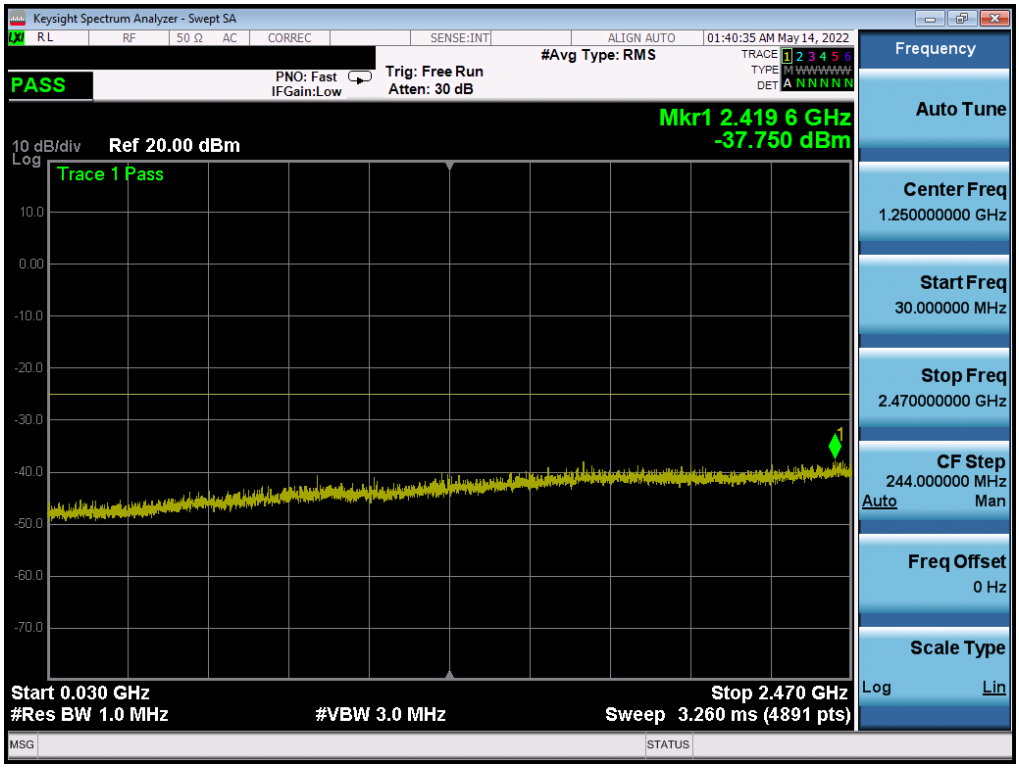


Plot 7-76. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant E)

