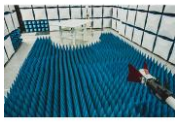
PCTEST
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com



PART 22 MEASUREMENT REPORT

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

Date of Testing:
4/07/2021– 6/08/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2104070032-02.A3L

FCC ID:	**A3LSMF711U**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-F711U
Additional Model(s):	SM-F711U1
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	22
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, 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.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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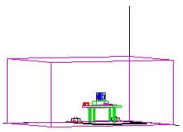
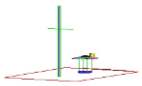


PART 22 MEASUREMENT REPORT



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.091	19.59	0.149	21.74	13M5G7D
		16QAM	831.5 - 841.5	0.075	18.74	0.123	20.89	13M4W7D
	10 MHz	QPSK	829.0 - 844.0	0.093	19.66	0.152	21.81	8M95G7D
		16QAM	829.0 - 844.0	0.073	18.61	0.119	20.76	8M99W7D
	5 MHz	QPSK	826.5 - 846.5	0.095	19.79	0.156	21.94	4M50G7D
		16QAM	826.5 - 846.5	0.072	18.55	0.117	20.70	4M51W7D
	3 MHz	QPSK	825.5 - 847.5	0.090	19.55	0.148	21.70	2M71G7D
		16QAM	825.5 - 847.5	0.071	18.48	0.116	20.63	2M70W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.093	19.68	0.152	21.83	1M10G7D
		16QAM	824.7 - 848.3	0.070	18.44	0.115	20.59	1M09W7D
NR Band n5	20 MHz	π/2 BPSK	834.0 - 839.0	0.079	18.96	0.129	21.11	17M9G7D
		QPSK	834.0 - 839.0	0.076	18.78	0.124	20.93	19M0G7D
		16QAM	834.0 - 839.0	0.056	17.48	0.092	19.63	19M0W7D
	15 MHz	π/2 BPSK	831.5 - 841.5	0.078	18.93	0.128	21.08	13M4G7D
		QPSK	831.5 - 841.5	0.076	18.80	0.125	20.95	14M2G7D
		16QAM	831.5 - 841.5	0.059	17.73	0.097	19.88	14M2W7D
	10 MHz	π/2 BPSK	829.0 - 844.0	0.077	18.86	0.126	21.01	8M97G7D
		QPSK	829.0 - 844.0	0.076	18.81	0.125	20.96	9M32G7D
		16QAM	829.0 - 844.0	0.057	17.57	0.094	19.72	9M34W7D
	5 MHz	π/2 BPSK	826.5 - 846.5	0.077	18.86	0.126	21.01	4M49G7D
		QPSK	826.5 - 846.5	0.072	18.59	0.119	20.74	4M52G7D
		16QAM	826.5 - 846.5	0.055	17.40	0.090	19.55	4M53W7D

EUT Overview

Mode	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
			Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	GMSK	824.2 - 848.8	0.343	25.35	0.562	27.50	248KGXW
EDGE	8-PSK	824.2 - 848.8	0.099	19.97	0.163	22.12	247KG7W
WCDMA	Spread Spectrum	826.4 - 846.6	0.090	19.56	0.148	21.71	4M20F9W
CDMA	Spread Spectrum	824.70 - 848.31	0.089	19.47	0.145	21.62	1M29F9W

EUT Overview

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 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 located in Columbia, MD 21046, U.S.A.

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

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

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF711U**. 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 22.

Test Device Serial No.: 0823M, 0846M, 0859M, 0811M, 0130M, 0151M, 0880M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n12, n5, n66, n2, n25, n30, n41, n77, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

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.

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 conditions 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. Both configurations are tested, and the worst case radiated emissions data is shown in this report.

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 Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Measurement Guidance for Certification of Licensed Digital Transmitters" (KDB 971168 D01 v03r01) 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/TIA-603-E-2016. 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 and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

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

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.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6200901190
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
Keysight Technologies	N9020A	MXA Signal Analyzer	8/14/2020	Annual	8/14/2021	US46470561
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/17/2020	Annual	9/17/2021	MY57141001
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/10/2020	Annual	8/10/2021	103200
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511
-	AP2	EMC Cable and Switch System	9/9/2020	Annual	9/9/2021	AP2
-	AP1	EMC Cable and Switch System	9/10/2020	Annual	9/10/2021	AP1
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx2	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx2
-	LTx3	LIcensed Transmitter Cable Set	8/28/2020	Annual	8/28/2021	LTx3
-	LTx4	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx4
-	LTx5	LIcensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx5

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

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W
EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

CDMA Emission Designator

Emission Designator = 1M25F9W
CDMA BW = 1.25 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W
WCDMA BW = 4.16 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

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: A3LSMF711U

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

Mode(s): NR/GSM/GPRS/WCDMA/CDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	RSS-132(5.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 22.355	RSS-132(5.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
	Uplink Carrier Aggregation	22.917(a), 27.53(h)	RSS-199(4.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Section 7.6
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.5
	Radiated Spurious Emissions	2.1053, 22.917(a)	RSS-132(5.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots 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 PCTEST EMC Software Tool Beta 8.
5) Due to MPR application across all bands, data for only the lowest order modulation is included in this section.

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.

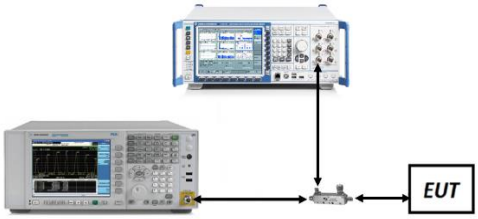
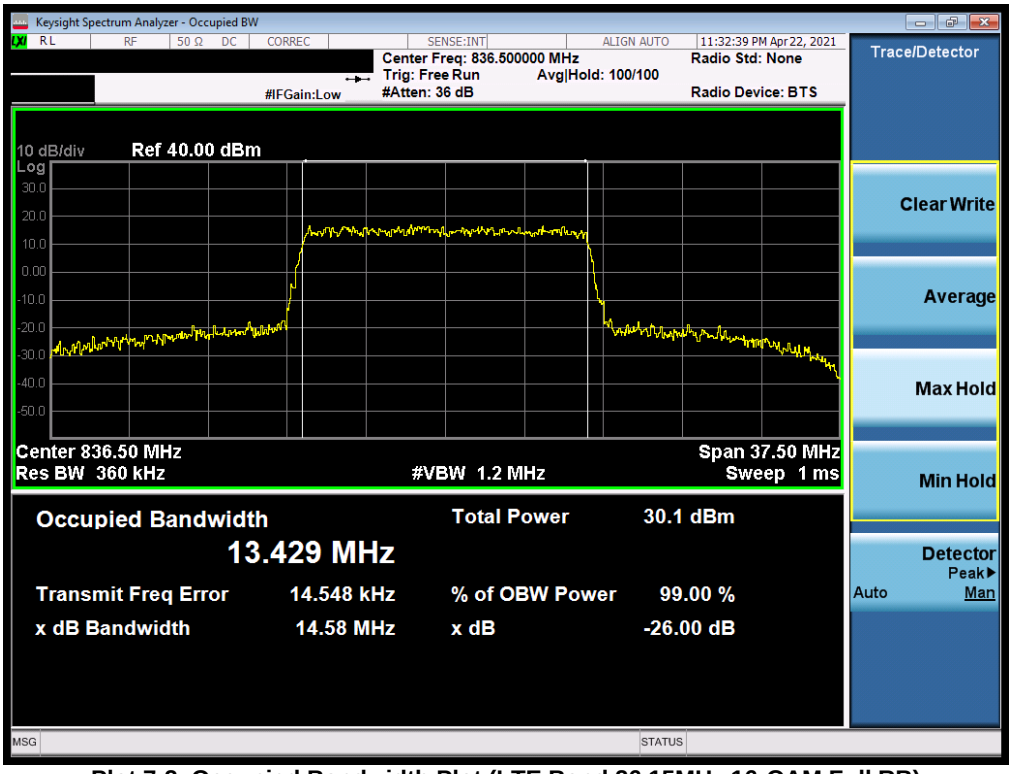


Figure 7-1. Test Instrument & Measurement Setup

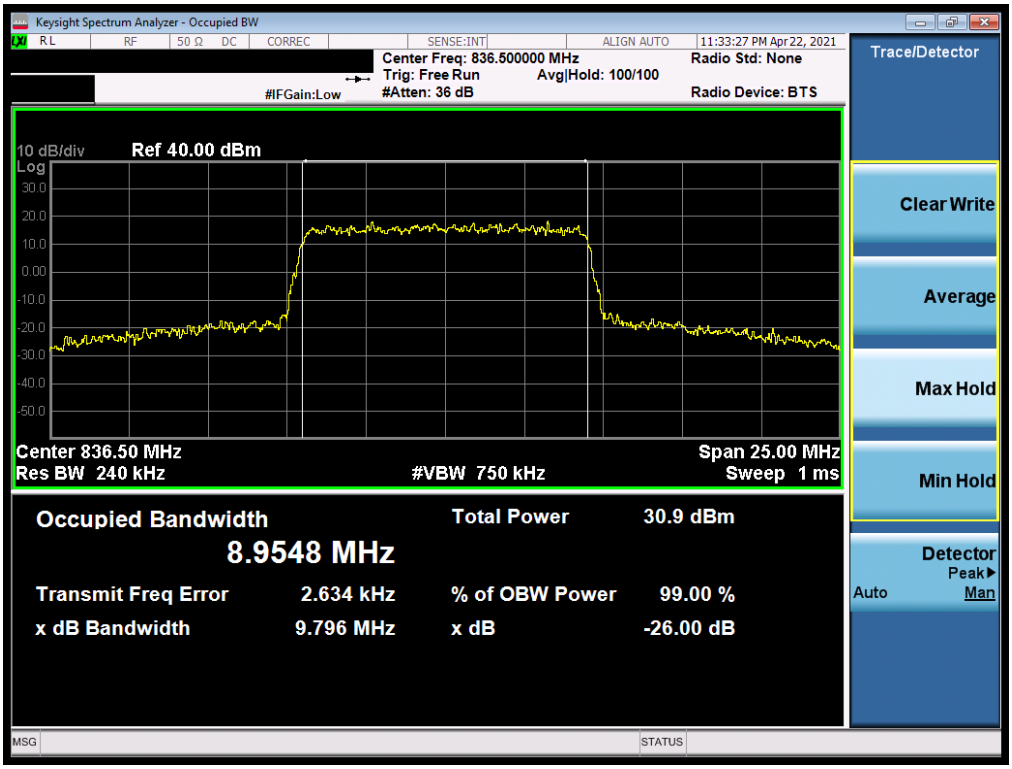
Test Notes

None.

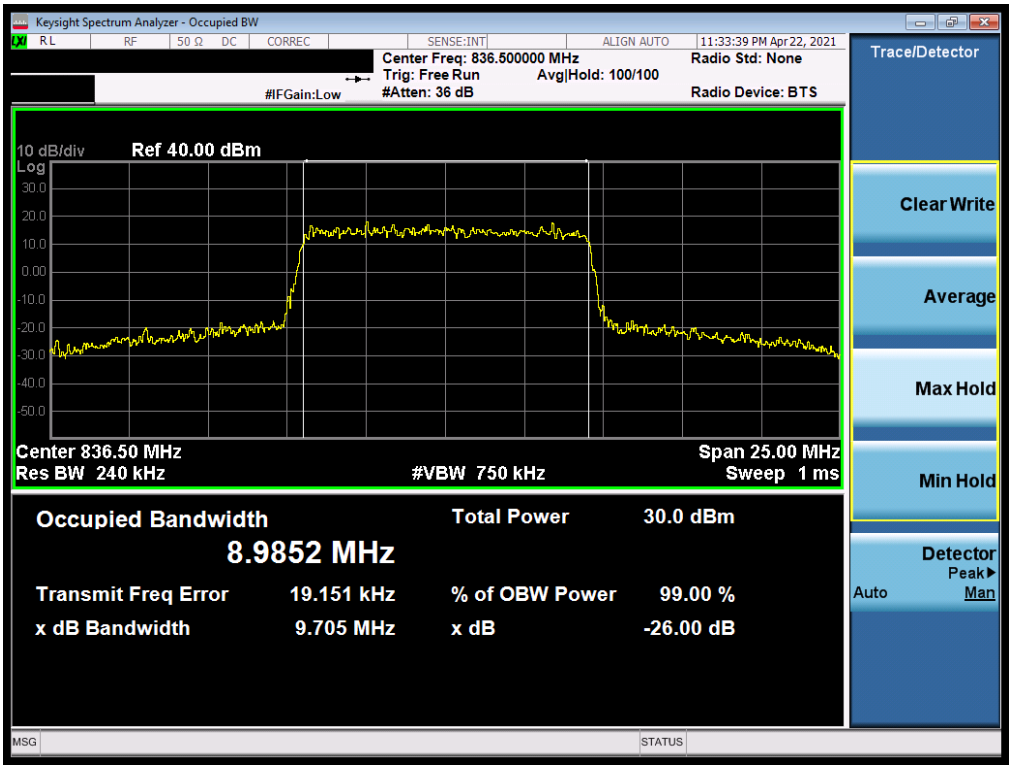
Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 15MHz QPSK Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 15MHz 16-QAM Full RB)



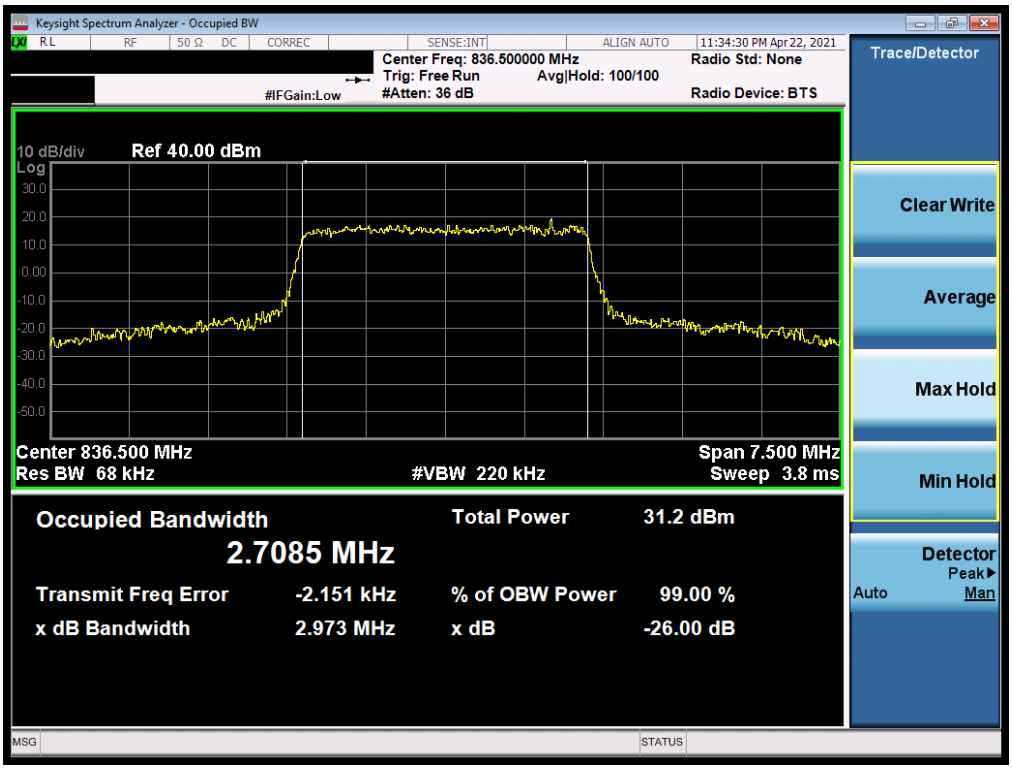
Plot 7-3. Occupied Bandwidth Plot (LTE Band 26/5 10MHz QPSK Full RB)



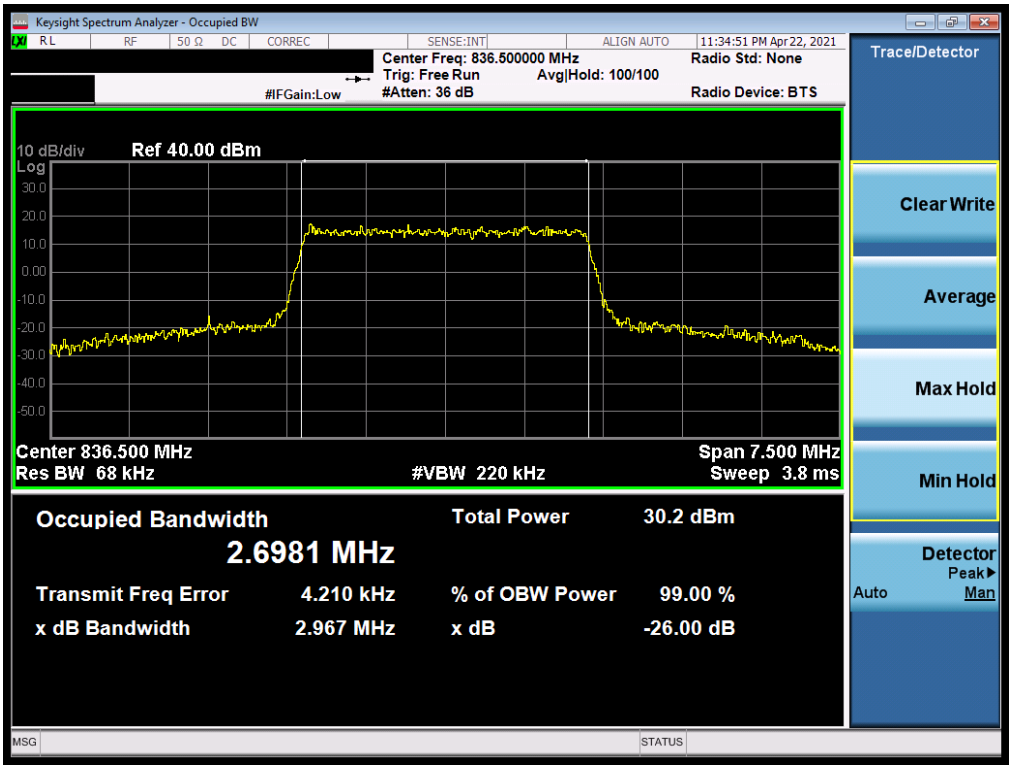
Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 10MHz 16-QAM Full RB)

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 5MHz QPSK Full RB)

Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 5MHz 16-QAM Full RB)

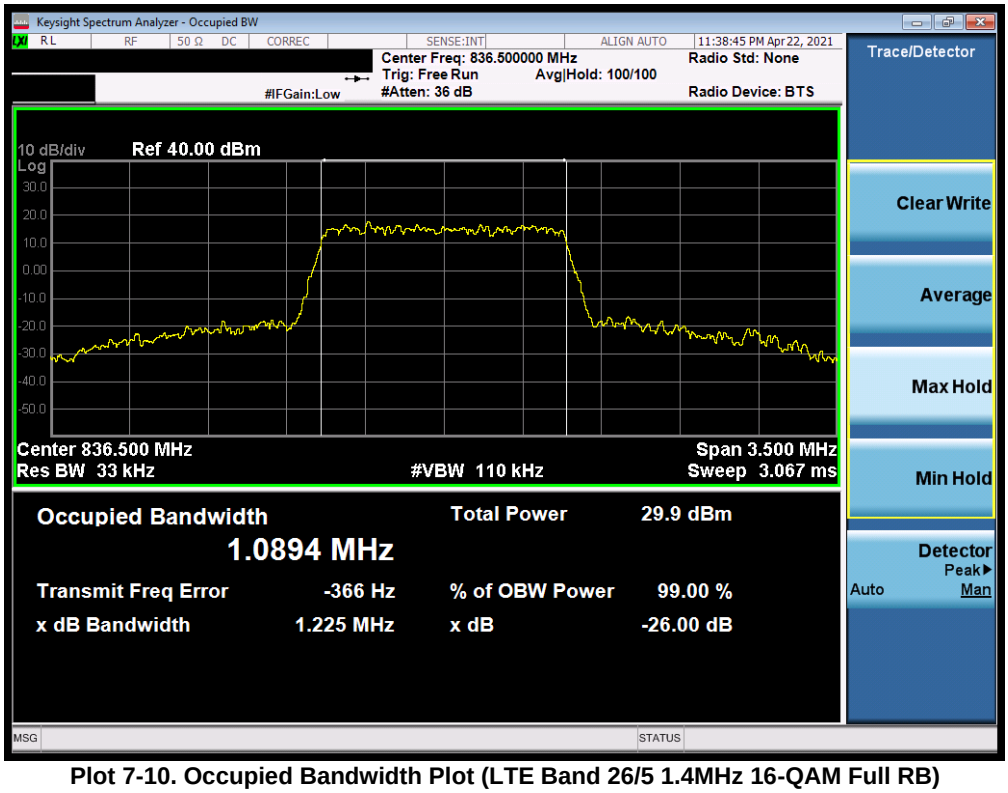


Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 3MHz QPSK Full RB)

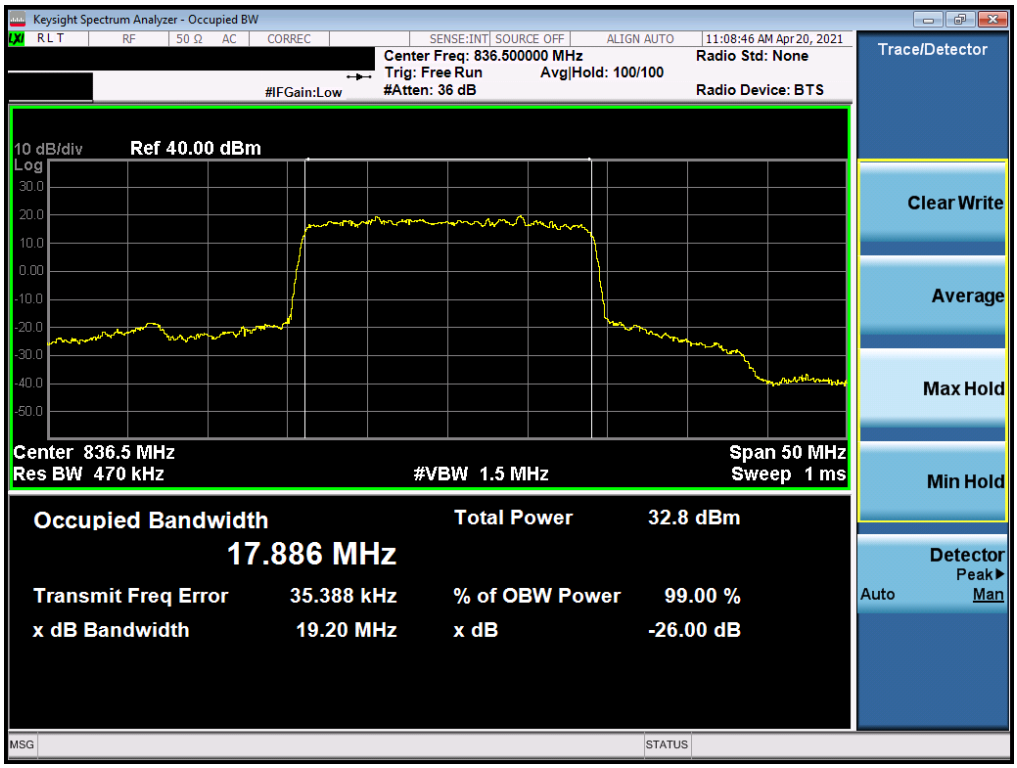


Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 3MHz 16-QAM Full RB)

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 1.4MHz QPSK Full RB)