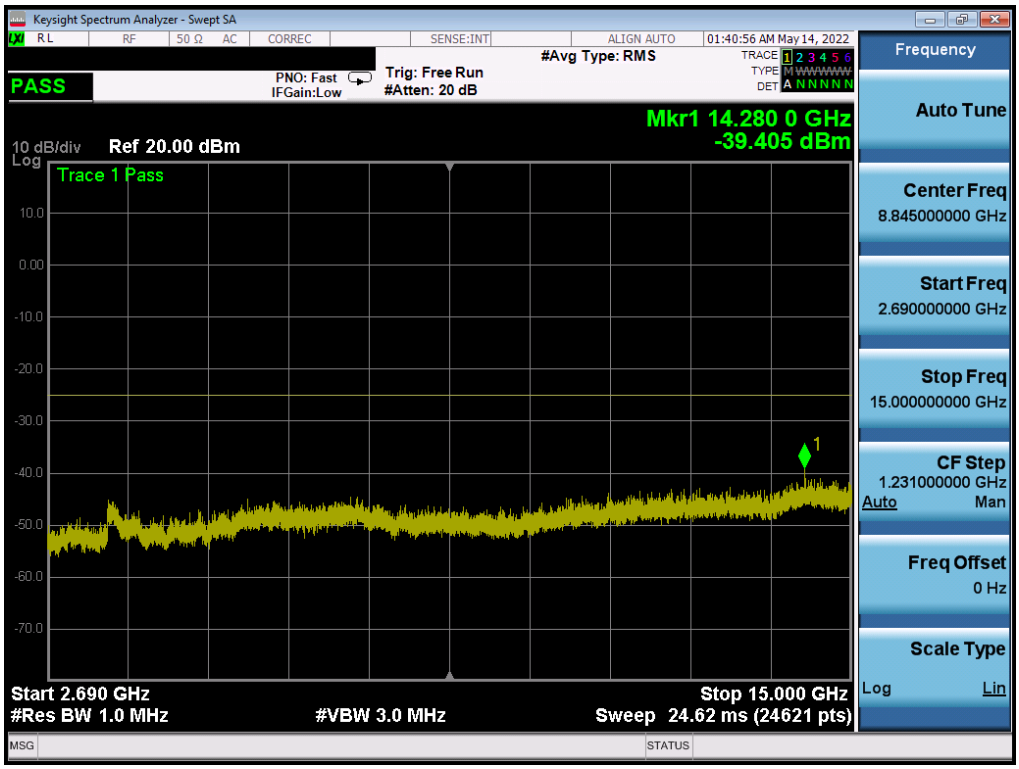


Plot 7-77. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant E)

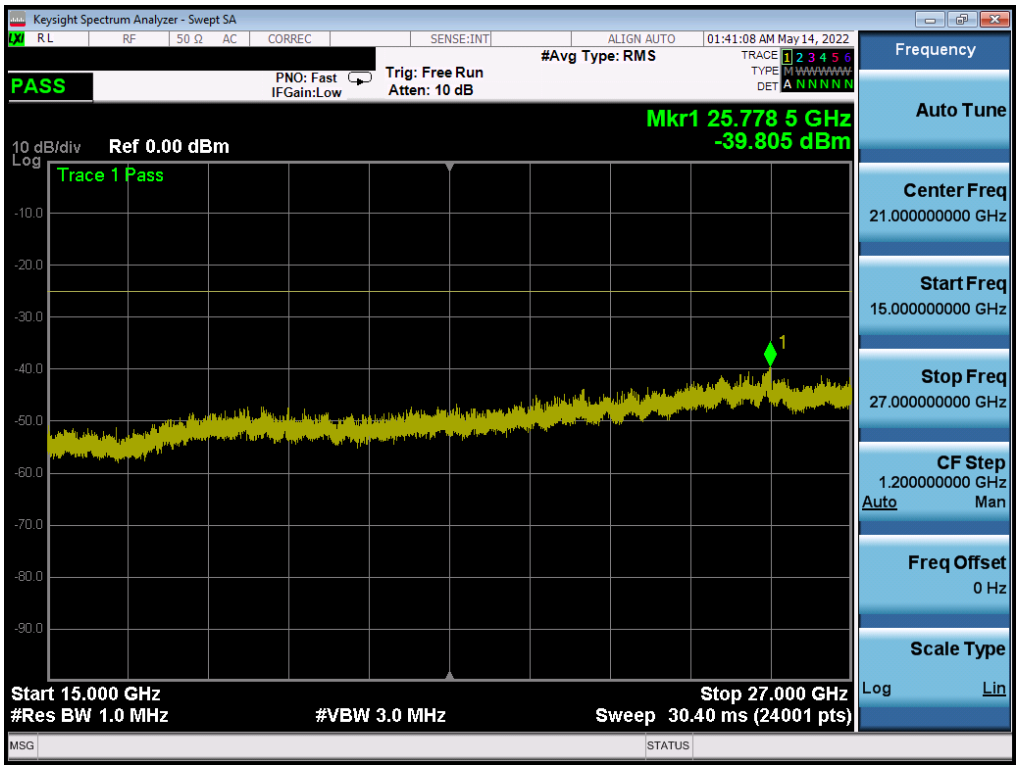
NR Band n41 – Ant C



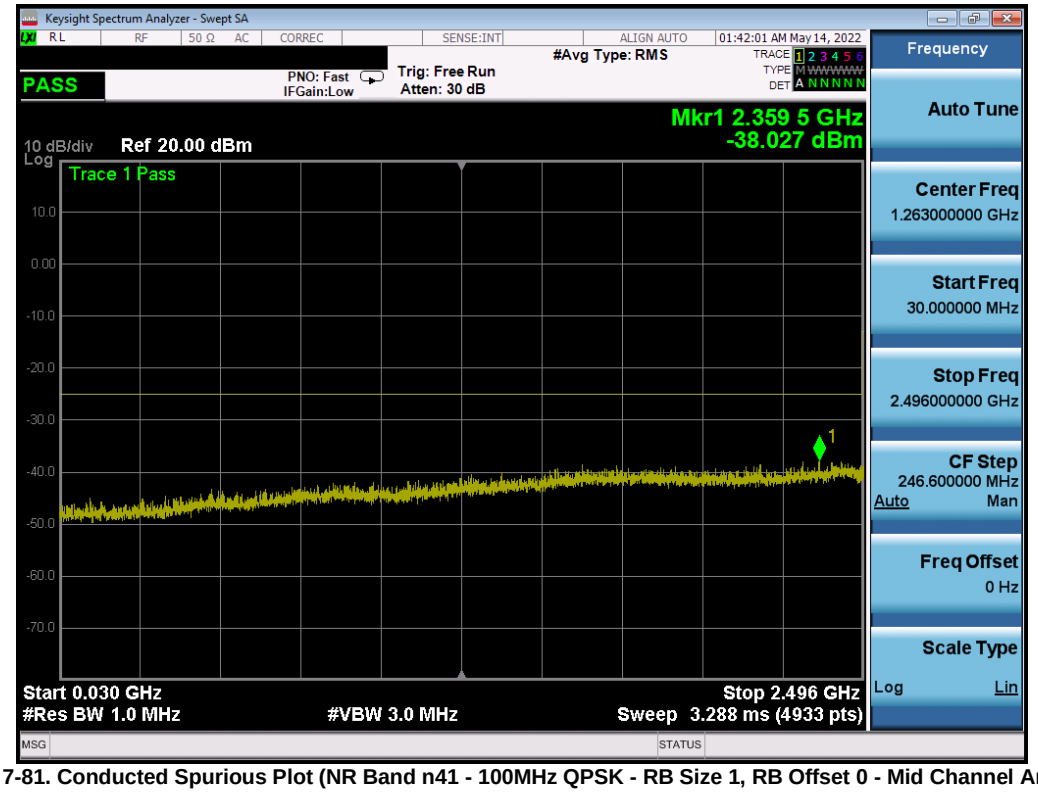
Plot 7-78. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant C)



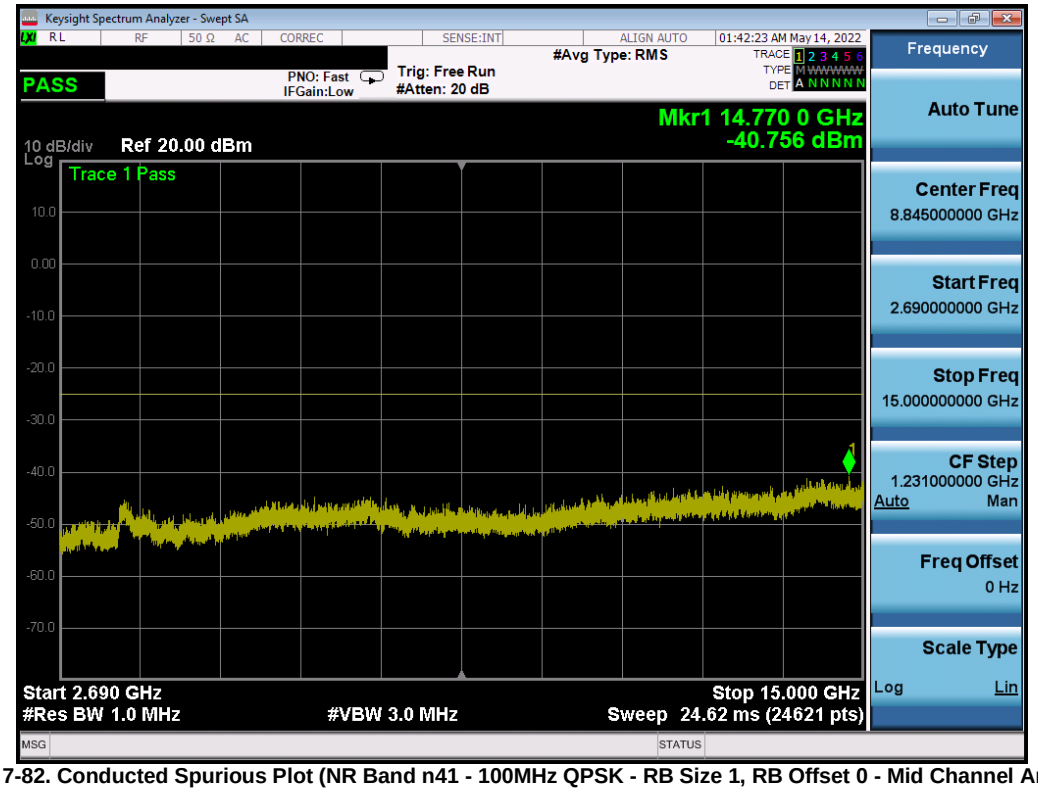
Plot 7-79. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant C)