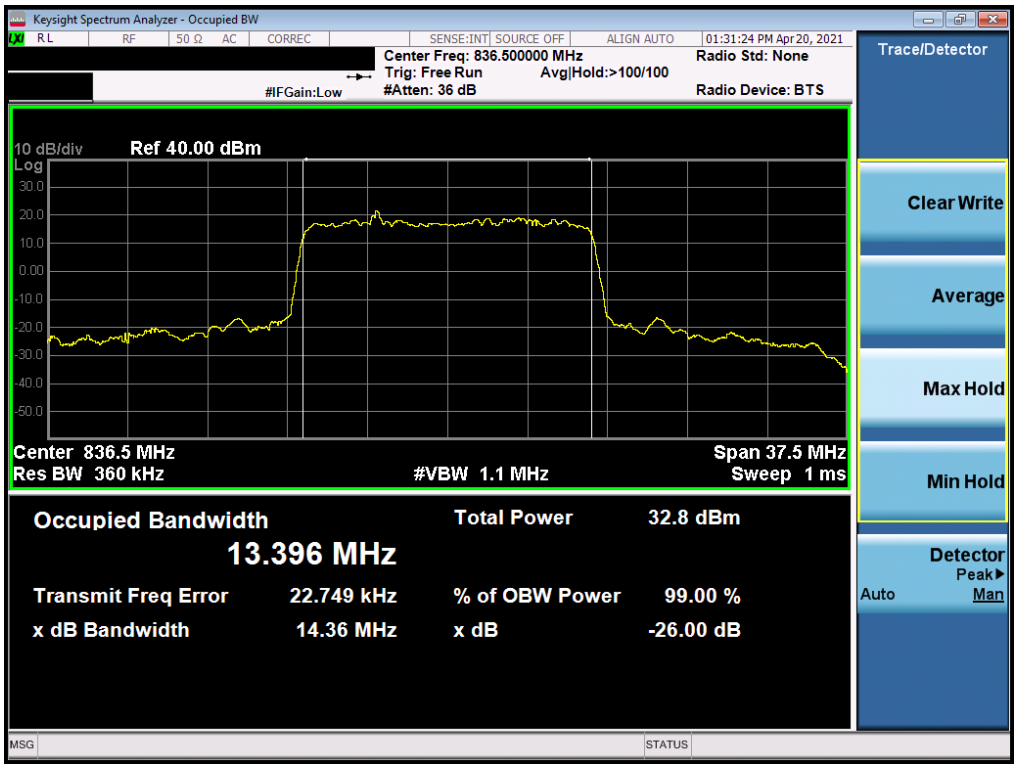
Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 1.4MHz 16-QAM Full RB)



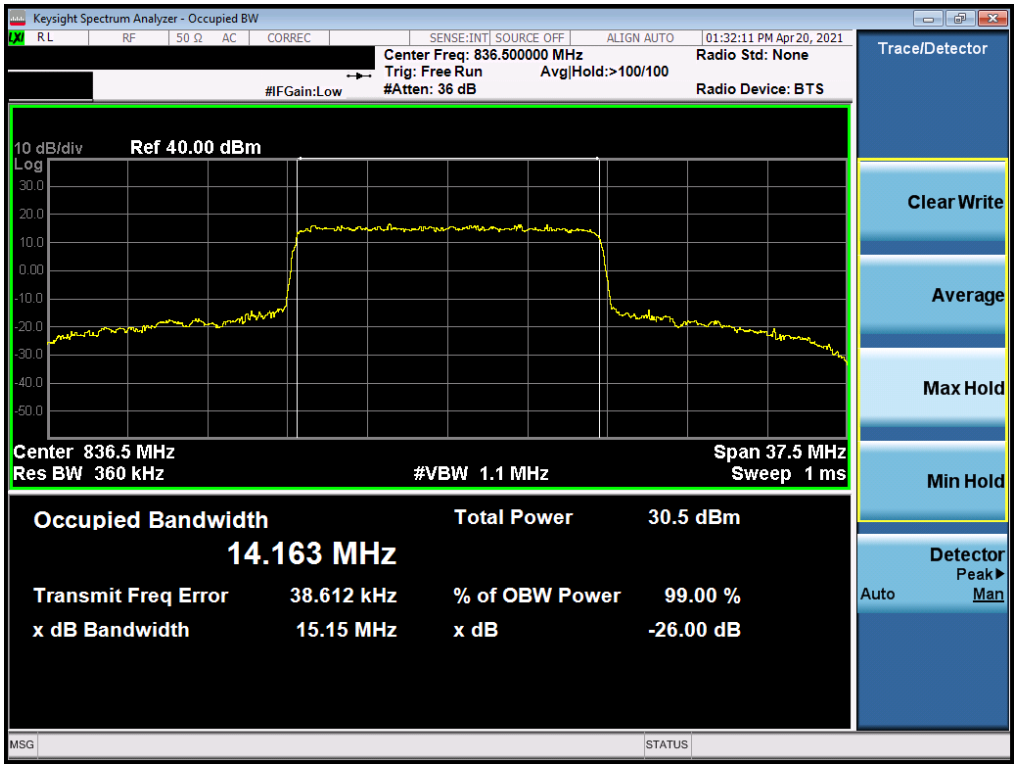
Plot 7-11. Occupied Bandwidth Plot (NR Band n5 20MHz π/2 BPSK Full RB)

Plot 7-12. Occupied Bandwidth Plot (NR Band n5 20MHz QPSK Full RB)

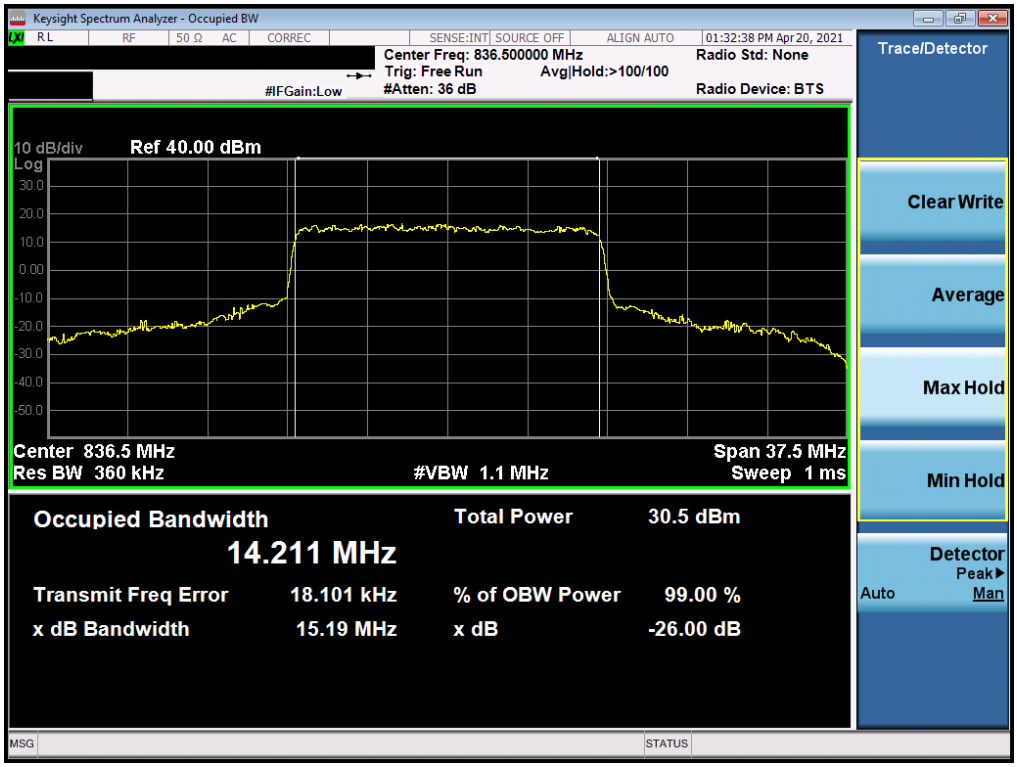
Plot 7-13. Occupied Bandwidth Plot (NR Band n5 20MHz 16-QAM Full RB)



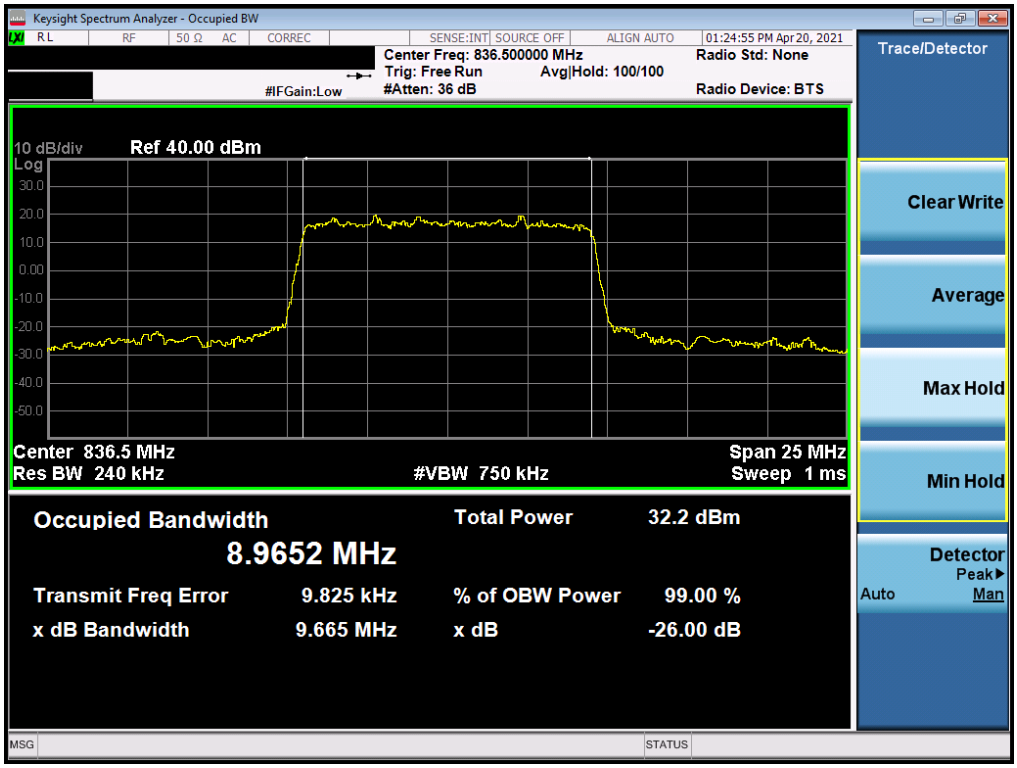
Plot 7-14. Occupied Bandwidth Plot (NR Band n5 15MHz π/2 BPSK Full RB)



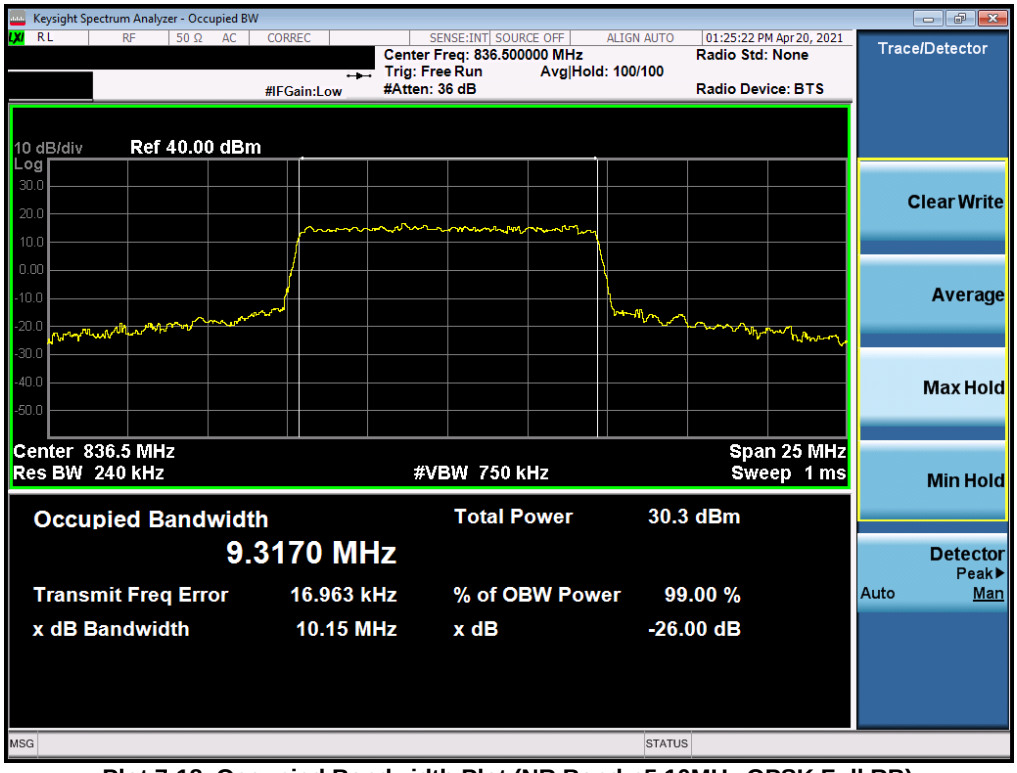
Plot 7-15. Occupied Bandwidth Plot (NR Band n5 15MHz QPSK Full RB)



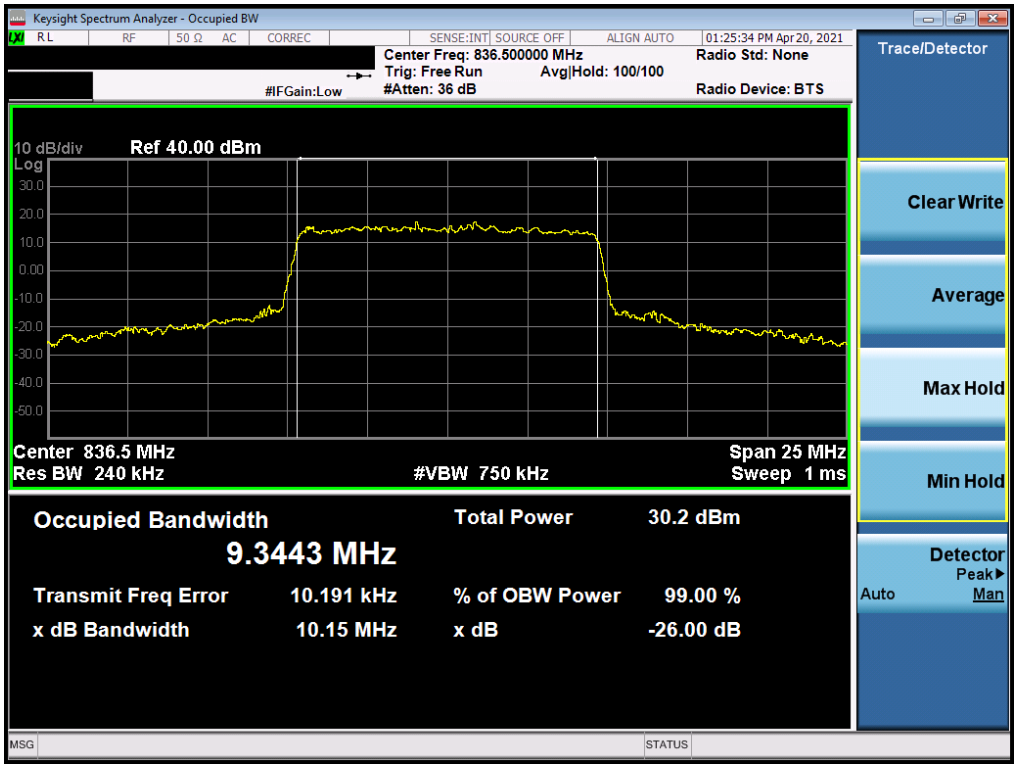
Plot 7-16. Occupied Bandwidth Plot (NR Band n5 15MHz 16-QAM Full RB)



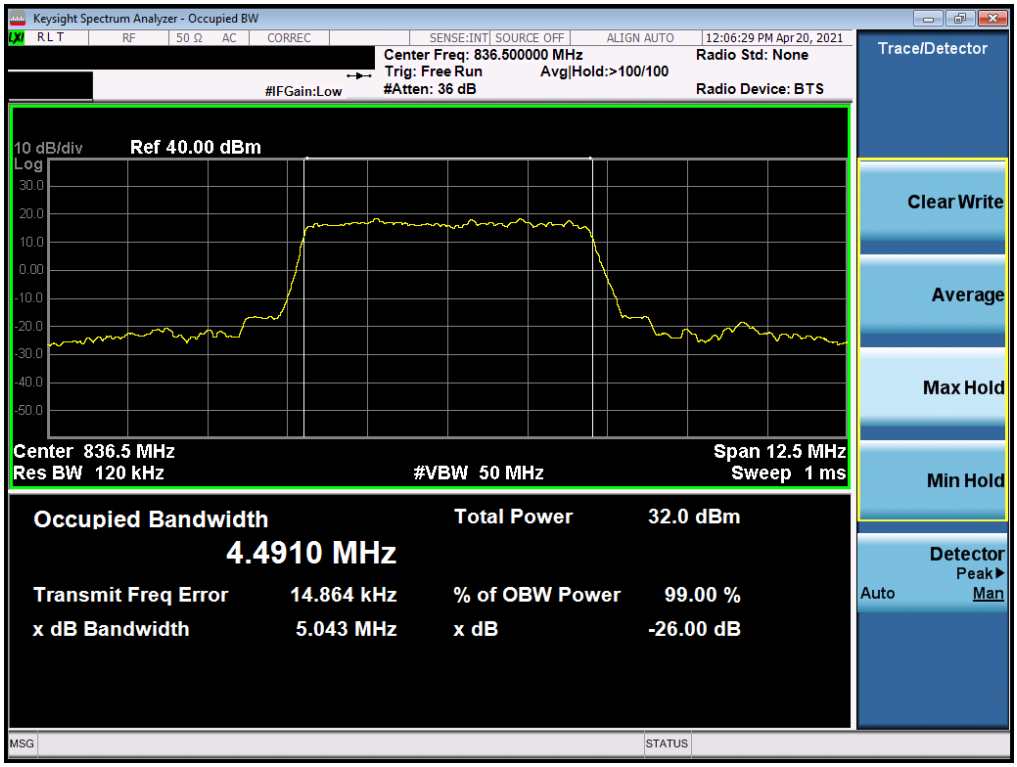
Plot 7-17. Occupied Bandwidth Plot (NR Band n5 10MHz π/2 BPSK Full RB)



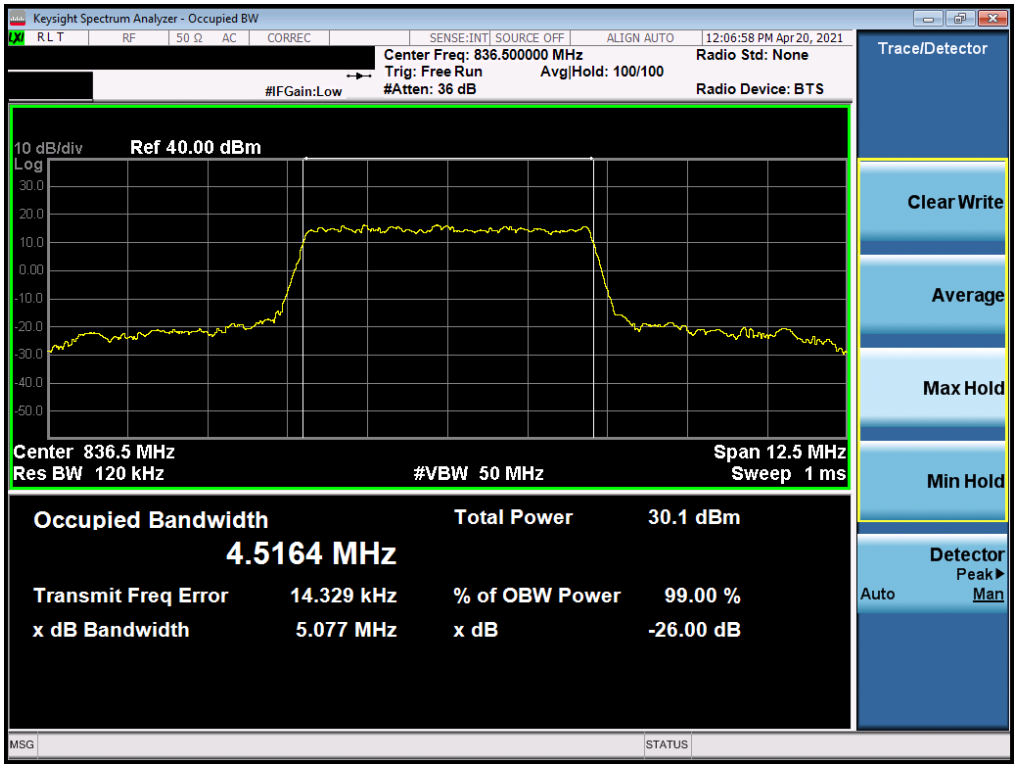
Plot 7-18. Occupied Bandwidth Plot (NR Band n5 10MHz QPSK Full RB)



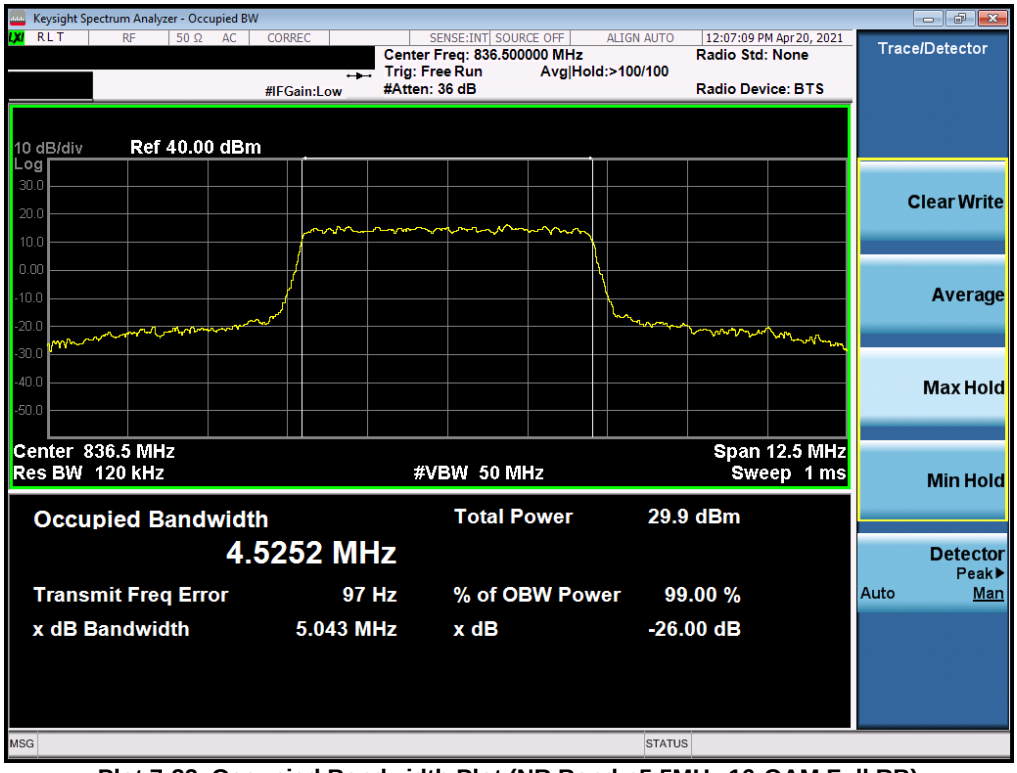
Plot 7-19. Occupied Bandwidth Plot (NR Band n5 10MHz 16-QAM Full RB)



Plot 7-20. Occupied Bandwidth Plot (NR Band n5 5MHz π/2 BPSK Full RB)



Plot 7-21. Occupied Bandwidth Plot (NR Band n5 5MHz QPSK Full RB)



Plot 7-22. Occupied Bandwidth Plot (NR Band n5 5MHz 16-QAM Full RB)

GPRS Cell

Plot 7-23. Occupied Bandwidth Plot (GPRS, Ch. 190)

Plot 7-24. Occupied Bandwidth Plot (EDGE, Ch. 190)

WCDMA Cell

Plot 7-25. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

CDMA Cell

Plot 7-26. Occupied Bandwidth Plot (CDMA, Ch. 384)

7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 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.