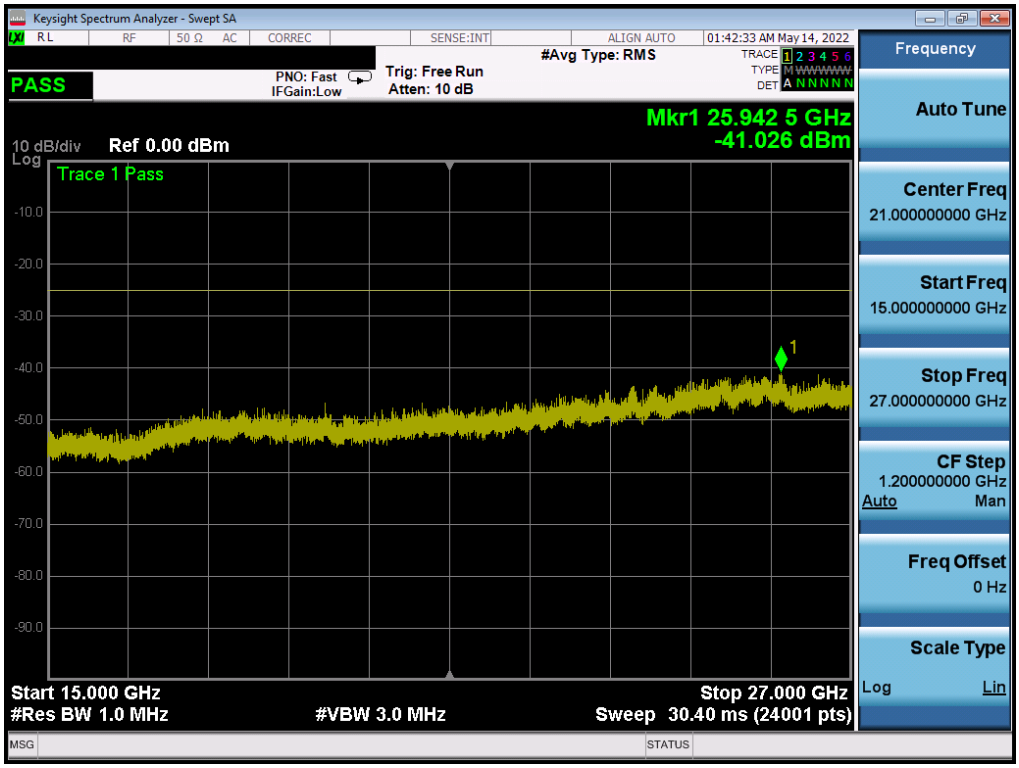
Plot 7-80. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Low Channel Ant C)



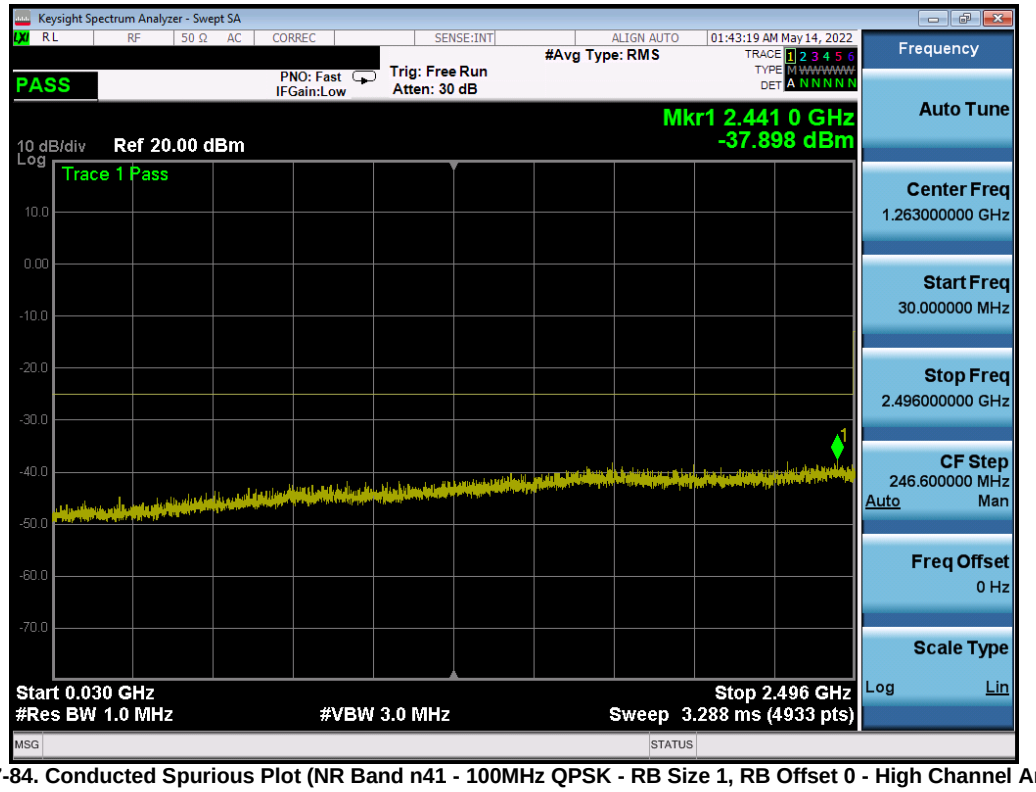
Plot 7-81. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant C)



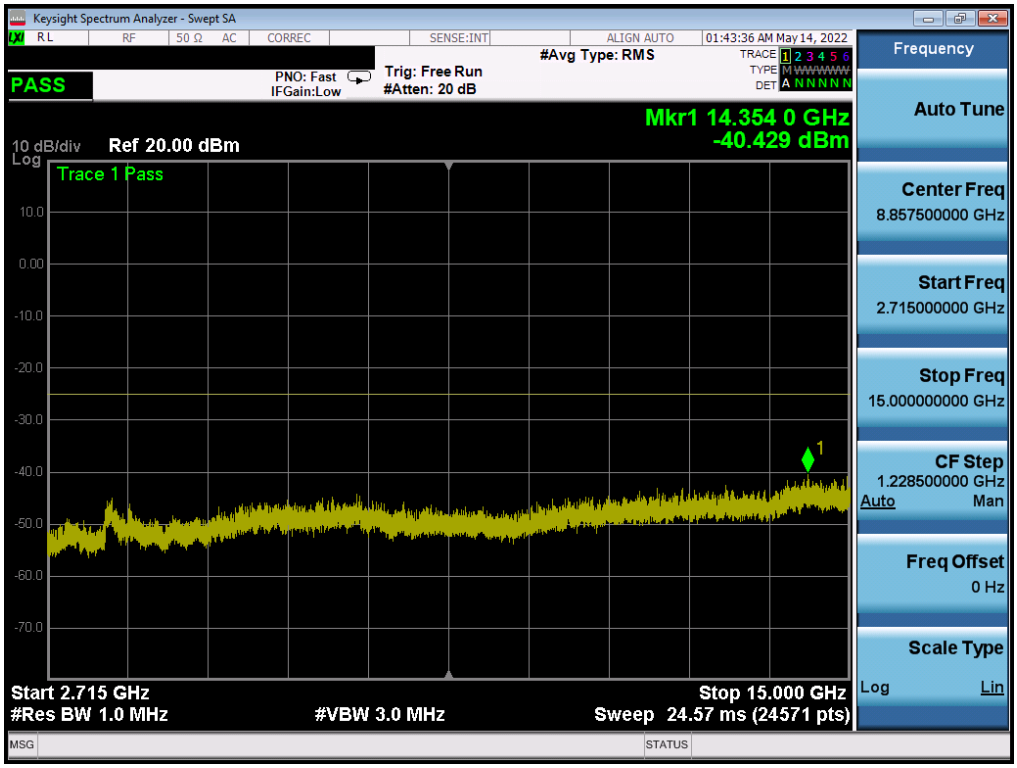
Plot 7-82. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant C)