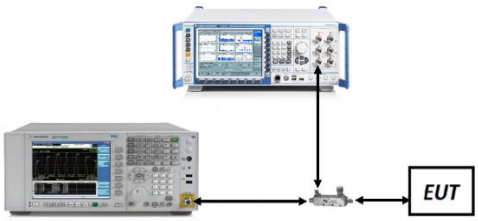


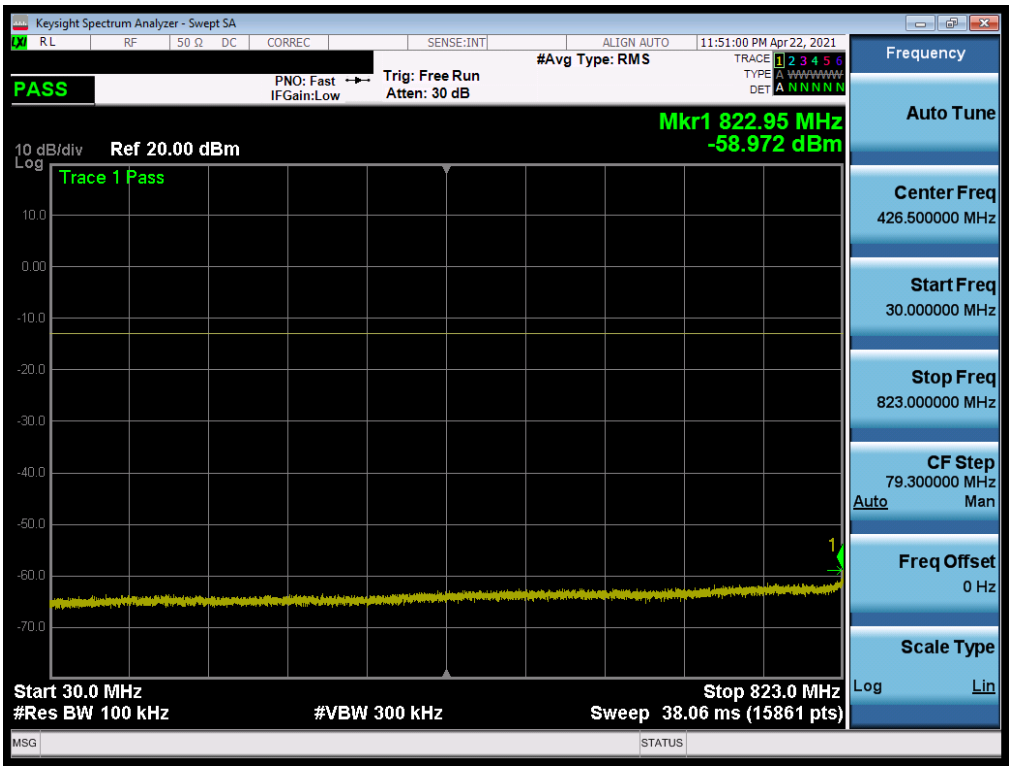
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

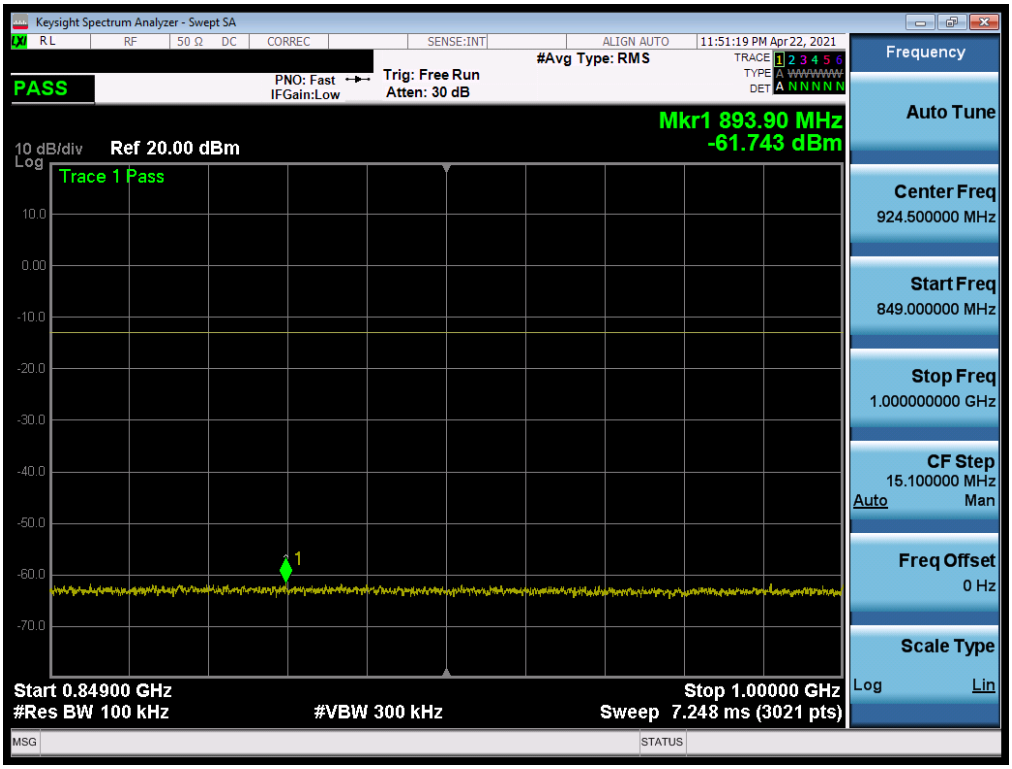
1. Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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 26/5

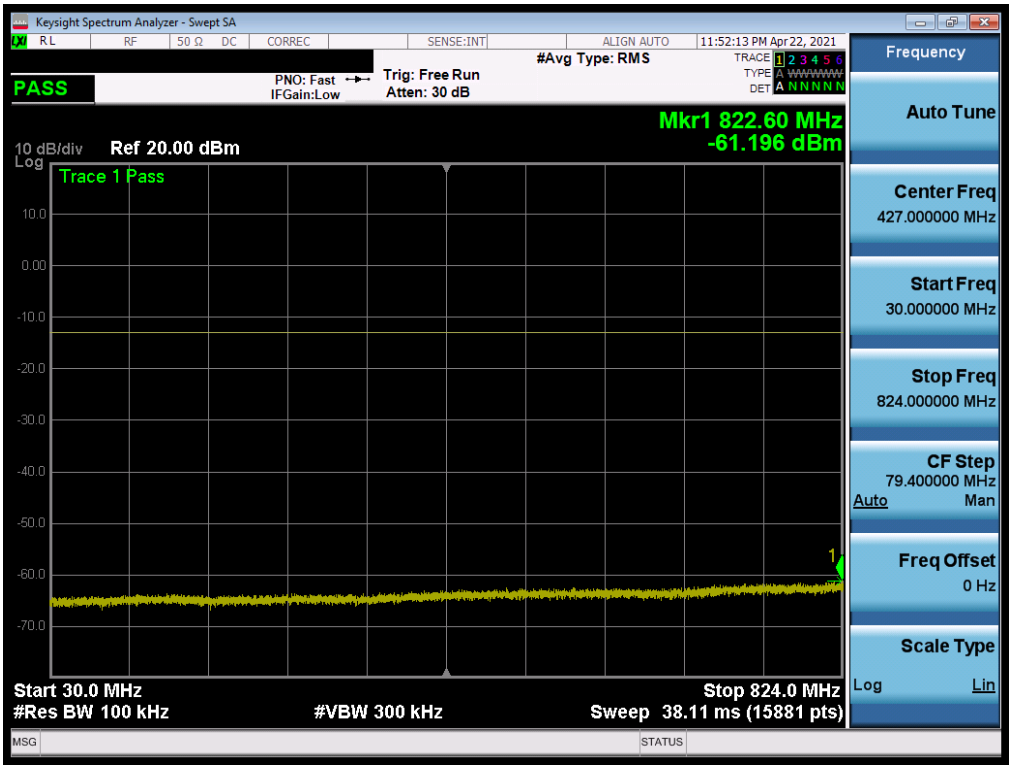


Plot 7-27. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK – 1 RB Low Channel)

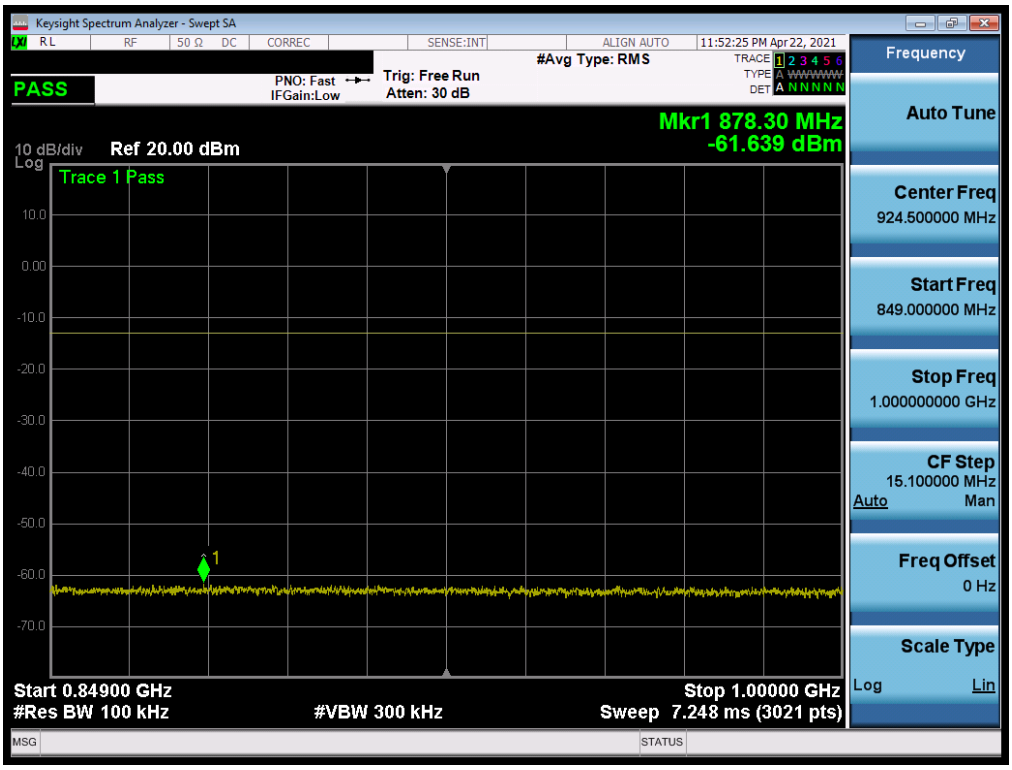


Plot 7-28. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB Low Channel)

Plot 7-29. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB Low Channel)

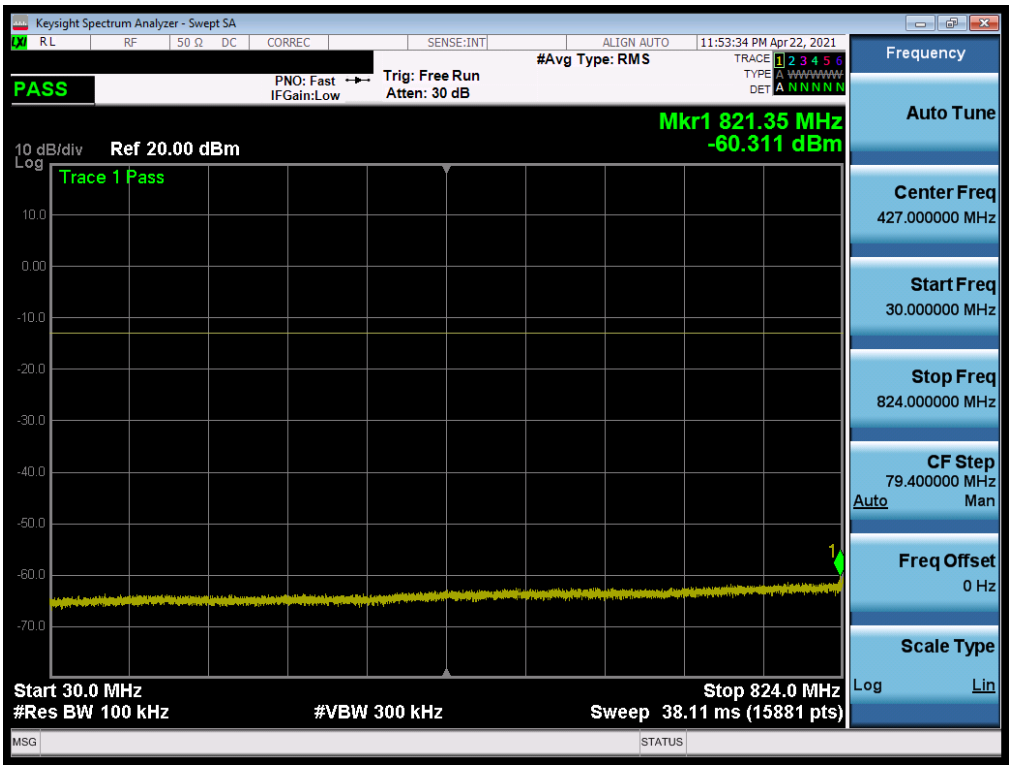


Plot 7-30. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB Mid Channel)

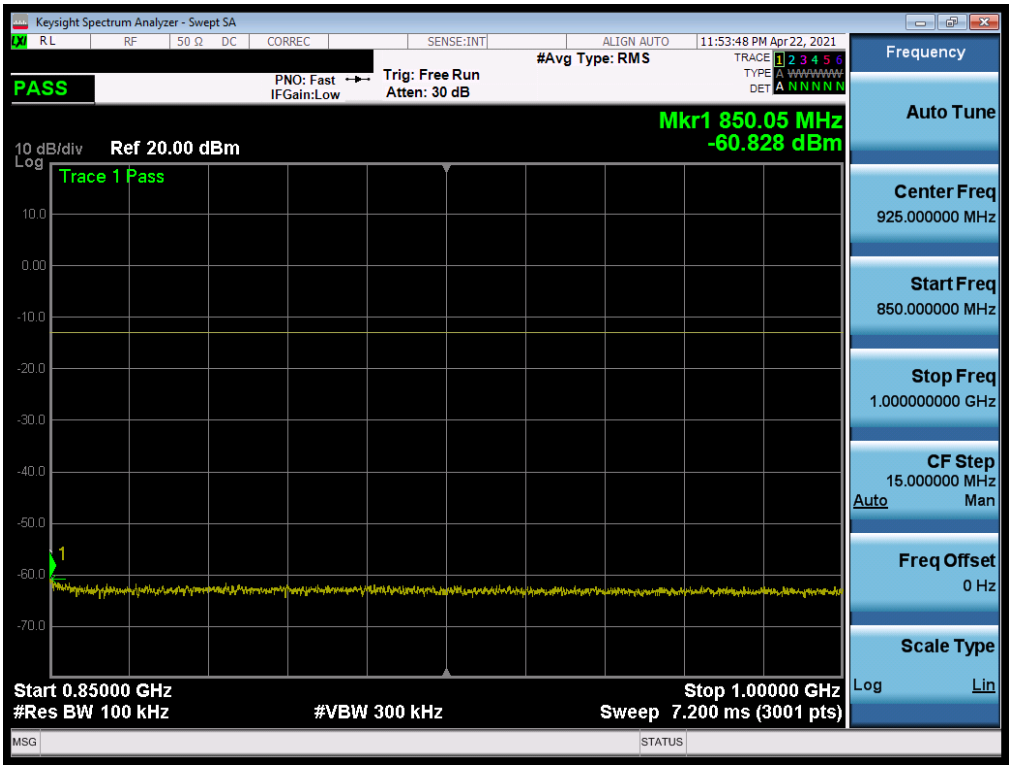


Plot 7-31. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB Mid Channel)

Plot 7-32. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB Mid Channel)



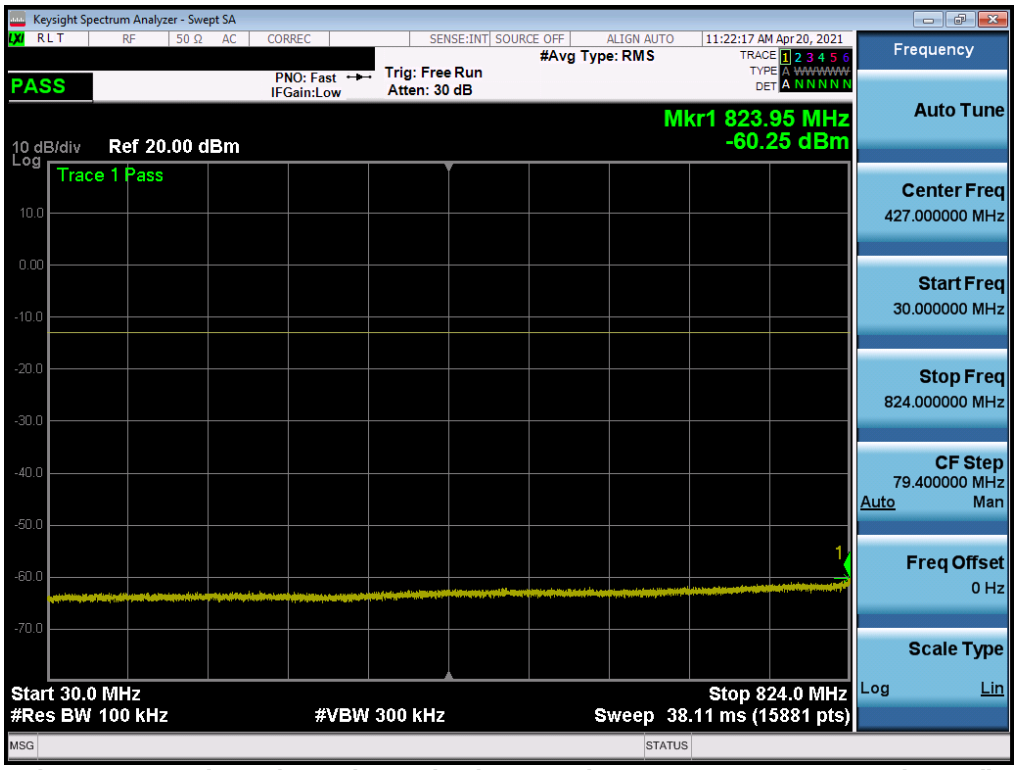
Plot 7-33. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB High Channel)



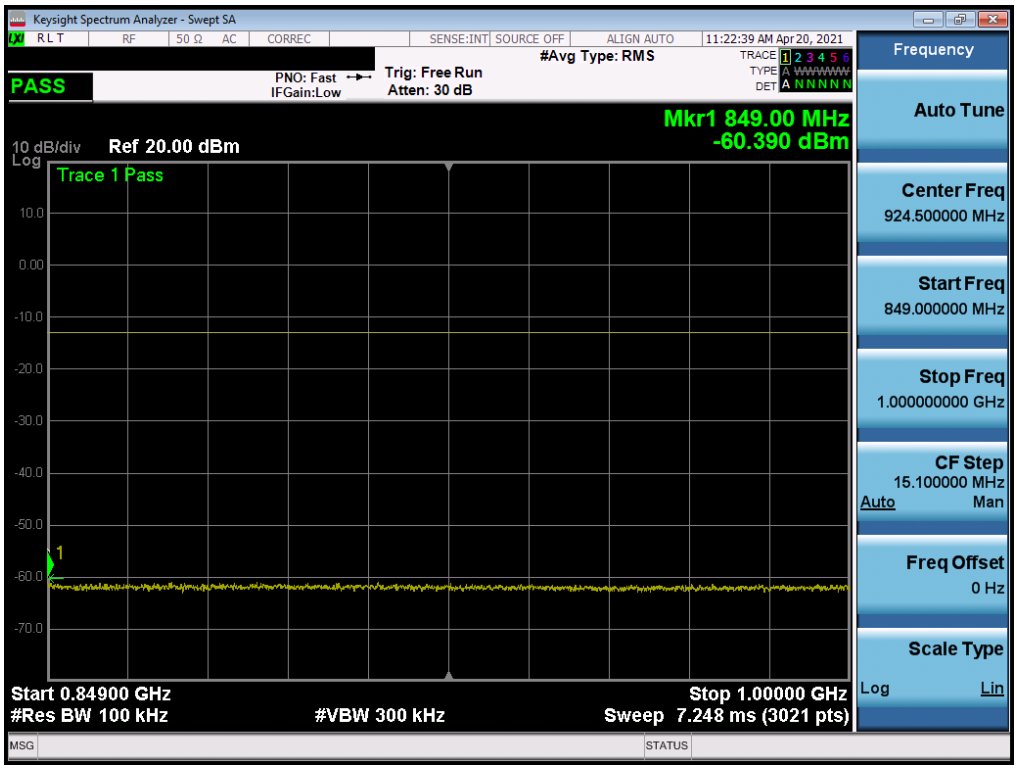
Plot 7-34. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB High Channel)

Plot 7-35. Conducted Spurious Plot (LTE Band 26/5 10MHz QPSK 1 RB High Channel)

NR Band n5

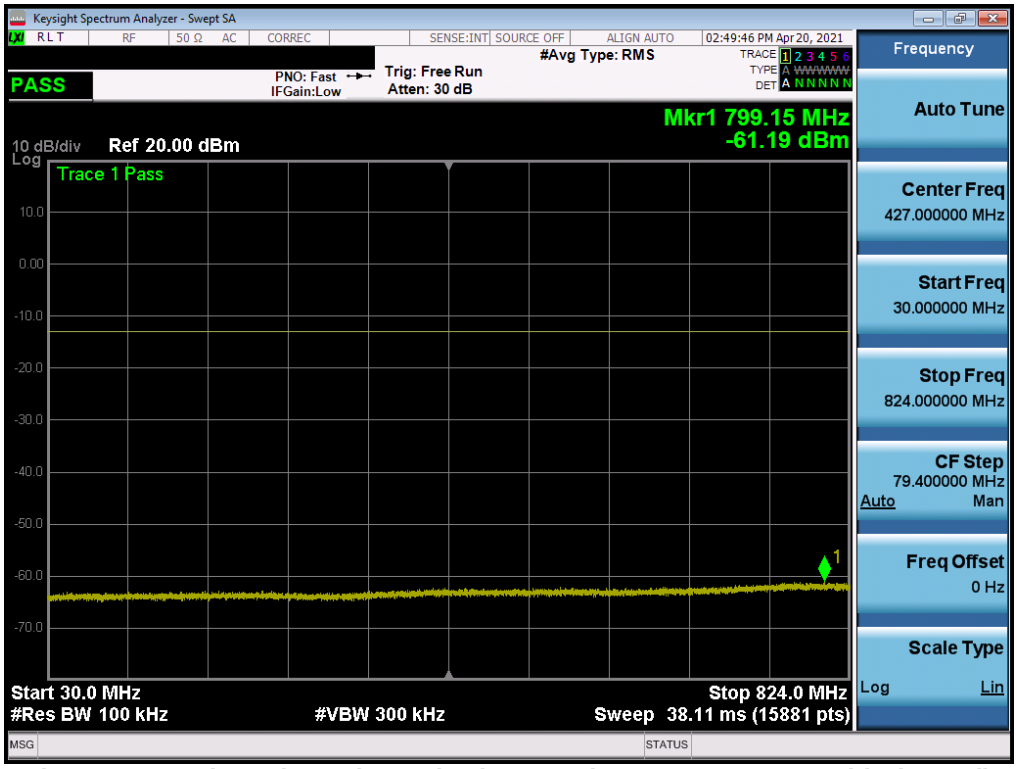


Plot 7-36. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Low Channel)

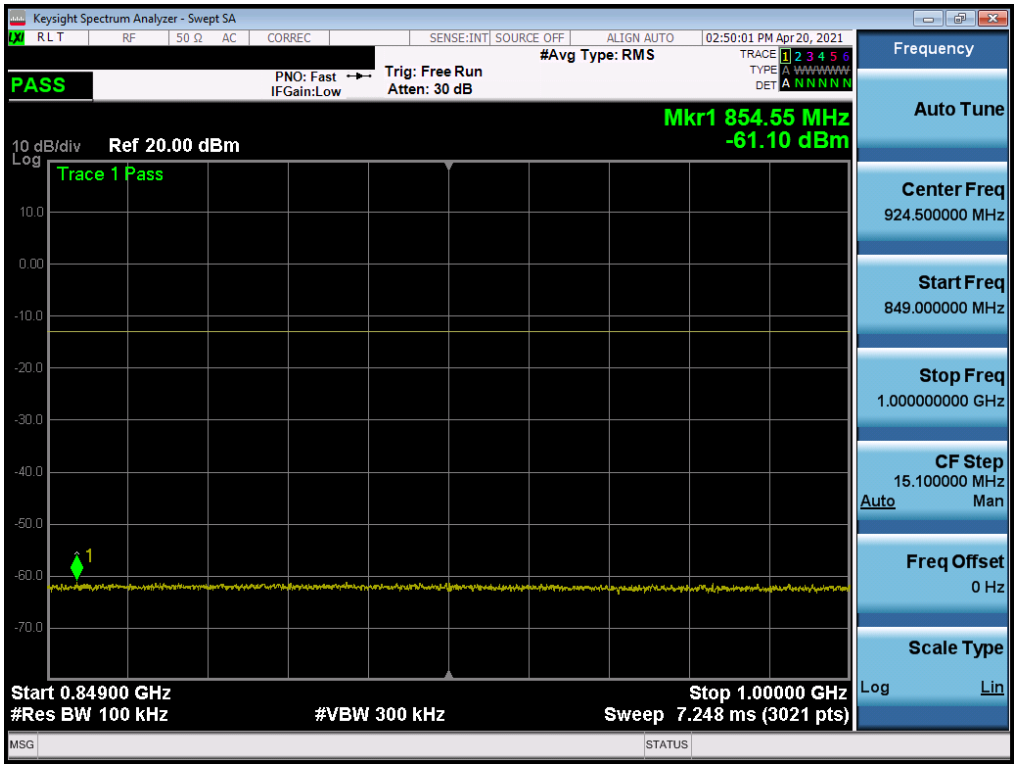


Plot 7-37. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Low Channel)