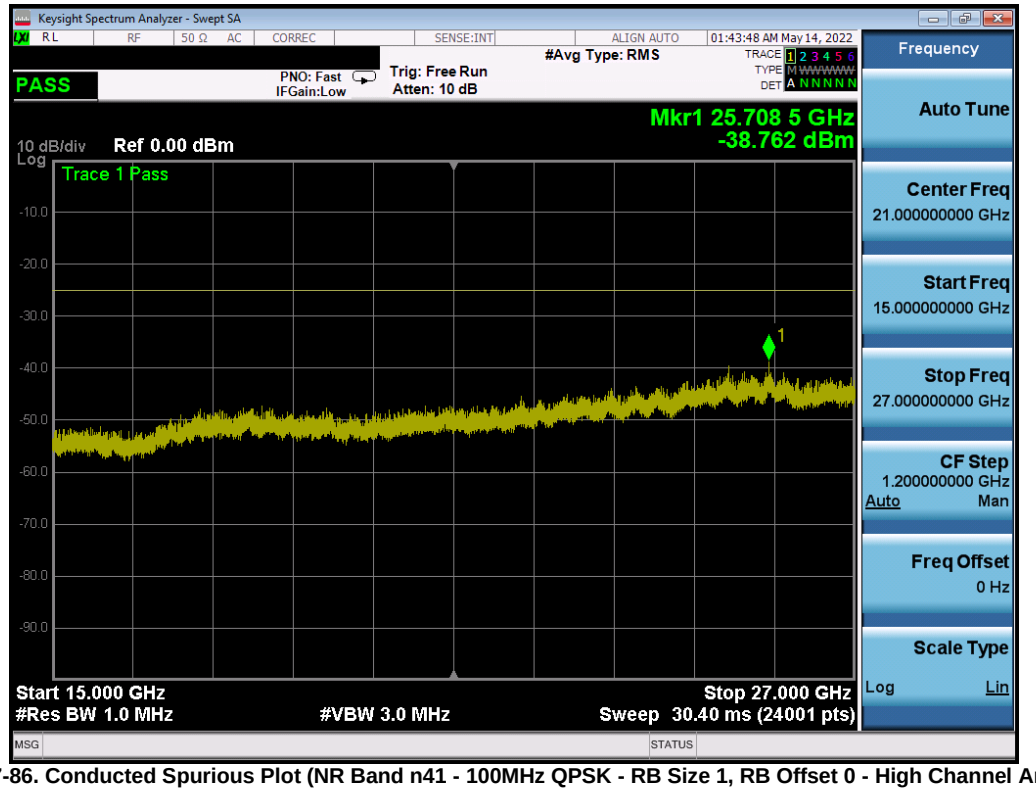
Plot 7-83. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel Ant C)



Plot 7-84. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant C)



Plot 7-85. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant C)



Plot 7-86. Conducted Spurious Plot (NR Band n41 - 100MHz QPSK - RB Size 1, RB Offset 0 - High Channel Ant C)