Plot 7-38. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Low Channel)

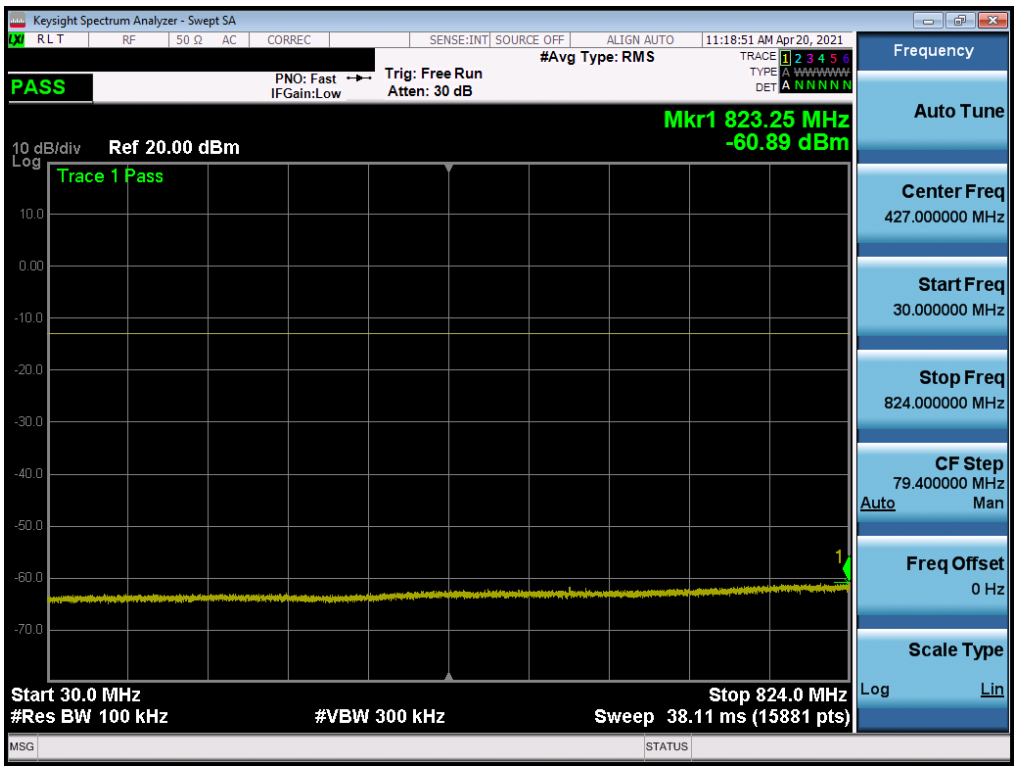


Plot 7-39. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Mid Channel)

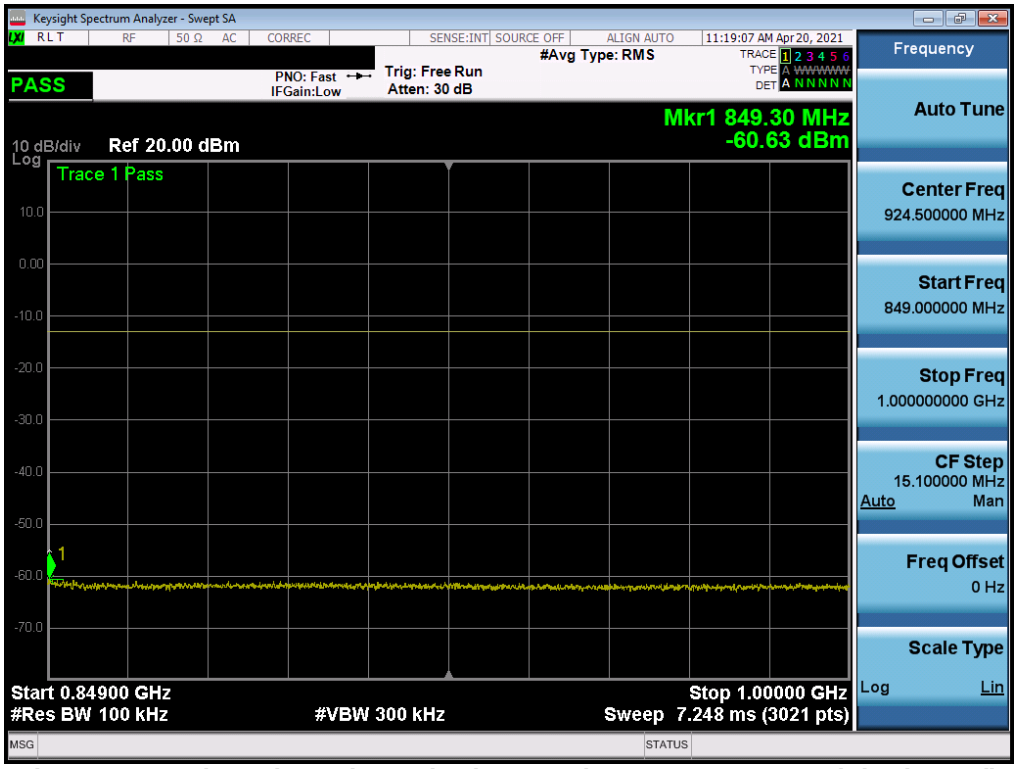


Plot 7-40. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Mid Channel)

Plot 7-41. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB Mid Channel)

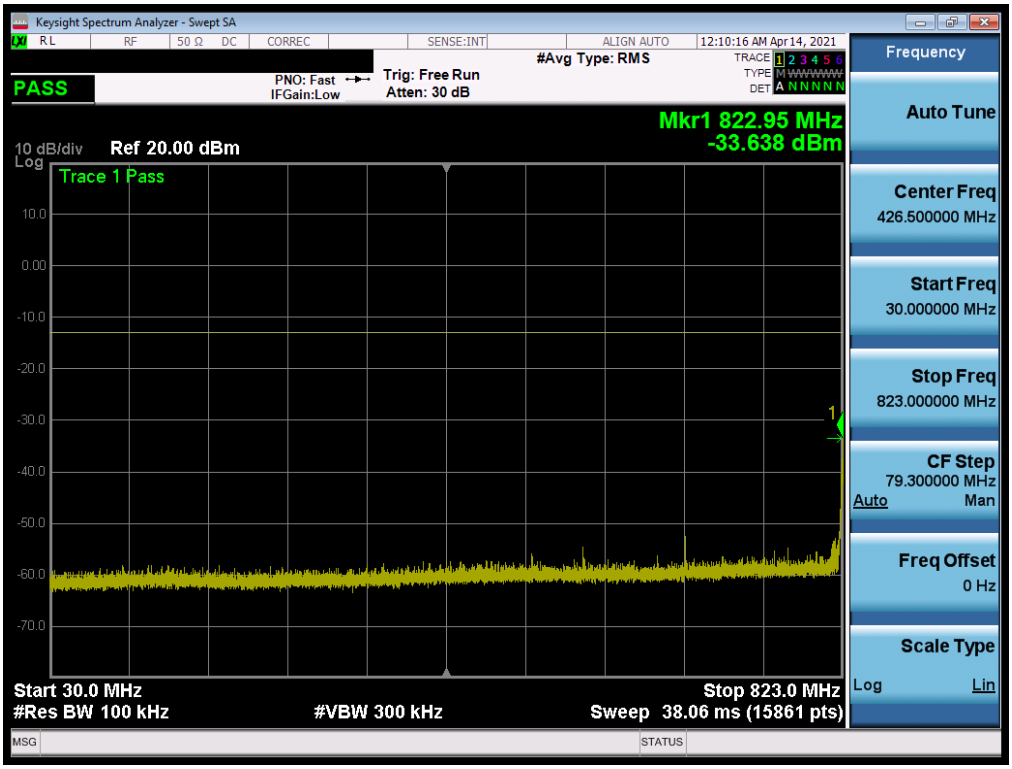


Plot 7-42. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB High Channel)

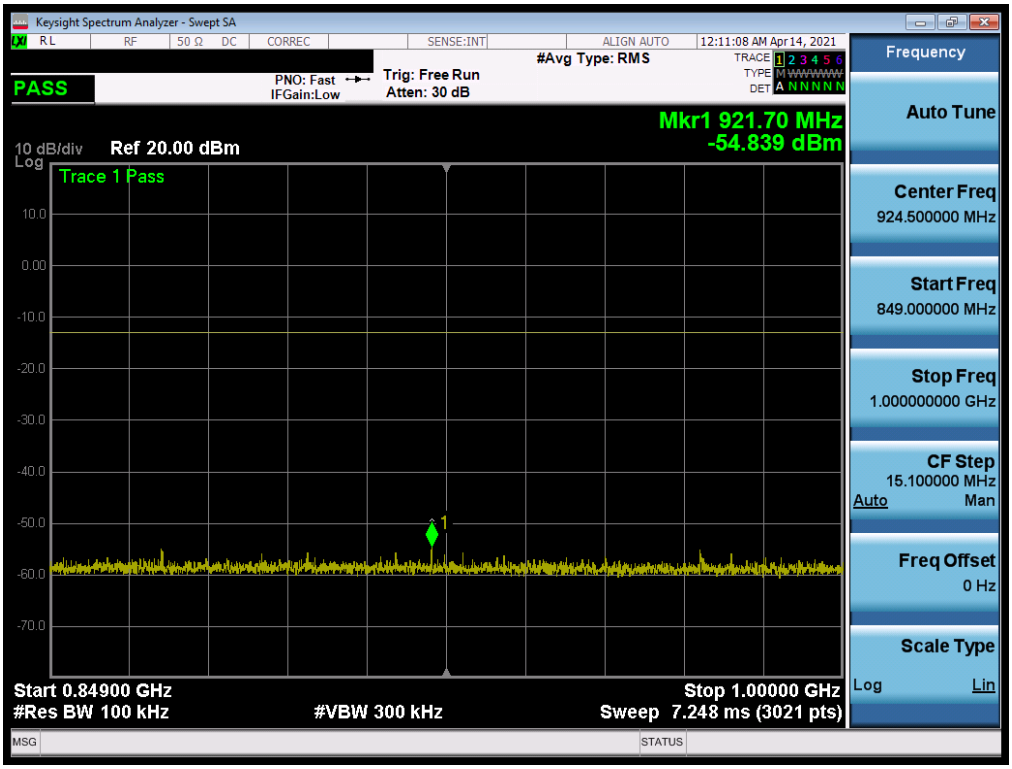


Plot 7-43. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB High Channel)

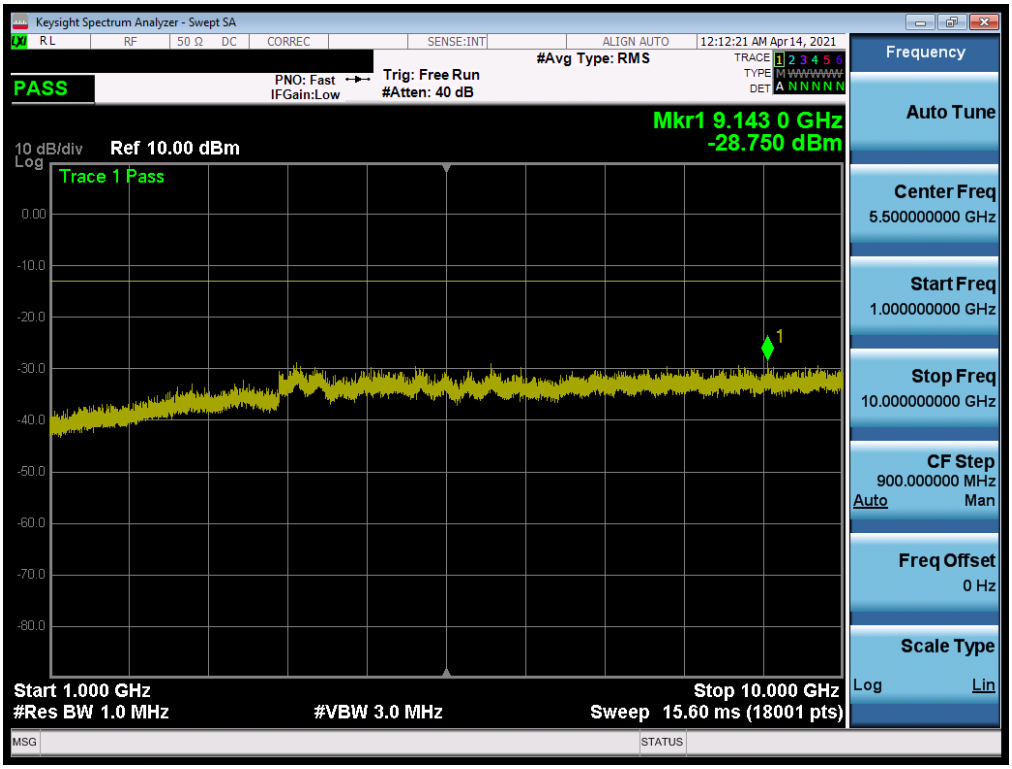
Plot 7-44. Conducted Spurious Plot (NR Band n5 20.0MHz 1 RB High Channel)



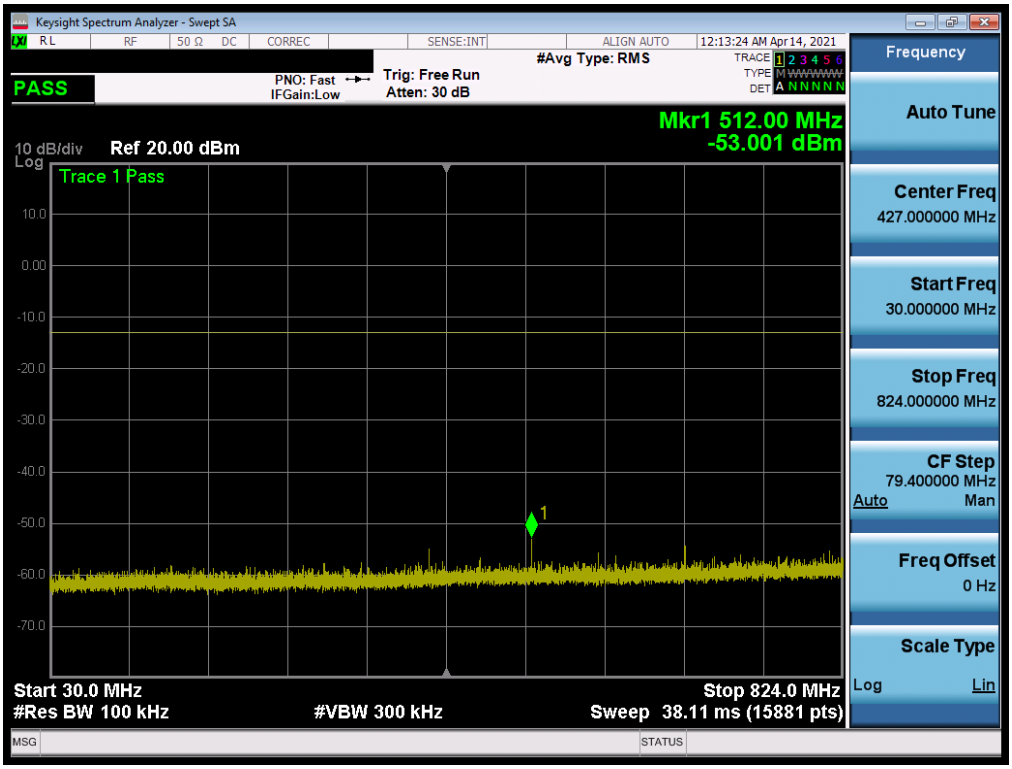
Plot 7-45. Conducted Spurious Plot (GPRS Ch. 128)



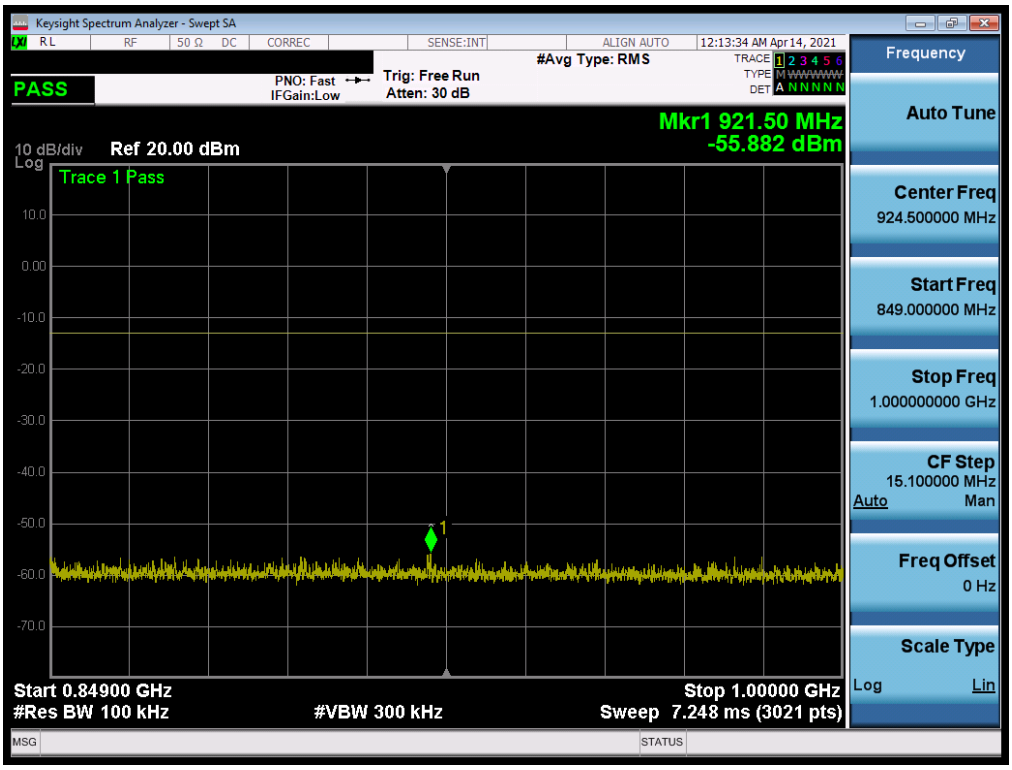
Plot 7-46. Conducted Spurious Plot (GPRS Ch. 128)



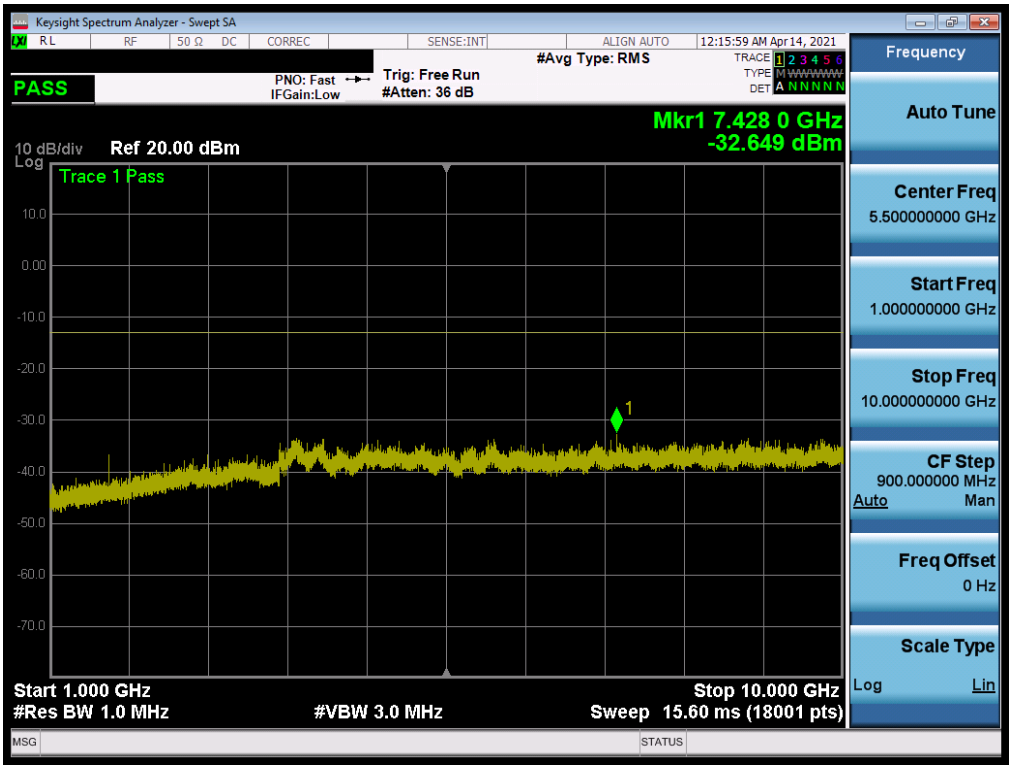
Plot 7-47. Conducted Spurious Plot (GPRS Ch. 128)



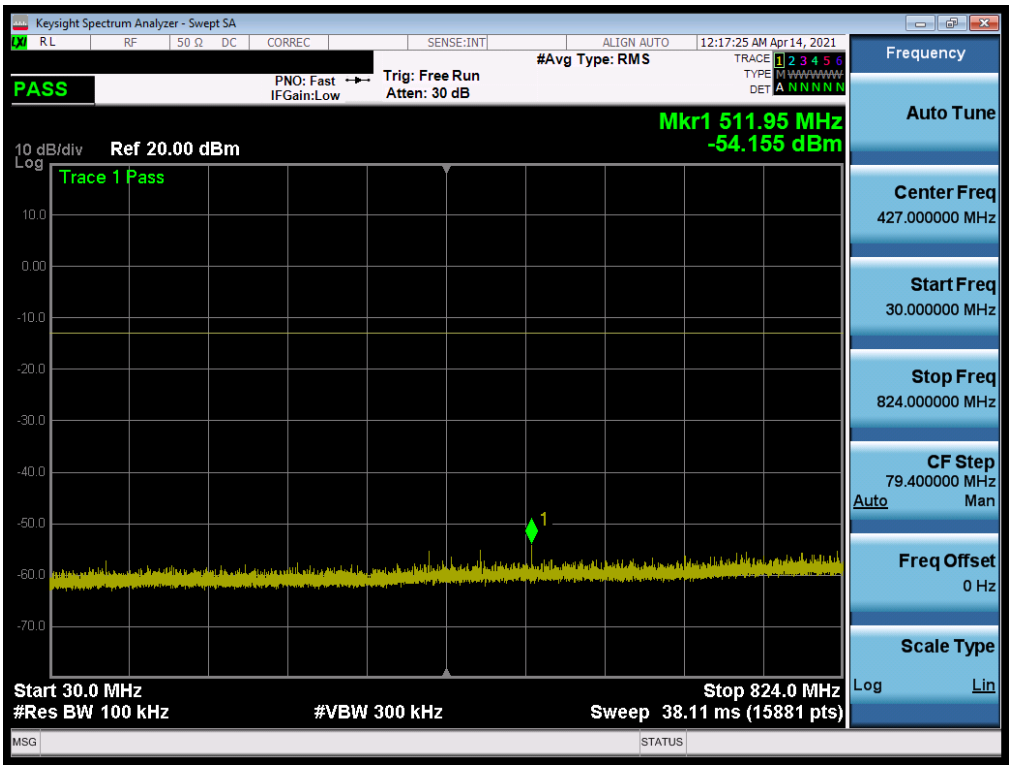
Plot 7-48. Conducted Spurious Plot (GPRS Ch. 190)



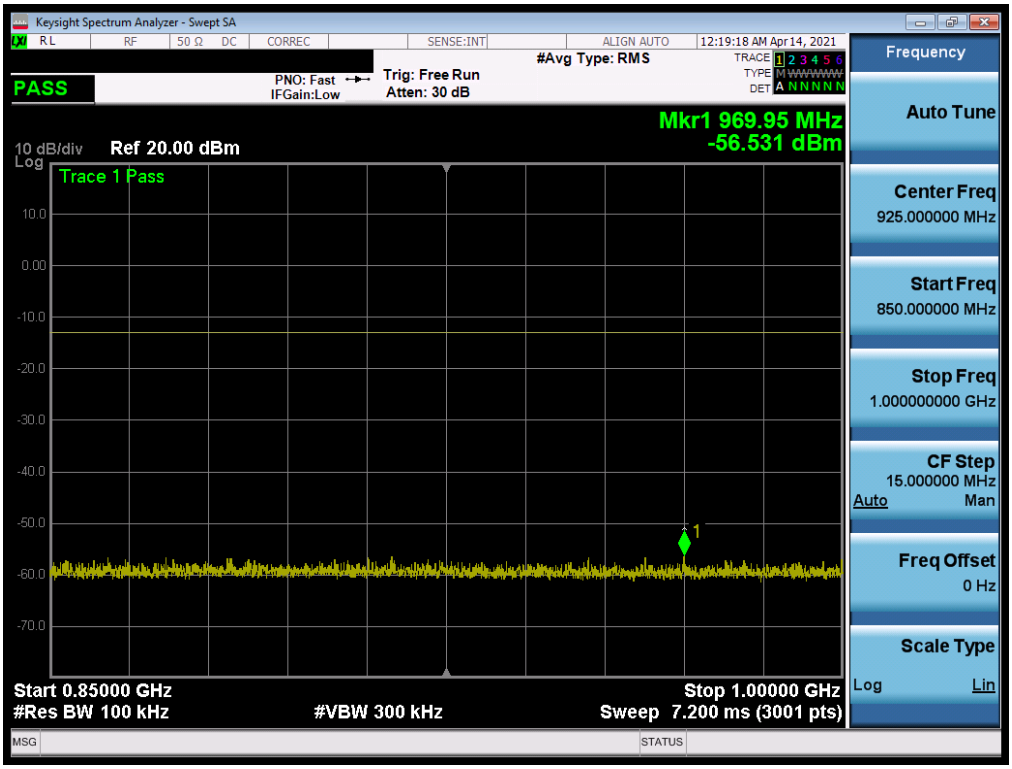
Plot 7-49. Conducted Spurious Plot (GPRS Ch. 190)



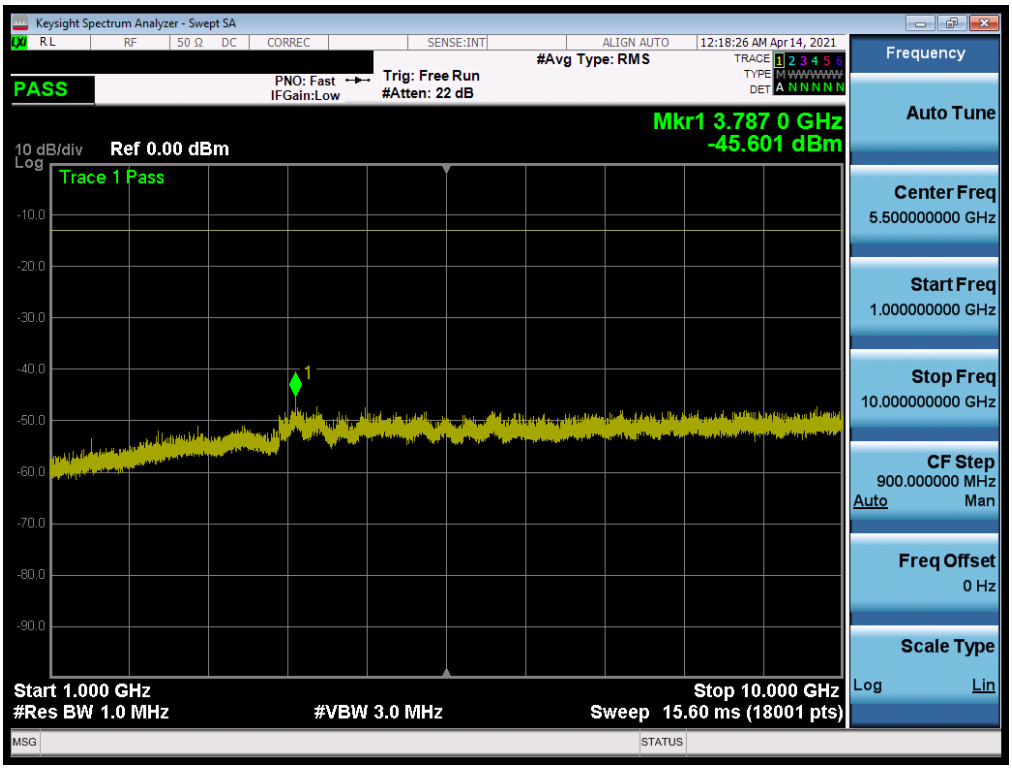
Plot 7-50. Conducted Spurious Plot (GPRS Ch. 190)



Plot 7-51. Conducted Spurious Plot (GPRS Ch. 251)

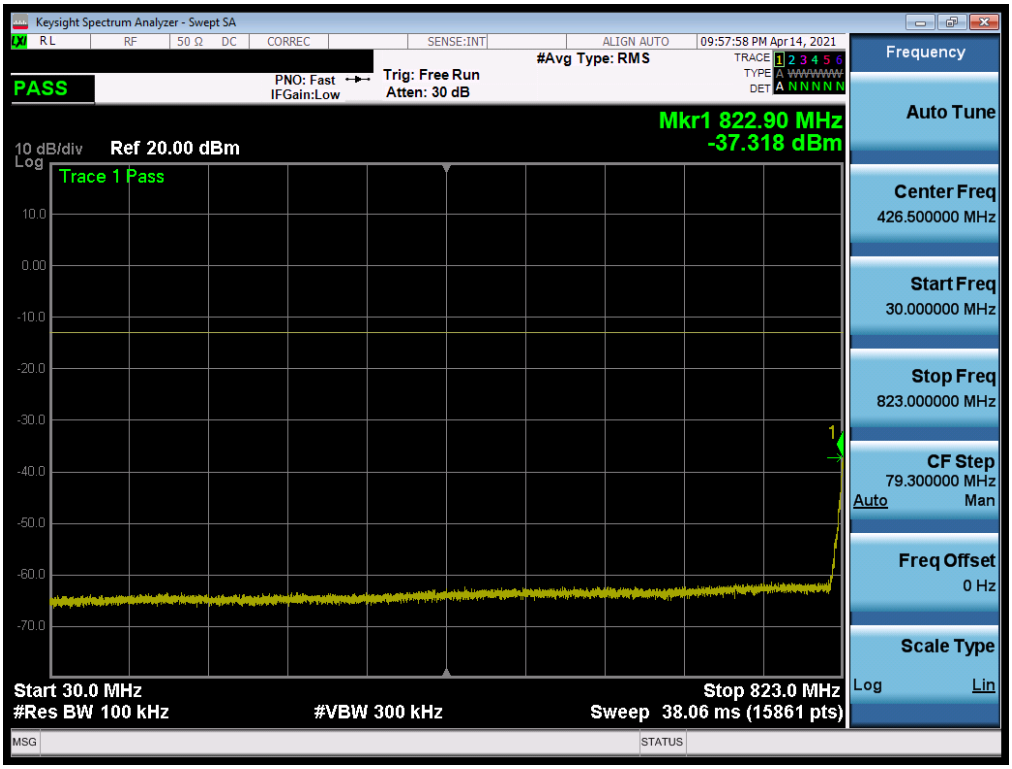


Plot 7-52. Conducted Spurious Plot (GPRS Ch. 251)

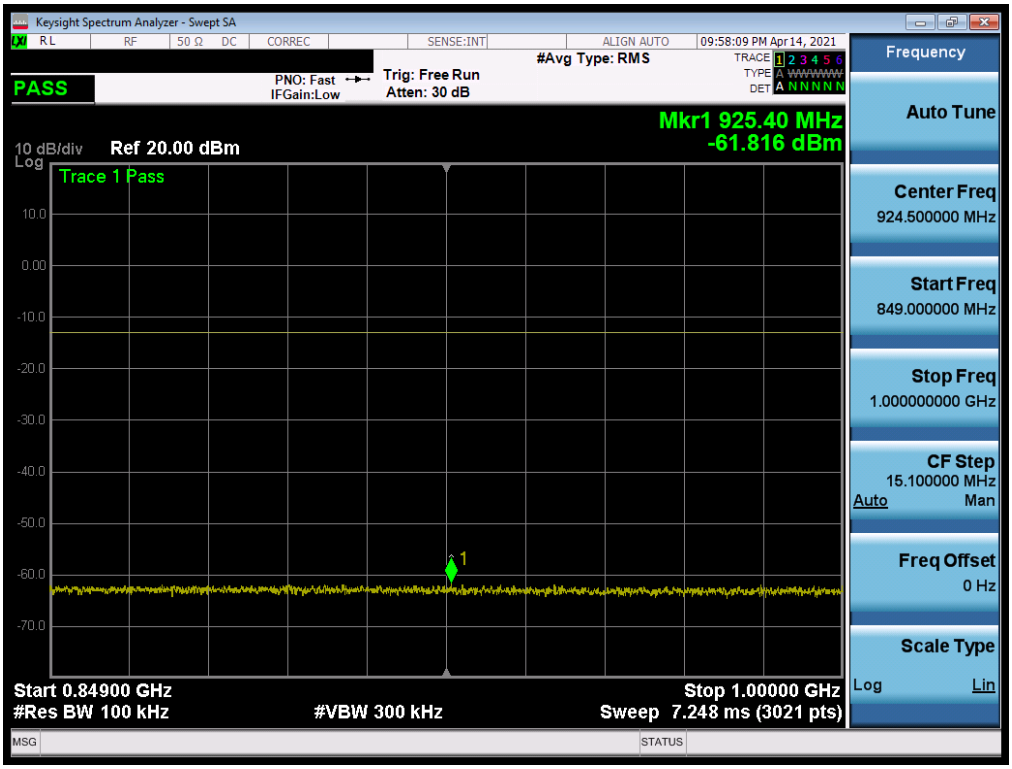


Plot 7-53. Conducted Spurious Plot (GPRS Ch. 251)

WCDMA Cell

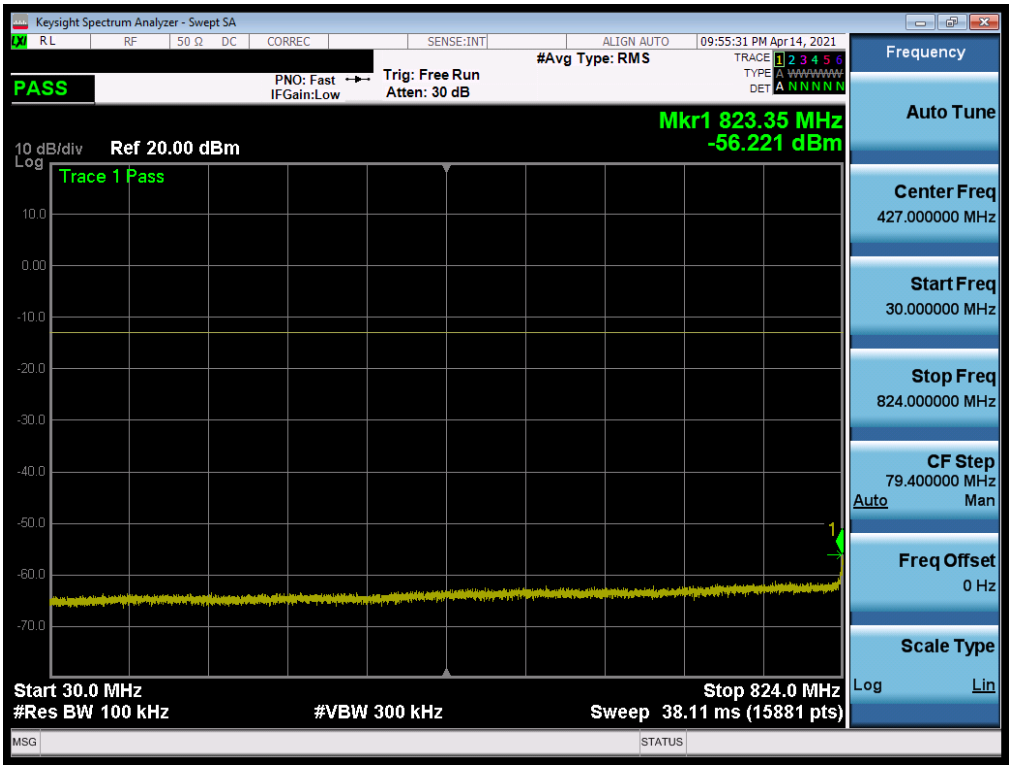


Plot 7-54. Conducted Spurious Plot (WCDMA Ch. 4132)

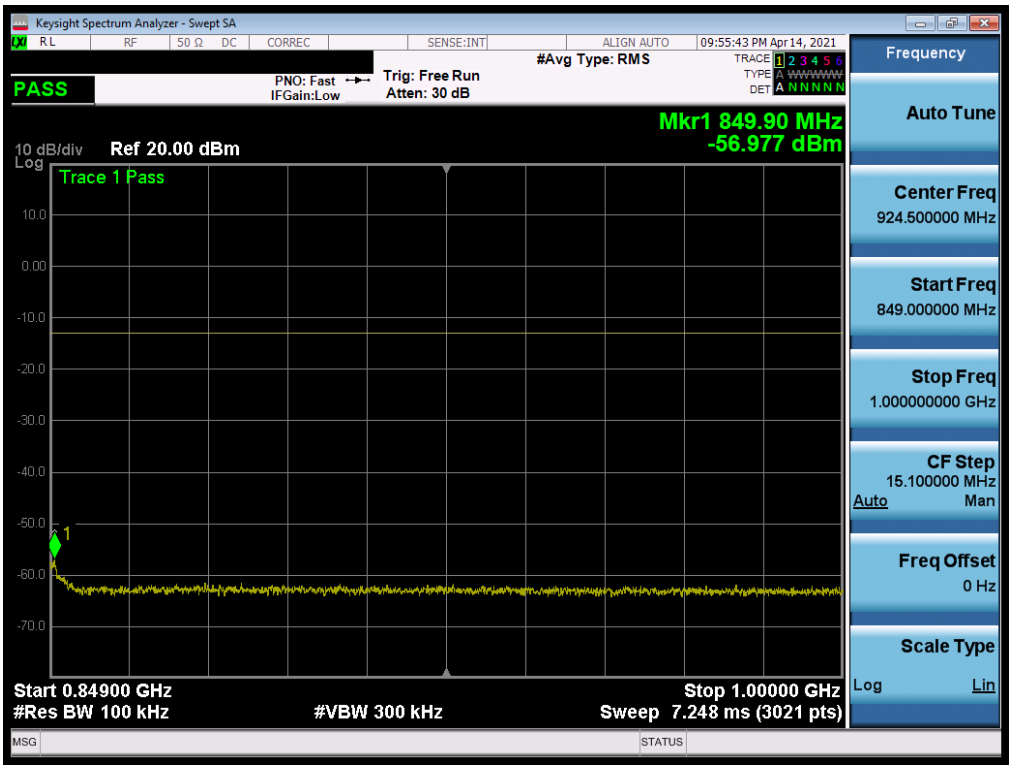


Plot 7-55. Conducted Spurious Plot (WCDMA Ch. 4132)

Plot 7-56. Conducted Spurious Plot (WCDMA Ch. 4132)

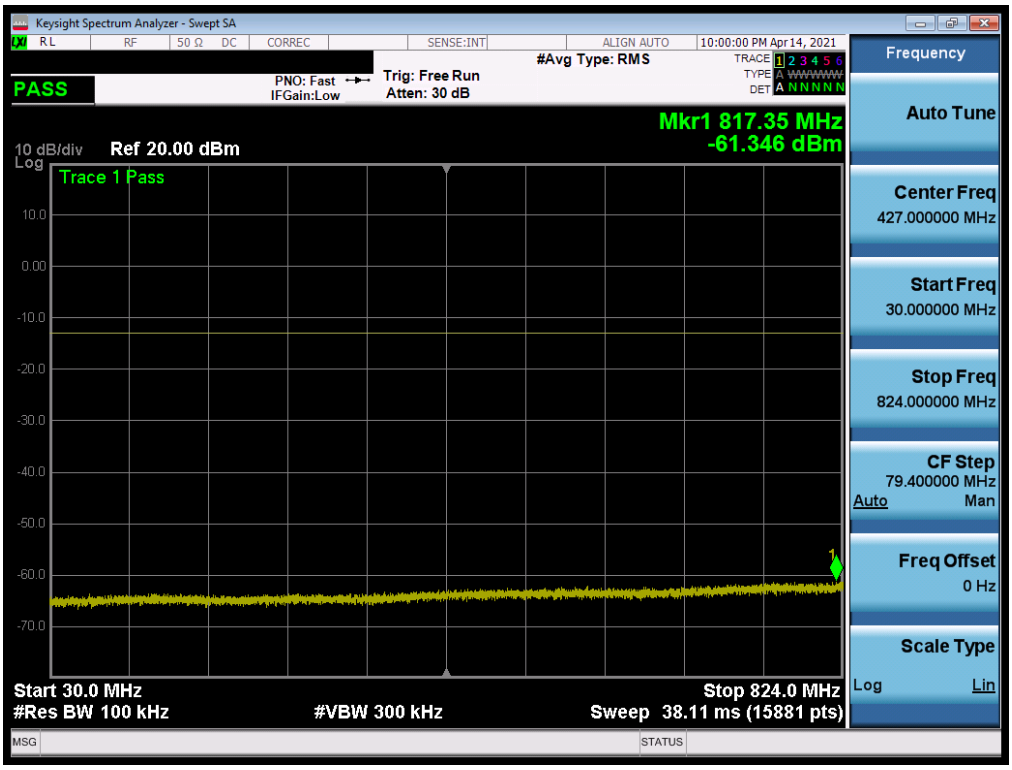


Plot 7-57. Conducted Spurious Plot (WCDMA Ch. 4183)

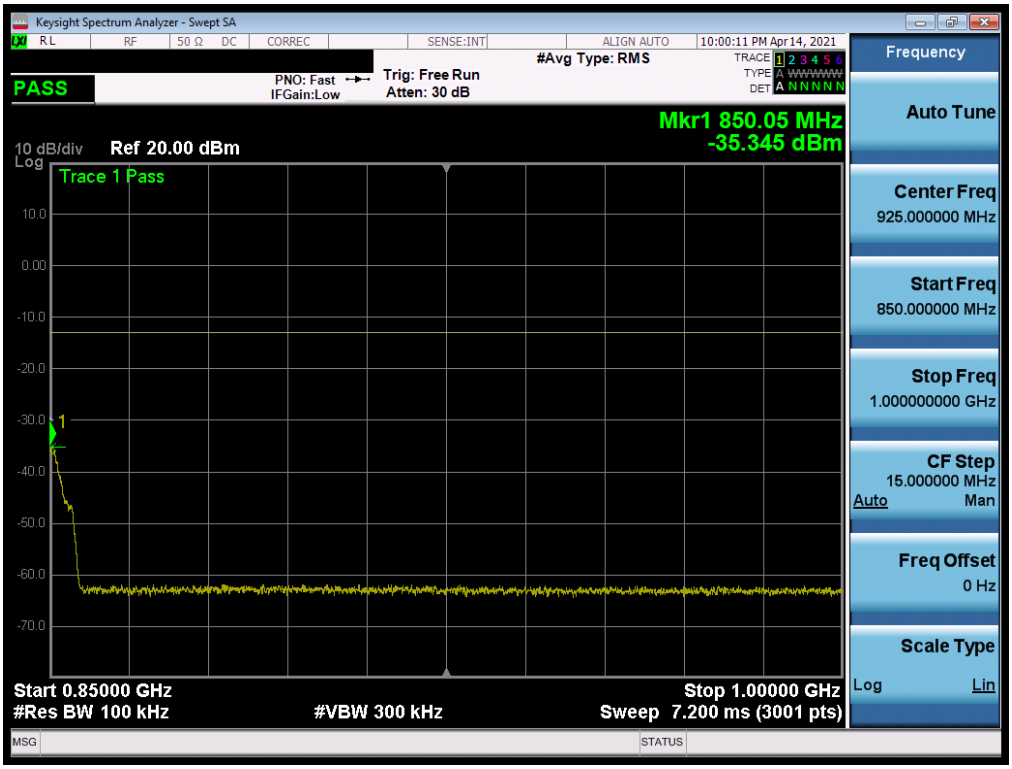


Plot 7-58. Conducted Spurious Plot (WCDMA Ch. 4183)

Plot 7-59. Conducted Spurious Plot (WCDMA Ch. 4183)



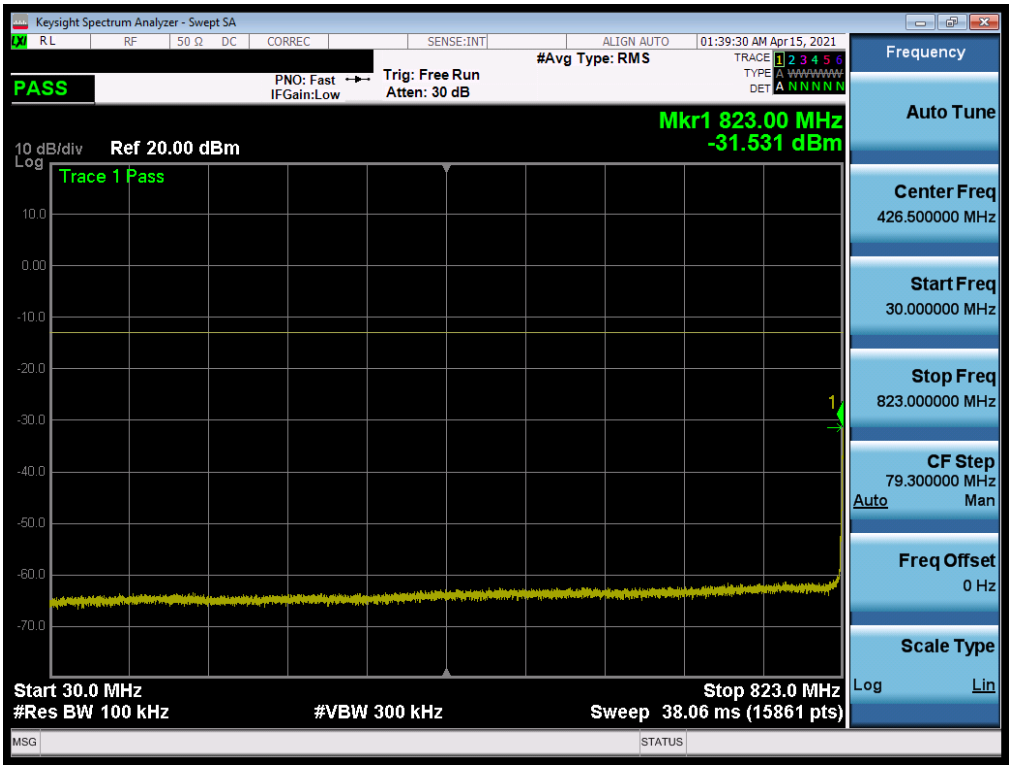
Plot 7-60. Conducted Spurious Plot (WCDMA Ch. 4233)



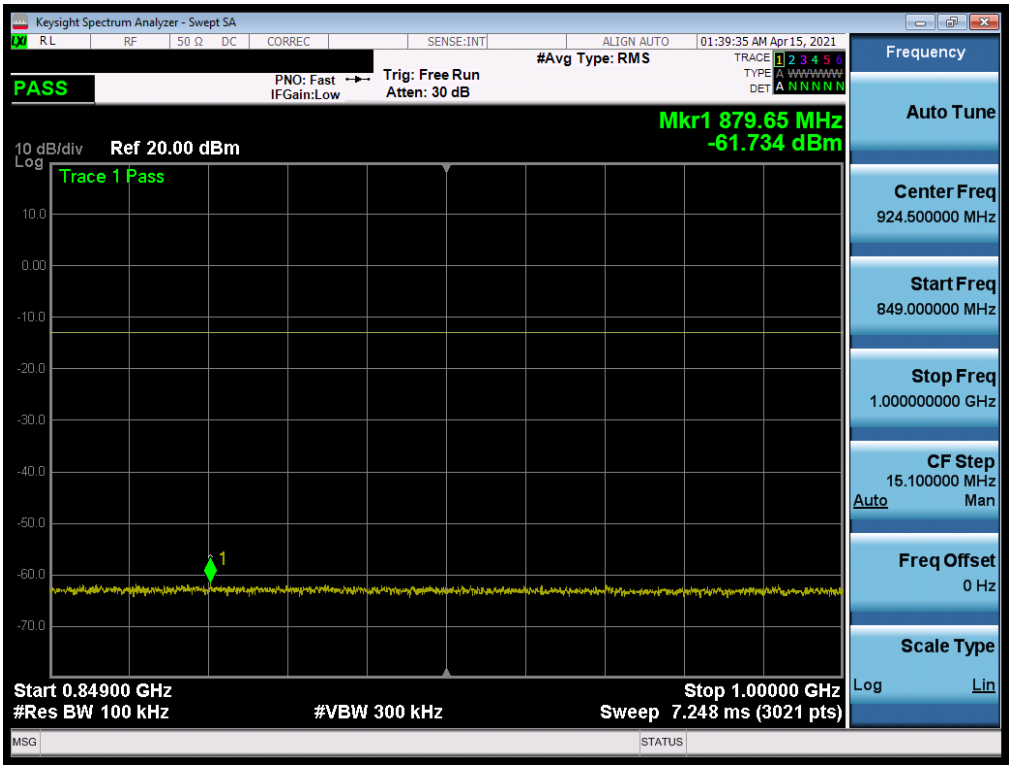
Plot 7-61. Conducted Spurious Plot (WCDMA Ch. 4233)

Plot 7-62. Conducted Spurious Plot (WCDMA Ch. 4233)

CDMA Cell

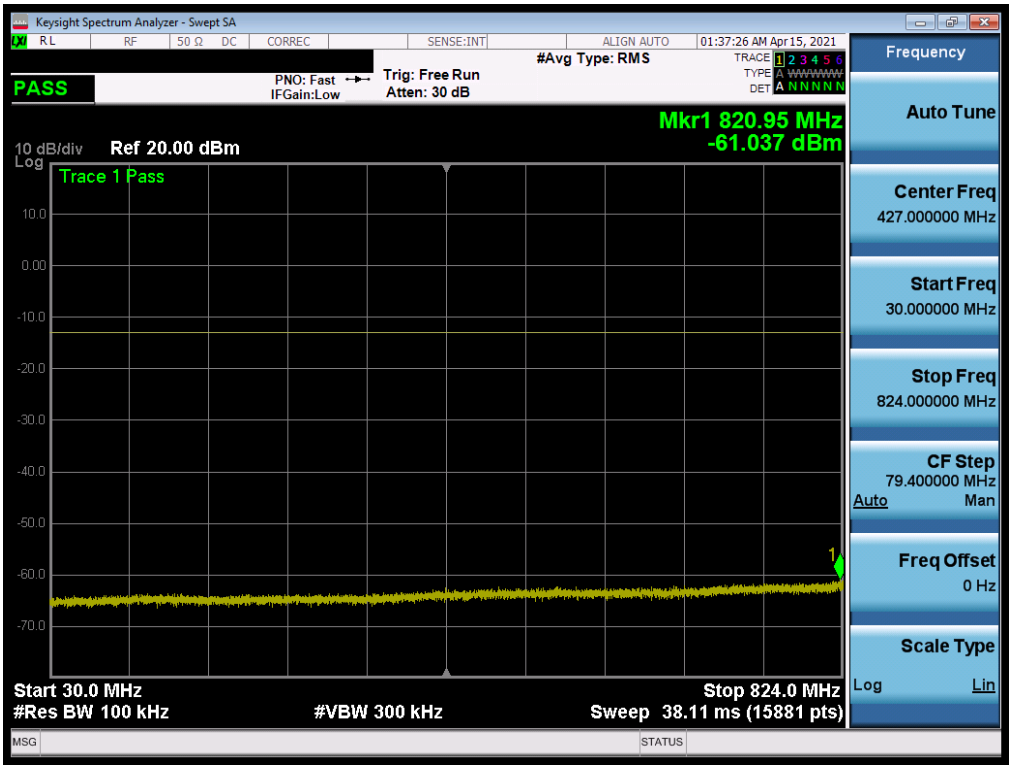


Plot 7-63. Conducted Spurious Plot (CDMA Ch. 1013)

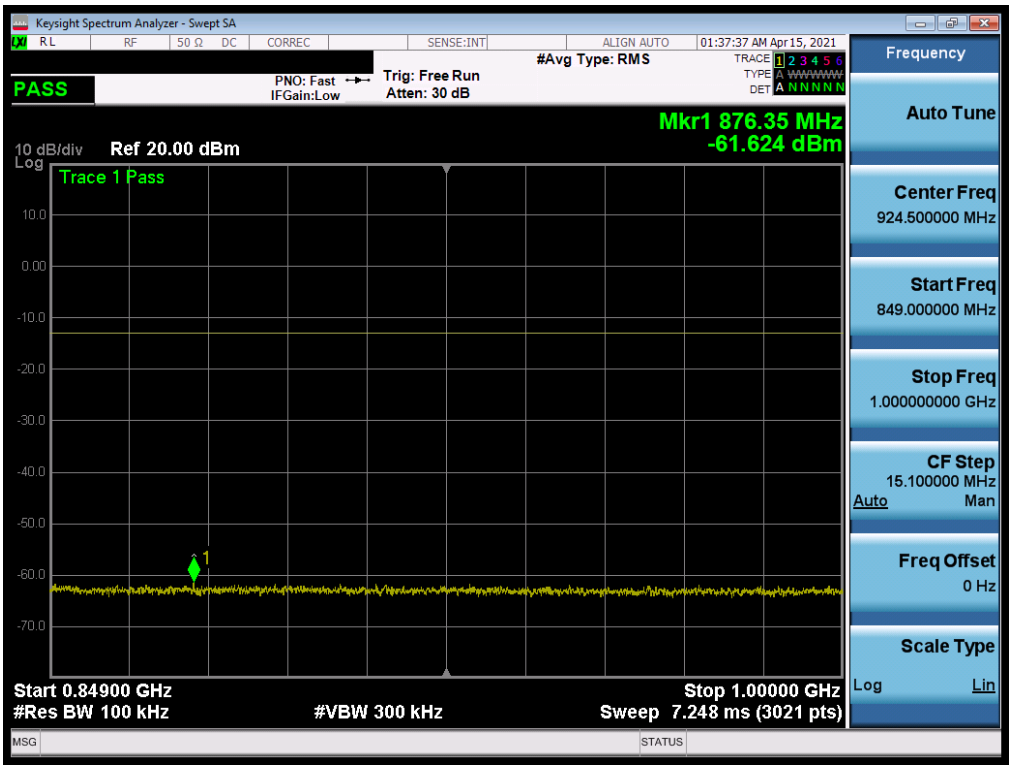


Plot 7-64. Conducted Spurious Plot (CDMA Ch. 1013)

Plot 7-65. Conducted Spurious Plot (CDMA Ch. 1013)

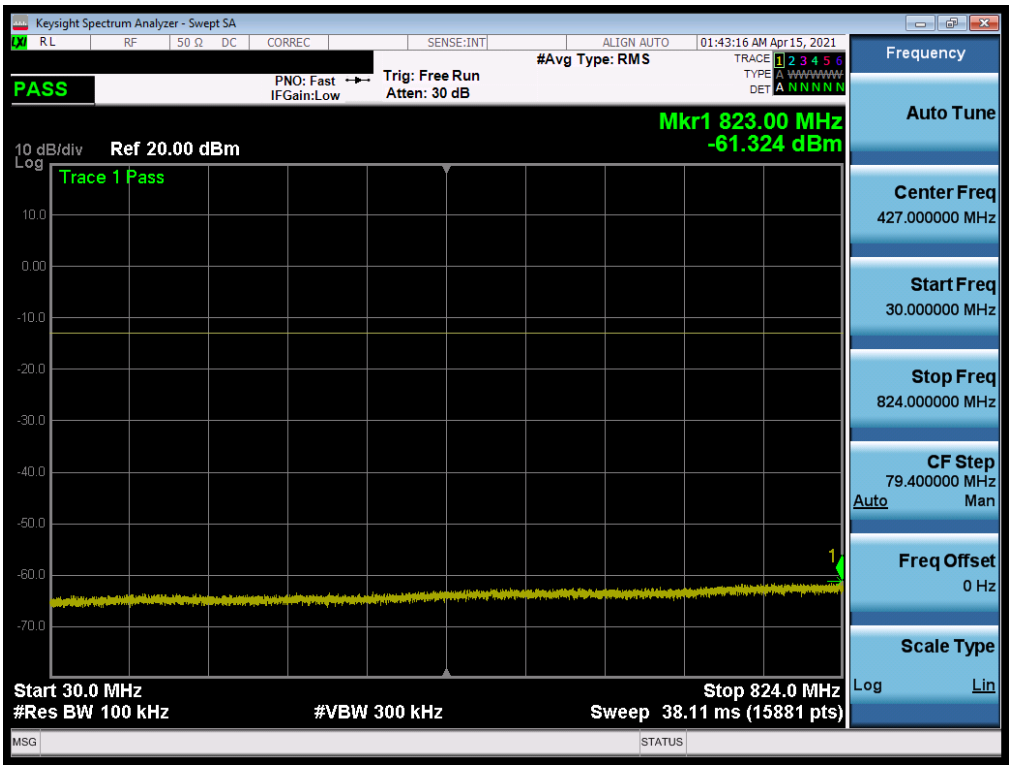


Plot 7-66. Conducted Spurious Plot (CDMA Ch. 384)

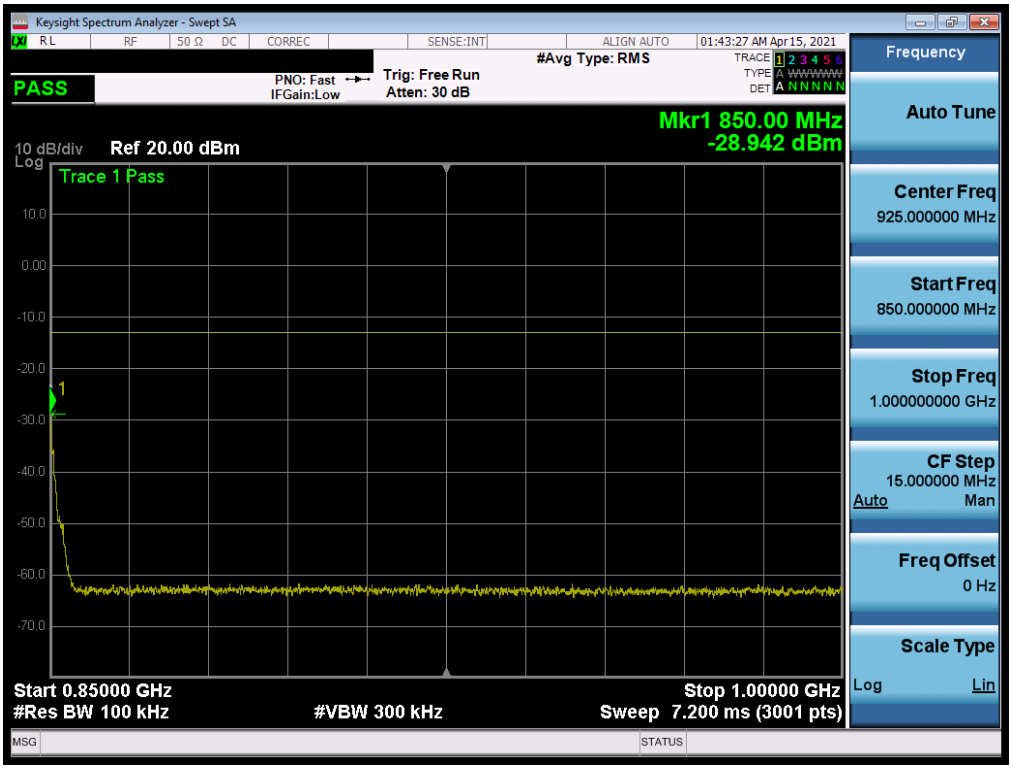


Plot 7-67. Conducted Spurious Plot (CDMA Ch. 384)

Plot 7-68. Conducted Spurious Plot (CDMA Ch. 384)



Plot 7-69. Conducted Spurious Plot (CDMA Ch. 777)



Plot 7-70. Conducted Spurious Plot (CDMA Ch. 777)

Plot 7-71. Conducted Spurious Plot (CDMA Ch. 777)

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 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

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Test Settings

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

Test Setup

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

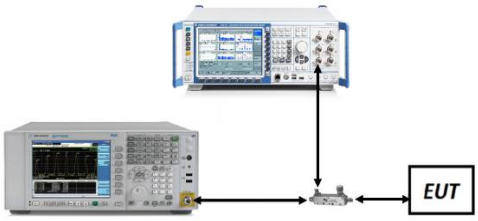


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

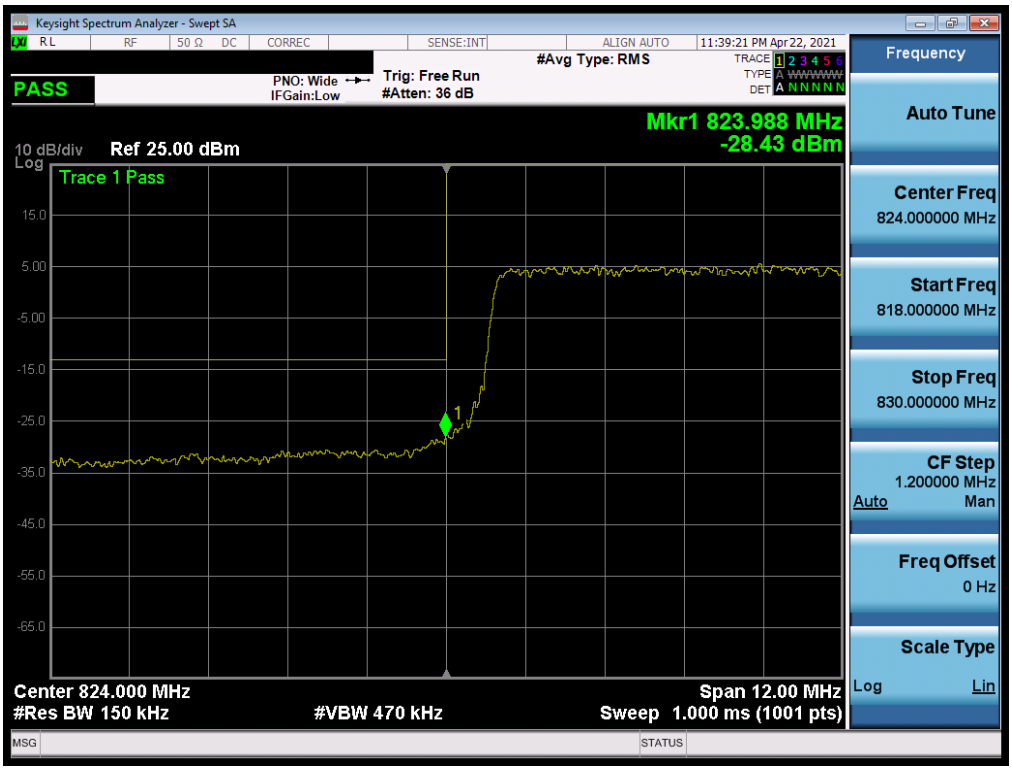
1. Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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.

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.

3. This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were reported.

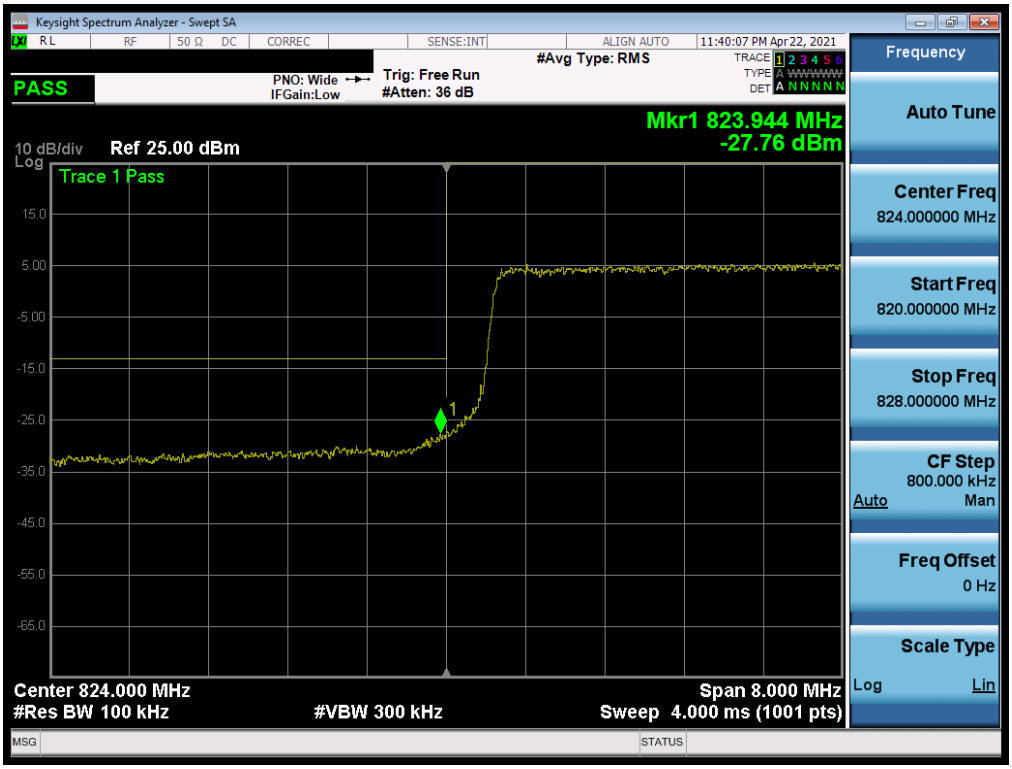
4. This device employs CDMA technology and was tested under all RC and SO combinations and the worst case is reported.

LTE Band 26/5



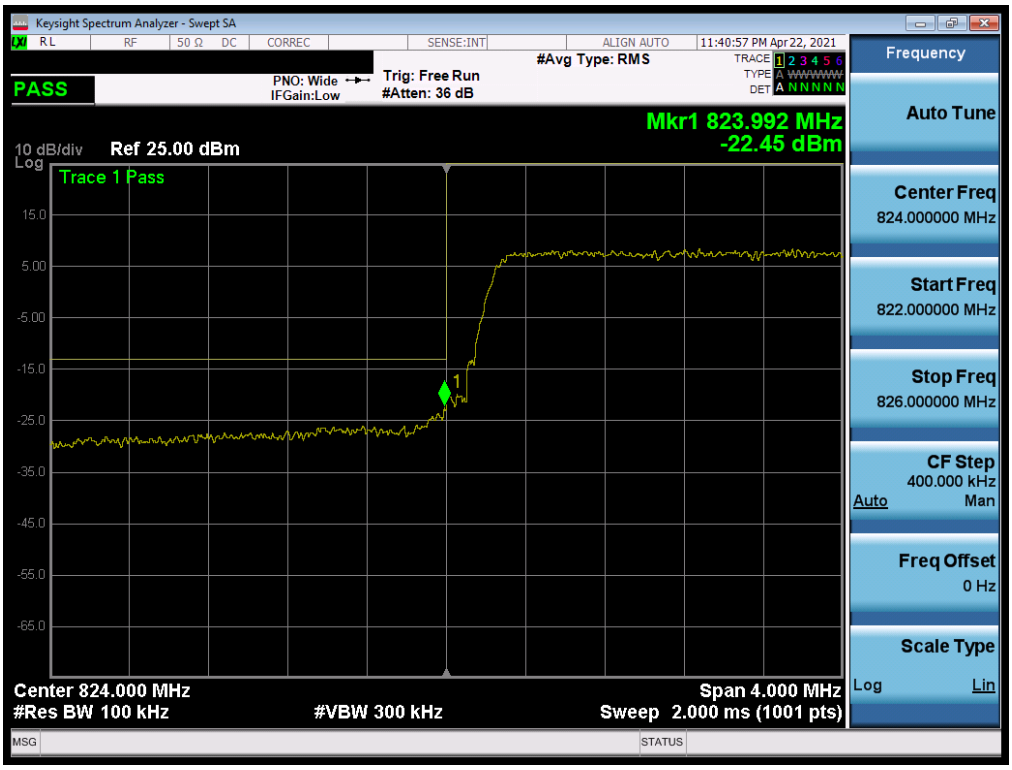
Plot 7-72. Lower Band Edge Plot (LTE Band 26 15MHz QPSK – Full RB)

Plot 7-73. Upper Band Edge Plot (LTE Band 26 15MHz QPSK – Full RB)



Plot 7-74. Lower Band Edge Plot (LTE Band 26/5 10MHz QPSK – Full RB)

Plot 7-75. Upper Band Edge Plot (LTE Band 26/5 10MHz QPSK – Full RB)

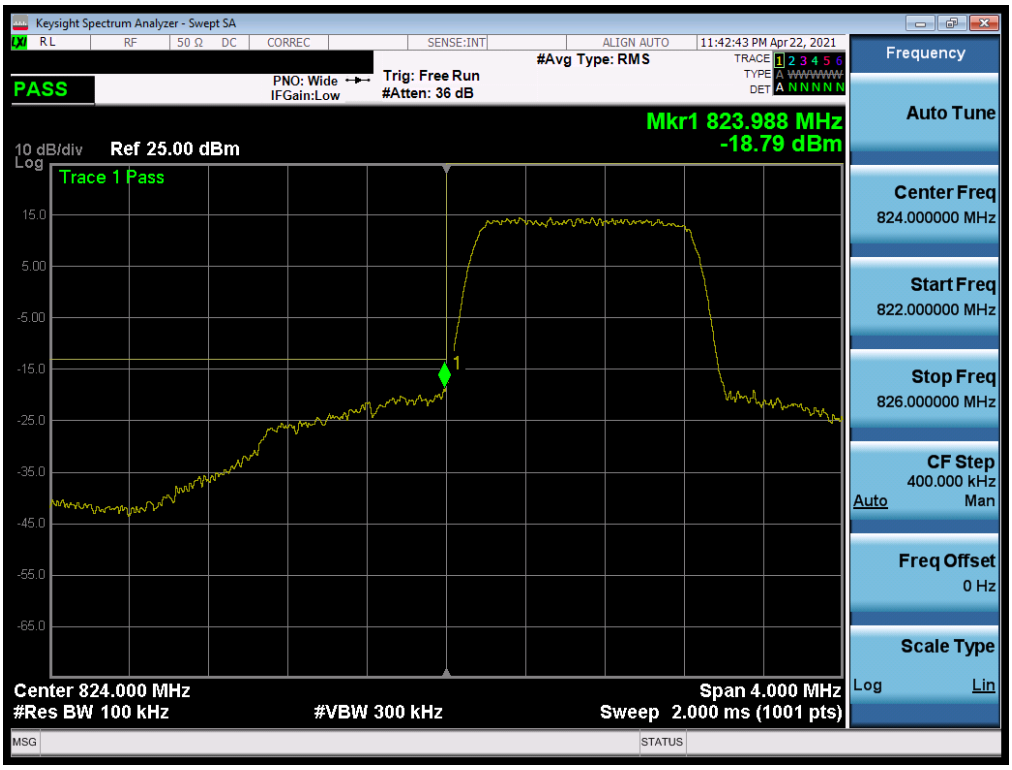


Plot 7-76. Lower Band Edge Plot (LTE Band 26/5 5MHz QPSK – Full RB)

Plot 7-77. Upper Band Edge Plot (LTE Band 26/5 5MHz QPSK – Full RB)

Plot 7-78. Lower Band Edge Plot (LTE Band 26/5 3MHz QPSK – Full RB)

Plot 7-79. Upper Band Edge Plot (LTE Band 26/5 3MHz QPSK – Full RB)



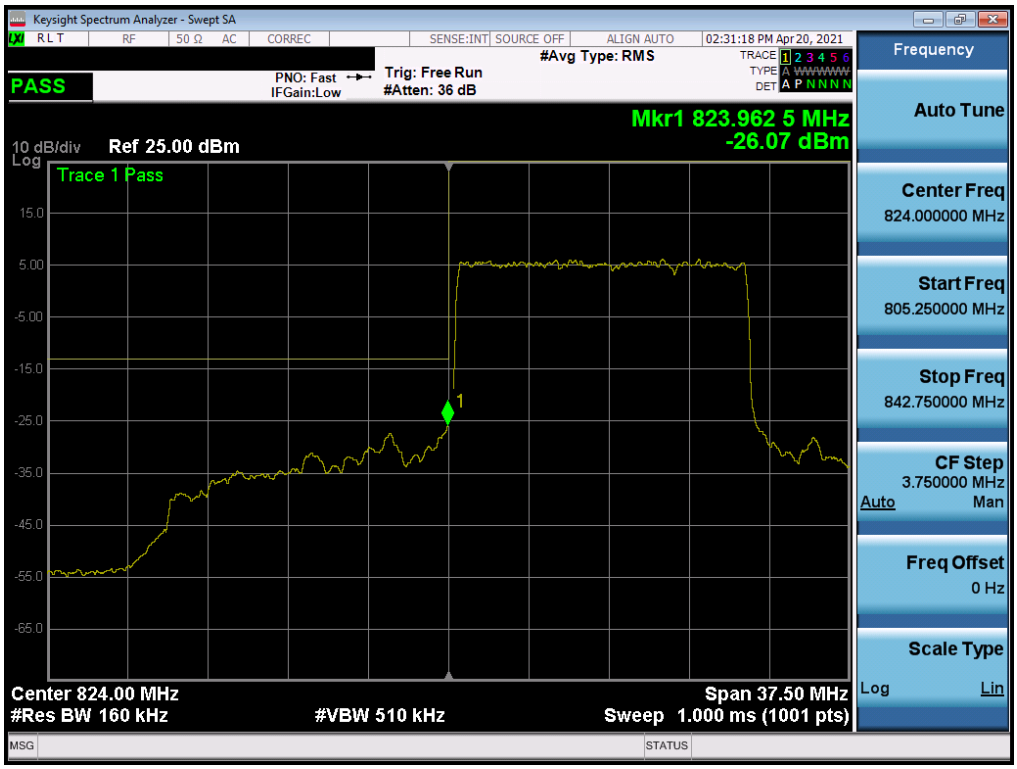
Plot 7-80. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

Plot 7-81. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

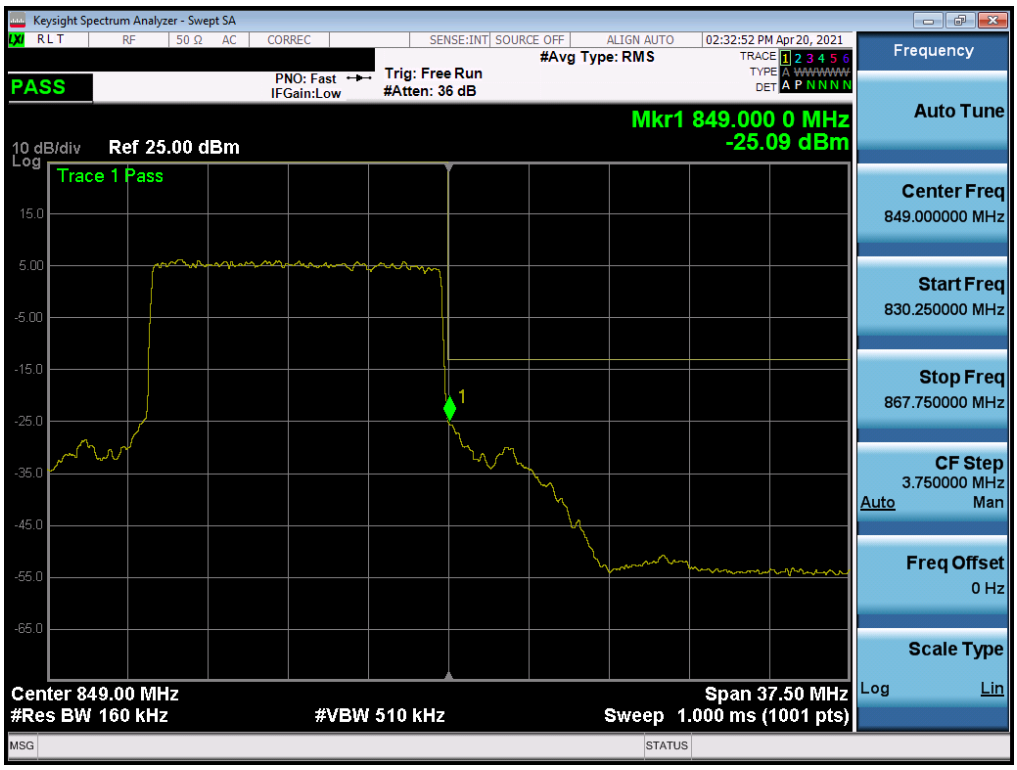
NR Band n5

Plot 7-82. Lower Band Edge Plot (NR Band n5 – 20.0MHz QPSK – Full RB)

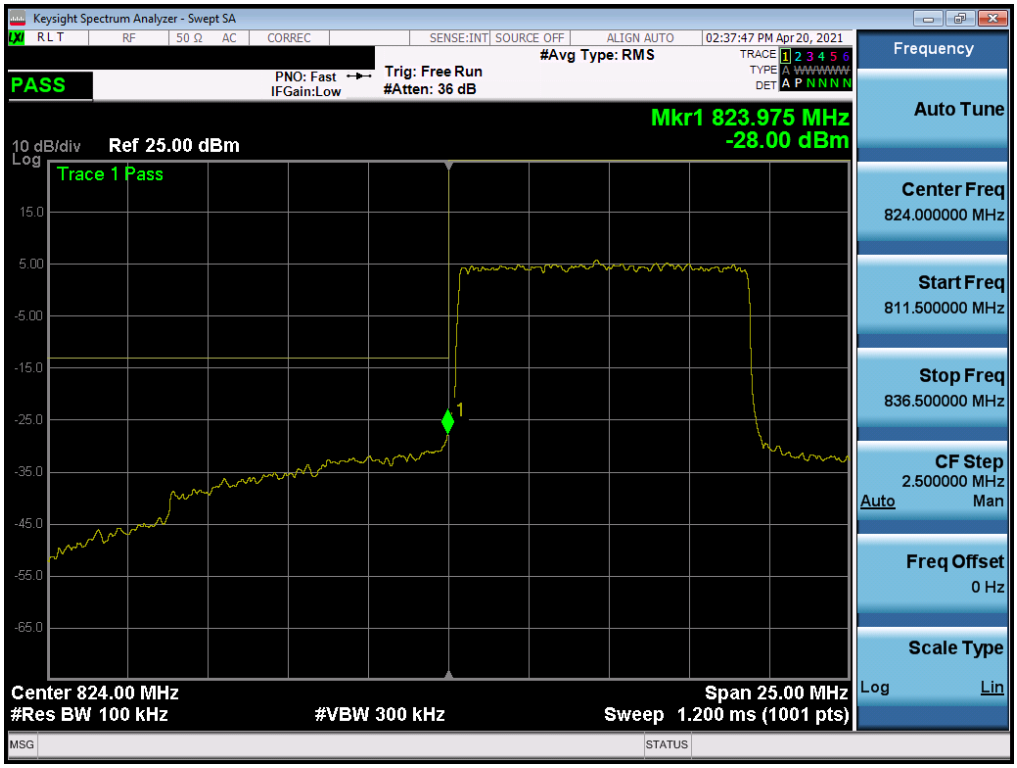
Plot 7-83. Upper Band Edge Plot (NR Band n5 – 20.0MHz QPSK – Full RB)



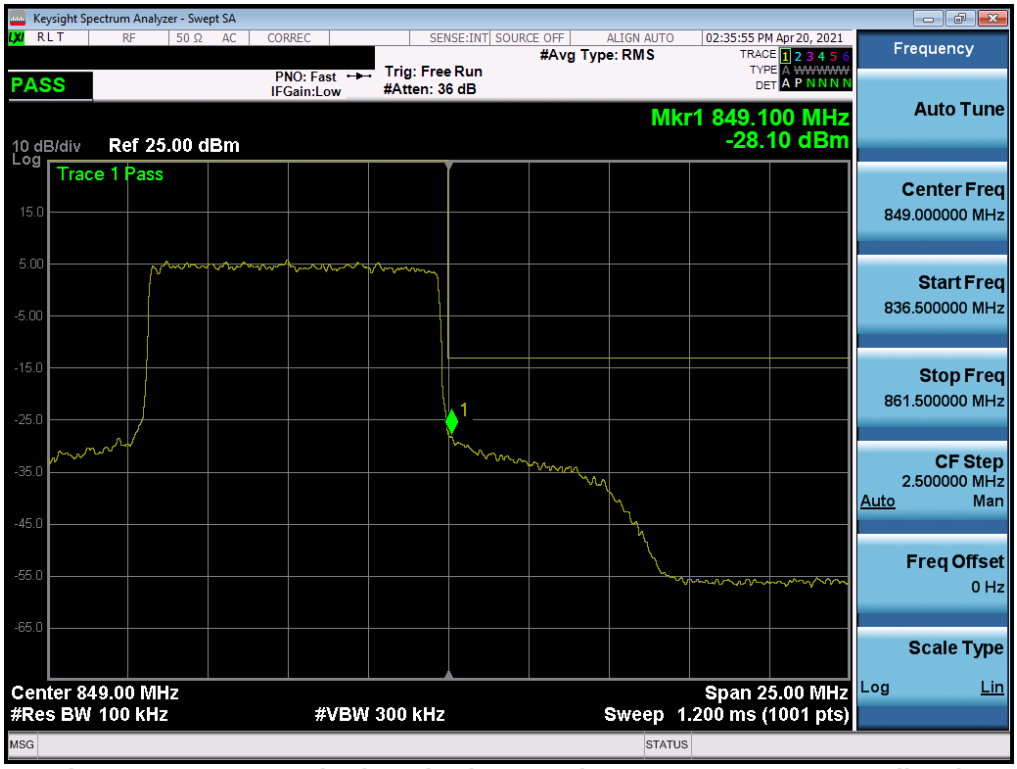
Plot 7-84. Lower Band Edge Plot (NR Band n5 – 15.0MHz QPSK – Full RB)



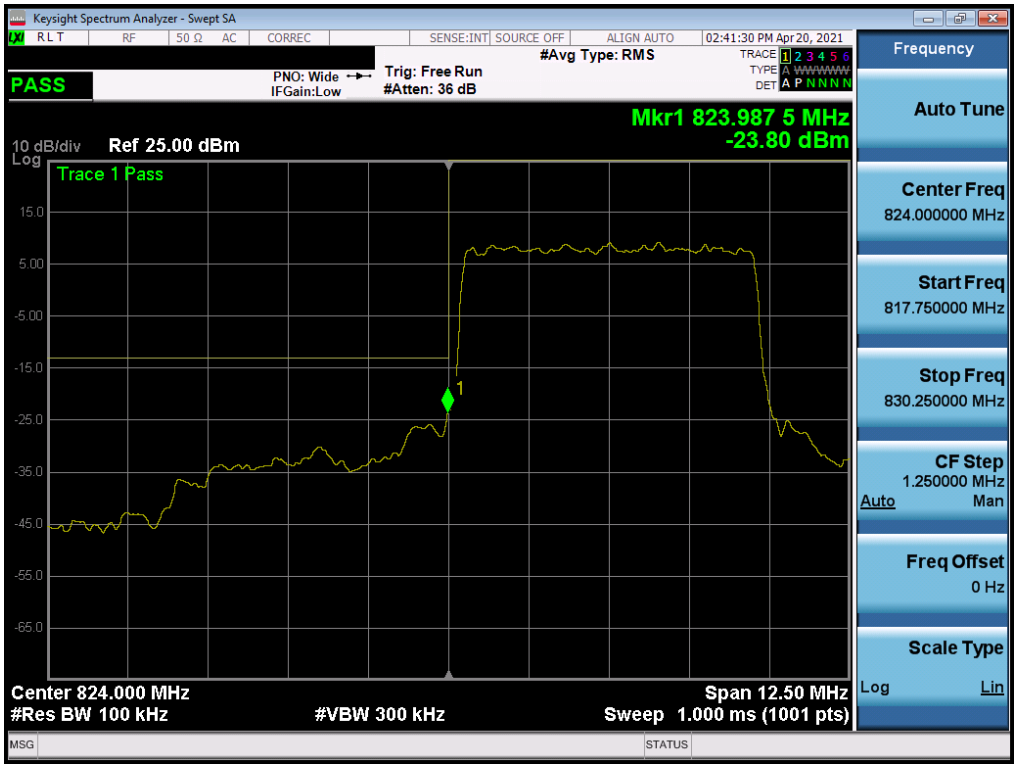
Plot 7-85. Upper Band Edge Plot (NR Band n5 – 15.0MHz QPSK – Full RB)



Plot 7-86. Lower Band Edge Plot (NR Band n5 – 10.0MHz QPSK – Full RB)

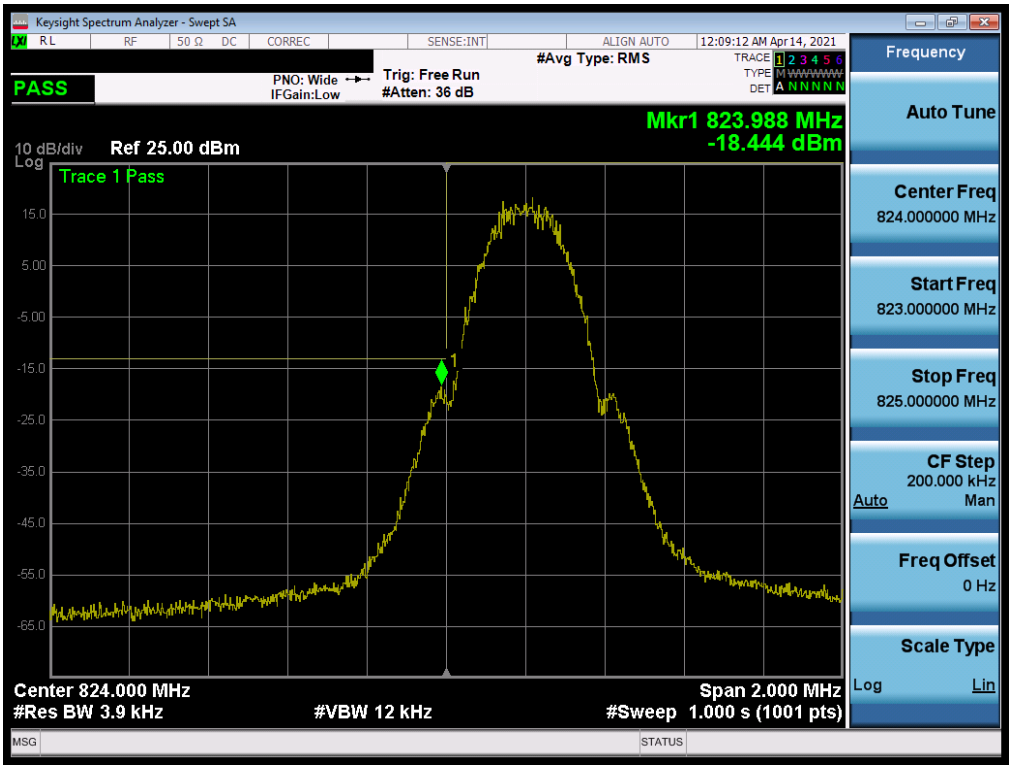


Plot 7-87. Upper Band Edge Plot (NR Band n5 – 10.0MHz QPSK – Full RB)

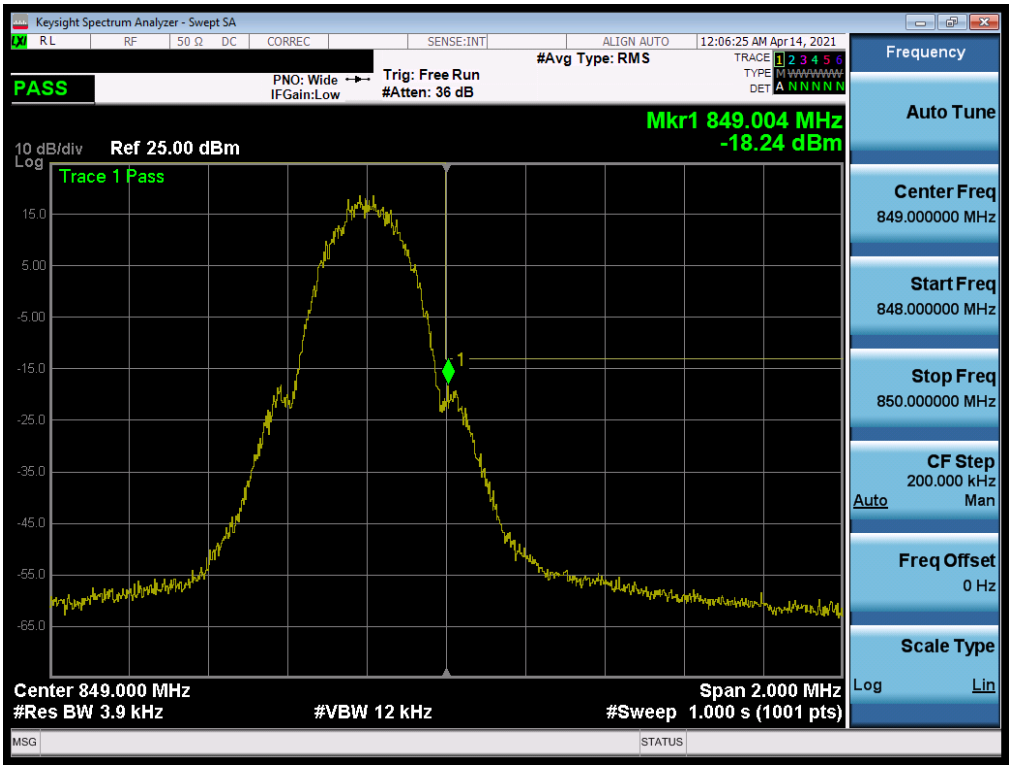


Plot 7-88. Lower Band Edge Plot (NR Band n5 – 5.0MHz QPSK – Full RB)

Plot 7-89. Upper Band Edge Plot (NR Band n5 – 5.0MHz QPSK – Full RB)

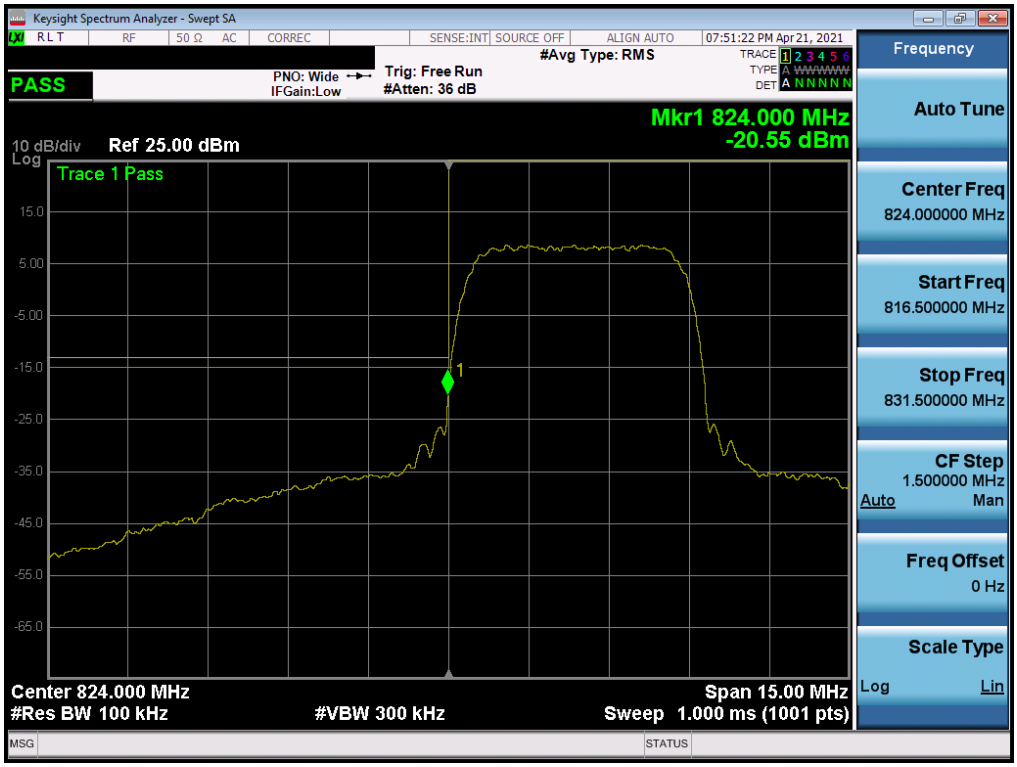


Plot 7-90. Lower Band Edge Plot (GPRS Cell – Ch. 128)

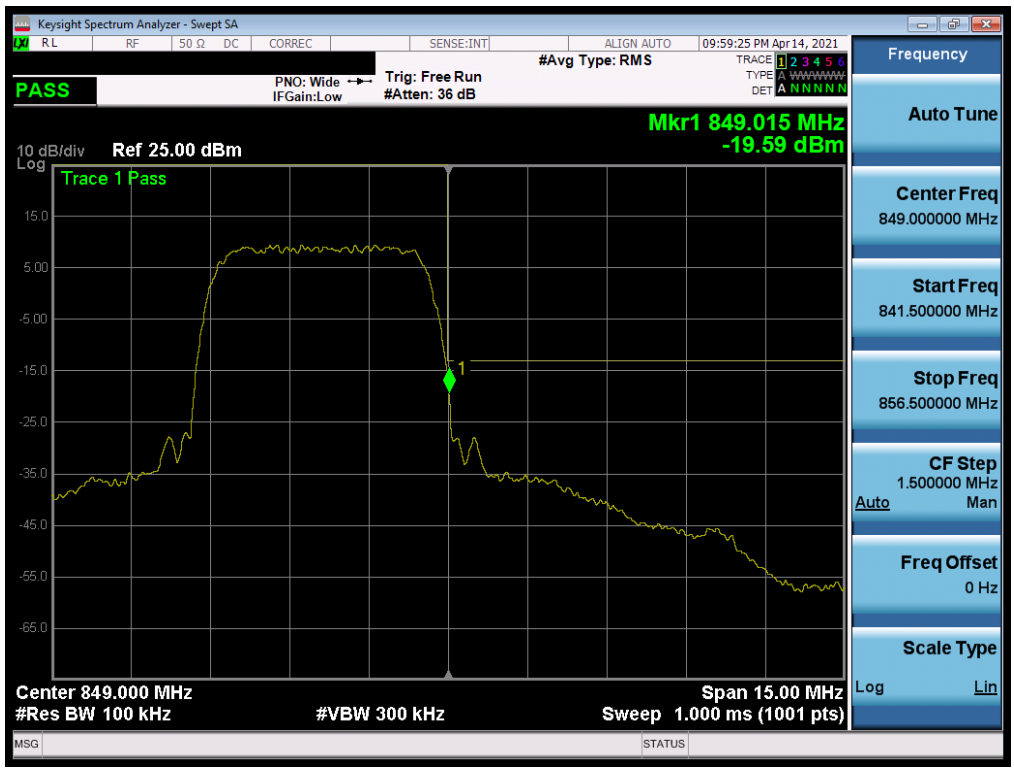


Plot 7-91. Upper Band Edge Plot (GPRS Cell – Ch. 251)

WCDMA Cell

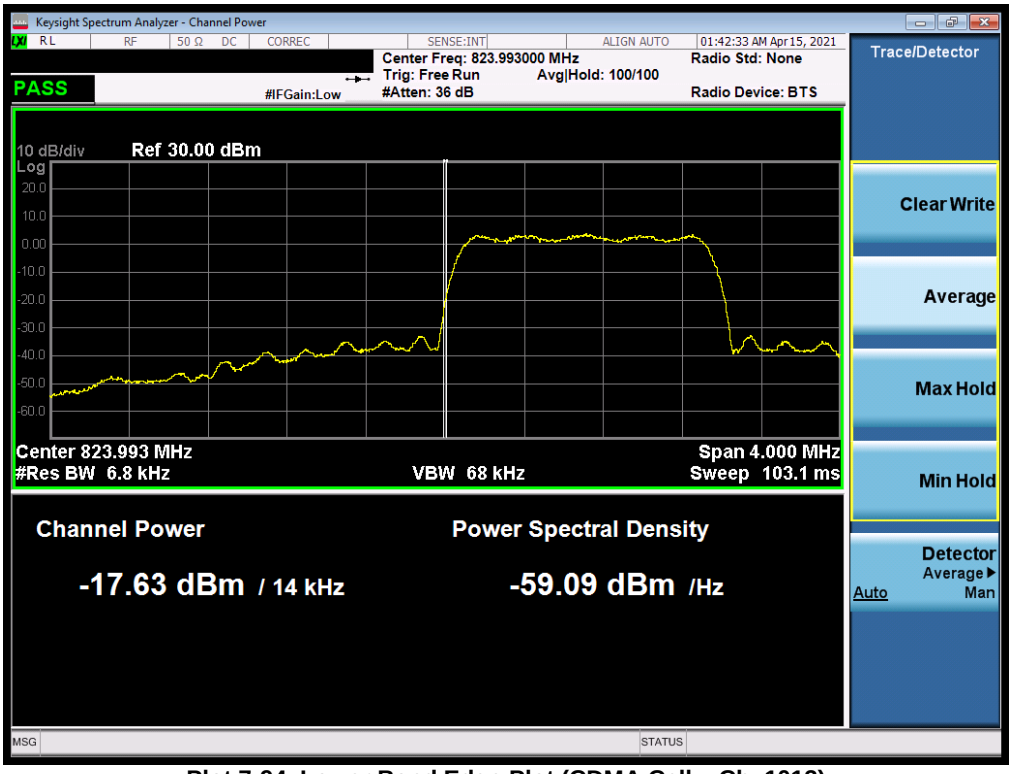


Plot 7-92. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)

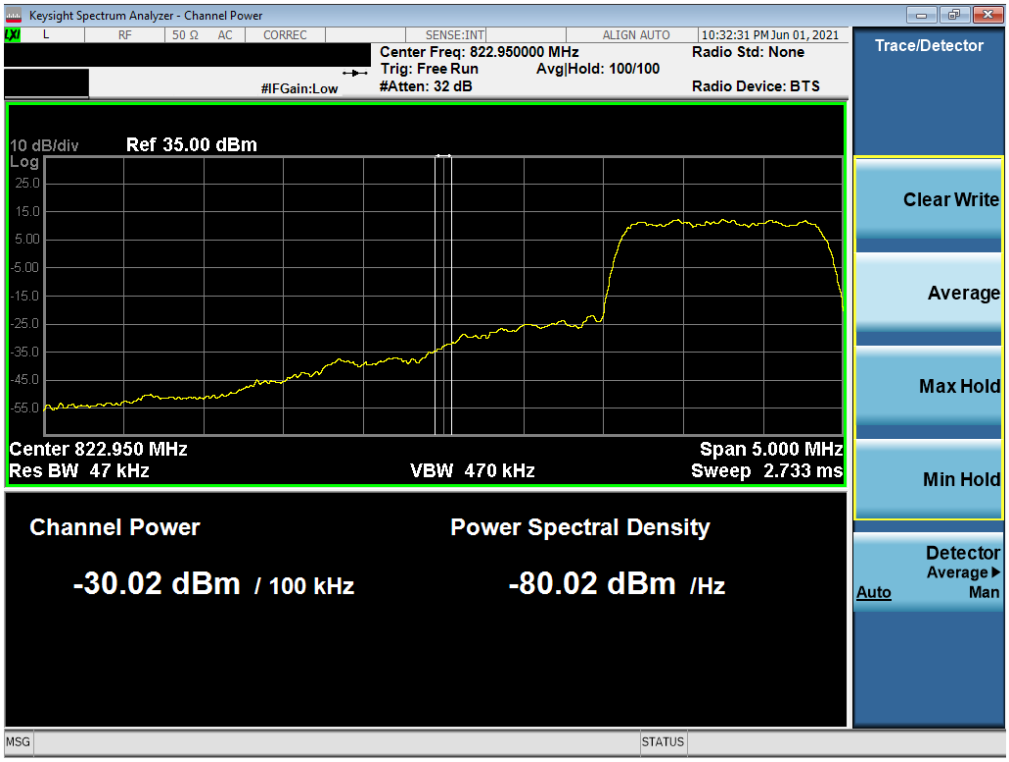


Plot 7-93. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

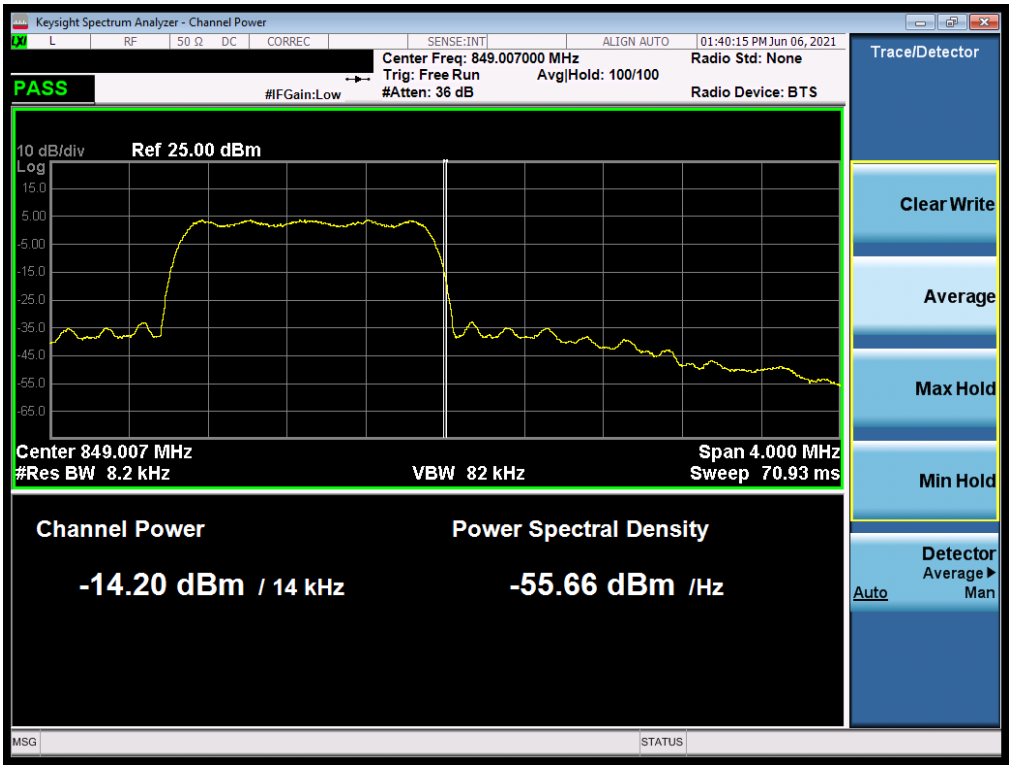
CDMA Cell



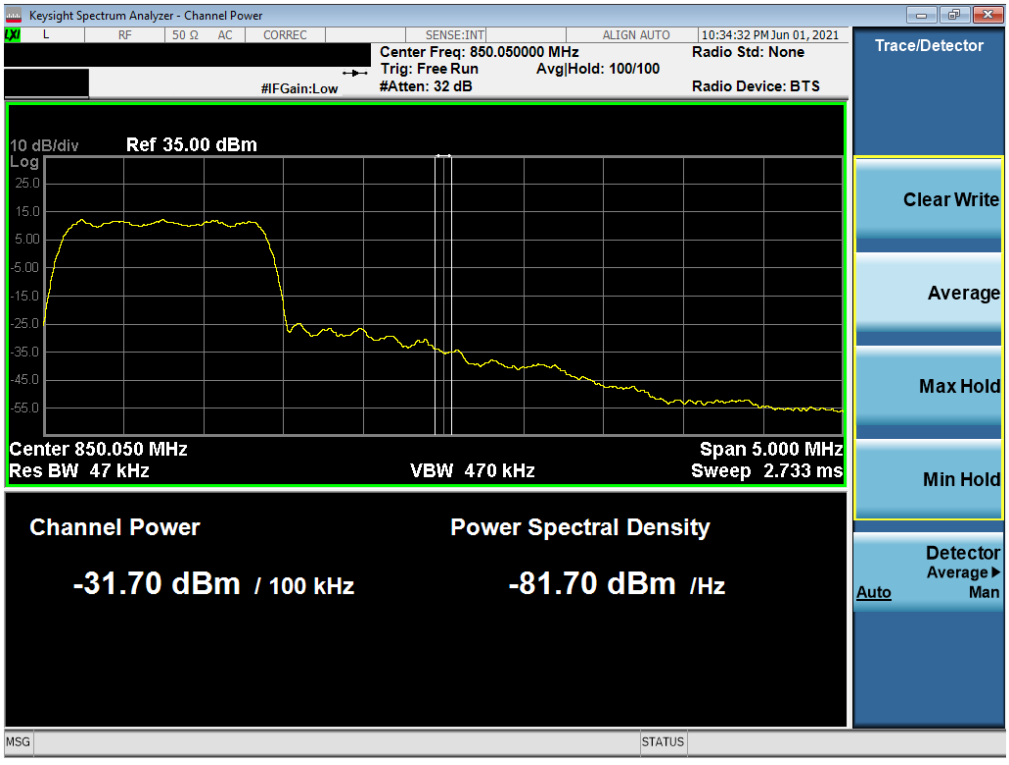
Plot 7-94. Lower Band Edge Plot (CDMA Cell – Ch. 1013)



Plot 7-95. Lower Extended Band Edge Plot (CDMA Cell – Ch. 1013)



Plot 7-96. Upper Band Edge Plot (CDMA Cell – Ch. 777)



Plot 7-97. Upper Extended Band Edge Plot (CDMA Cell – Ch. 777)

7.5 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) 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 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. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
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". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
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.

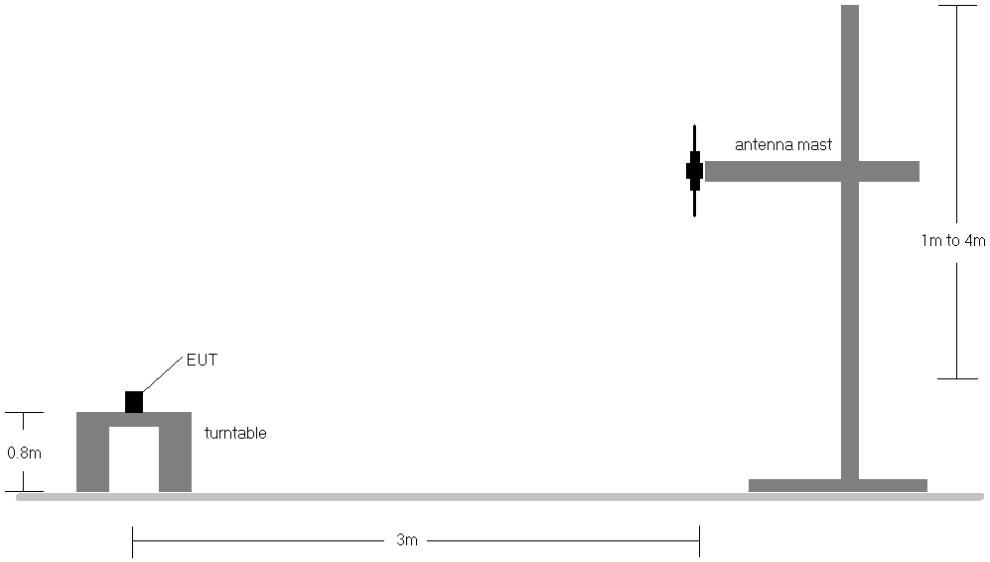


Figure 7-4. Radiated Test Setup <1GHz

Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.

2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

3) This device employs CDMA capabilities. The EUT was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.

4) 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.

5) This unit was tested with its standard battery.

6) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

7) 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.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.5	V	132	260	6.43	1 / 37	15.13	19.41	0.087	38.45	-19.04	21.56	0.143	40.61	-19.05
		836.5	V	147	265	6.38	1 / 37	15.01	19.24	0.084	38.45	-19.21	21.39	0.138	40.61	-19.22
		841.5	V	143	259	6.43	1 / 0	15.31	**19.59**	0.091	38.45	-18.86	**21.74**	0.149	40.61	-18.87
	16-QAM	841.5	V	143	259	6.43	1 / 0	14.46	18.74	0.075	38.45	-19.71	**20.89**	0.123	40.61	-19.72
10 MHz	QPSK	829.0	V	132	260	6.40	1 / 0	15.16	19.41	0.087	38.45	-19.04	21.56	0.143	40.61	-19.04
		836.5	V	147	265	6.38	1 / 49	15.09	19.32	0.086	38.45	-19.13	21.47	0.140	40.61	-19.13
		844.0	V	143	259	6.46	1 / 25	15.36	**19.66**	0.093	38.45	-18.79	**21.81**	0.152	40.61	-18.79
	16-QAM	844.0	V	143	259	6.46	1 / 0	14.30	18.61	0.073	38.45	-19.84	**20.76**	0.119	40.61	-19.85
5 MHz	QPSK	826.5	V	132	260	6.37	1 / 12	15.20	19.42	0.088	38.45	-19.03	21.57	0.144	40.61	-19.04
		836.5	V	147	265	6.38	1 / 0	15.11	19.34	0.086	38.45	-19.11	21.49	0.141	40.61	-19.12
		846.5	V	143	259	6.48	1 / 12	15.46	**19.79**	0.095	38.45	-18.66	**21.94**	0.156	40.61	-18.67
	16-QAM	846.5	V	143	259	6.48	1 / 24	14.22	18.55	0.072	38.45	-19.90	**20.70**	0.117	40.61	-19.91
3 MHz	QPSK	825.5	V	132	260	6.36	1 / 14	15.21	19.43	0.088	38.45	-19.02	21.58	0.144	40.61	-19.03
		836.5	V	147	265	6.38	1 / 7	15.13	19.36	0.086	38.45	-19.09	21.51	0.141	40.61	-19.10
		847.5	V	143	259	6.49	1 / 7	15.20	**19.55**	0.090	38.45	-18.91	**21.70**	0.148	40.61	-18.91
	16-QAM	847.5	V	143	259	6.49	1 / 14	14.14	18.48	0.071	38.45	-19.97	**20.63**	0.116	40.61	-19.97
1.4 MHz	QPSK	824.7	V	132	260	6.36	1 / 0	15.16	19.36	0.086	38.45	-19.09	21.51	0.142	40.61	-19.09
		836.5	V	147	265	6.38	1 / 3	15.14	19.37	0.087	38.45	-19.08	21.52	0.142	40.61	-19.08
		848.3	V	143	259	6.50	1 / 5	15.33	**19.68**	0.093	38.45	-18.77	**21.83**	0.152	40.61	-18.78
	16-QAM	848.3	V	143	259	6.50	1 / 3	14.09	18.44	0.070	38.45	-20.01	**20.59**	0.115	40.61	-20.02
5 MHz	QPSK (Opposite Pol.)	846.5	H	208	282	6.63	1 / 0	14.49	18.97	0.079	38.45	-19.48	21.12	0.129	40.61	-19.49
	QPSK (WCP)	846.5	V	126	347	6.43	1 / 12	8.47	12.75	0.019	38.45	-25.70	14.90	0.031	40.61	-25.71
	QPSK (Closed)	846.5	H	208	241	6.63	1 / 0	11.73	16.21	0.042	38.45	-22.24	18.36	0.069	40.61	-22.25

Table 7-2. ERP Data (LTE Band 26/5)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	π/2 BPSK	834.0	H	222	297	6.75	1 / 26	14.36	**18.96**	0.079	38.45	-19.49	**21.11**	0.129	40.61	-19.49
		836.5	H	218	291	6.68	1 / 26	14.09	18.62	0.073	38.45	-19.83	20.77	0.119	40.61	-19.84
		839.0	H	220	288	6.70	1 / 26	14.04	18.59	0.072	38.45	-19.86	20.74	0.119	40.61	-19.86
	QPSK	834.0	H	222	297	6.75	1 / 26	14.18	18.78	0.076	38.45	-19.67	**20.93**	0.124	40.61	-19.67
		836.5	H	218	291	6.68	1 / 26	13.97	18.50	0.071	38.45	-19.95	20.65	0.116	40.61	-19.96
		839.0	H	220	288	6.70	1 / 26	13.89	18.44	0.070	38.45	-20.01	20.59	0.115	40.61	-20.01
	16-QAM	834.0	H	222	297	6.75	1 / 26	12.88	17.48	0.056	38.45	-20.97	**19.63**	0.092	40.61	-20.97
15 MHz	π/2 BPSK	831.5	H	222	297	6.73	1 / 58	14.35	**18.93**	0.078	38.45	-19.52	**21.08**	0.128	40.61	-19.53
		836.5	H	218	291	6.68	1 / 58	14.32	18.85	0.077	38.45	-19.60	21.00	0.126	40.61	-19.61
		841.5	H	220	288	6.63	1 / 58	14.12	18.60	0.072	38.45	-19.85	20.75	0.119	40.61	-19.86
	QPSK	831.5	H	222	297	6.73	1 / 58	14.23	18.80	0.076	38.45	-19.65	**20.95**	0.125	40.61	-19.65
		836.5	H	218	291	6.68	1 / 58	13.90	18.43	0.070	38.45	-20.02	20.58	0.114	40.61	-20.03
		841.5	H	220	288	6.63	1 / 58	13.88	18.36	0.069	38.45	-20.09	20.51	0.113	40.61	-20.10
	16-QAM	831.5	H	222	297	6.73	1 / 58	13.15	17.73	0.059	38.45	-20.72	**19.88**	0.097	40.61	-20.73
10 MHz	π/2 BPSK	829.0	H	222	297	6.80	1 / 26	14.21	**18.86**	0.077	38.45	-19.59	**21.01**	0.126	40.61	-19.60
		836.5	H	218	291	6.68	1 / 26	14.22	18.74	0.075	38.45	-19.71	20.89	0.123	40.61	-19.71
		844.0	H	220	288	6.66	1 / 26	14.05	18.55	0.072	38.45	-19.90	20.70	0.118	40.61	-19.90
	QPSK	829.0	H	222	297	6.80	1 / 26	14.16	18.81	0.076	38.45	-19.64	**20.96**	0.125	40.61	-19.64
		836.5	H	218	291	6.68	1 / 26	13.95	18.48	0.070	38.45	-19.98	20.63	0.115	40.61	-19.98
		844.0	H	220	288	6.66	1 / 26	13.93	18.43	0.070	38.45	-20.02	20.58	0.114	40.61	-20.02
	16-QAM	829.0	H	222	297	6.80	1 / 26	12.92	17.57	0.057	38.45	-20.88	**19.72**	0.094	40.61	-20.89
5 MHz	π/2 BPSK	829.0	H	222	297	6.77	1 / 12	14.24	**18.86**	0.077	38.45	-19.59	**21.01**	0.126	40.61	-19.60
		836.5	H	218	291	6.68	1 / 12	14.32	18.85	0.077	38.45	-19.60	21.00	0.126	40.61	-19.61
		844.0	H	220	288	6.68	1 / 12	14.01	18.54	0.072	38.45	-19.91	20.69	0.117	40.61	-19.91
	QPSK	829.0	H	222	297	6.77	1 / 12	13.97	18.59	0.072	38.45	-19.86	**20.74**	0.119	40.61	-19.86
		836.5	H	218	291	6.68	1 / 12	13.92	18.45	0.070	38.45	-20.00	20.60	0.115	40.61	-20.00
		844.0	H	220	288	6.68	1 / 12	13.94	18.47	0.070	38.45	-19.98	20.62	0.115	40.61	-19.99
	16-QAM	829.0	H	222	297	6.77	1 / 12	12.77	17.40	0.055	38.45	-21.06	**19.55**	0.090	40.61	-21.06
20 MHz	QPSK (CP-OFDM)	834.0	H	222	297	6.70	1 / 26	12.38	16.93	0.049	38.45	-21.52	19.08	0.081	40.61	-21.52
	QPSK (Closed)	834.0	H	225	7	6.70	1 / 26	8.30	12.85	0.019	38.45	-25.60	15.00	0.032	40.61	-25.60
	QPSK (Opposite Pol.)	834.0	V	142	264	6.40	1 / 26	14.06	18.31	0.068	38.45	-20.14	20.46	0.111	40.61	-20.14
	QPSK (WCP)	834.0	V	140	344	6.40	1 / 26	8.19	12.44	0.018	38.45	-26.01	14.59	0.029	40.61	-26.01

Table 7-3. ERP Data (NR Band n5)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.20	GSM850	V	112	245	17.18	6.35	21.38	0.137	38.45	-17.07	23.53	0.225	40.61	-17.08
836.60	GSM850	V	144	285	21.12	6.38	**25.35**	**0.343**	38.45	-13.10	**27.50**	**0.562**	40.61	-13.11
848.80	GSM850	V	139	284	19.35	6.51	23.71	0.235	38.45	-14.75	25.86	0.385	40.61	-14.75
836.60	GSM850	H	208	290	19.73	6.68	**24.26**	**0.267**	38.45	-14.19	**26.41**	**0.437**	40.61	-14.20
836.60	EDGE850	V	144	285	15.74	6.38	19.97	0.099	38.45	-18.48	22.12	0.163	40.61	-18.49
836.60	GSM850 (Closed)	H	199	70	17.36	6.68	**21.89**	**0.155**	38.45	-16.56	**24.04**	**0.253**	40.61	-16.57
836.60	GSM850 (WCP)	V	101	311	12.52	6.38	16.75	0.047	38.45	-21.70	18.90	0.078	40.61	-21.71

Table 7-4. ERP Data (GPRS Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	V	135	255	14.42	6.37	18.64	0.073	38.45	-19.81	20.79	0.120	40.61	-19.81
836.60	WCDMA850	V	143	251	14.73	6.38	18.96	0.079	38.45	-19.49	21.11	0.129	40.61	-19.50
846.60	WCDMA850	V	145	282	15.23	6.48	**19.56**	**0.090**	38.45	-18.89	**21.71**	**0.148**	40.61	-18.89
846.60	WCDMA850	H	194	46	10.85	6.68	**15.38**	**0.035**	38.45	-23.07	**17.53**	**0.057**	40.61	-23.07
846.60	WCDMA850 (Closed)	H	195	227	10.51	6.68	15.04	0.032	38.45	-23.41	17.19	0.052	40.61	-23.41
846.60	WCDMA850 (WCP)	V	149	266	8.67	6.48	13.00	0.020	38.45	-25.45	15.15	0.033	40.61	-25.45

Table 7-5. ERP Data (WCDMA Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	CDMA850	V	154	296	14.99	6.36	19.20	0.083	38.45	-19.26	21.35	0.136	40.61	-19.26
836.52	CDMA850	V	139	282	15.07	6.38	19.30	0.085	38.45	-19.15	21.45	0.140	40.61	-19.16
848.31	CDMA850	V	154	278	15.12	6.50	**19.47**	**0.089**	38.45	-18.98	**21.62**	**0.145**	40.61	-18.99
848.31	CDMA850	H	205	295	13.66	6.50	**18.01**	**0.063**	38.45	-20.44	**20.16**	**0.104**	40.61	-20.45
848.31	CDMA850 (Closed)	H	146	114	9.08	6.50	13.43	0.022	38.45	-25.02	15.58	0.036	40.61	-25.03
848.31	CDMA850 (WCP)	V	135	286	8.93	6.50	13.28	0.021	38.45	-25.17	15.43	0.035	40.61	-25.18

Table 7-6. ERP Data (CDMA Cell)

7.6 Uplink Carrier Aggregation

§22.917(a)

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers 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.

For Band 5, the minimum permissible attenuation level of any spurious emission is 43 + 10 log10(P[Watts]).

Test Procedure Used

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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 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.

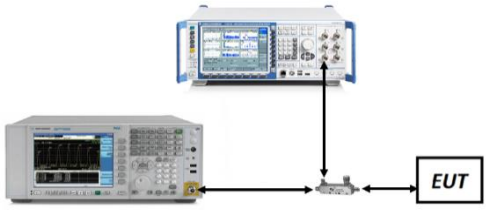


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

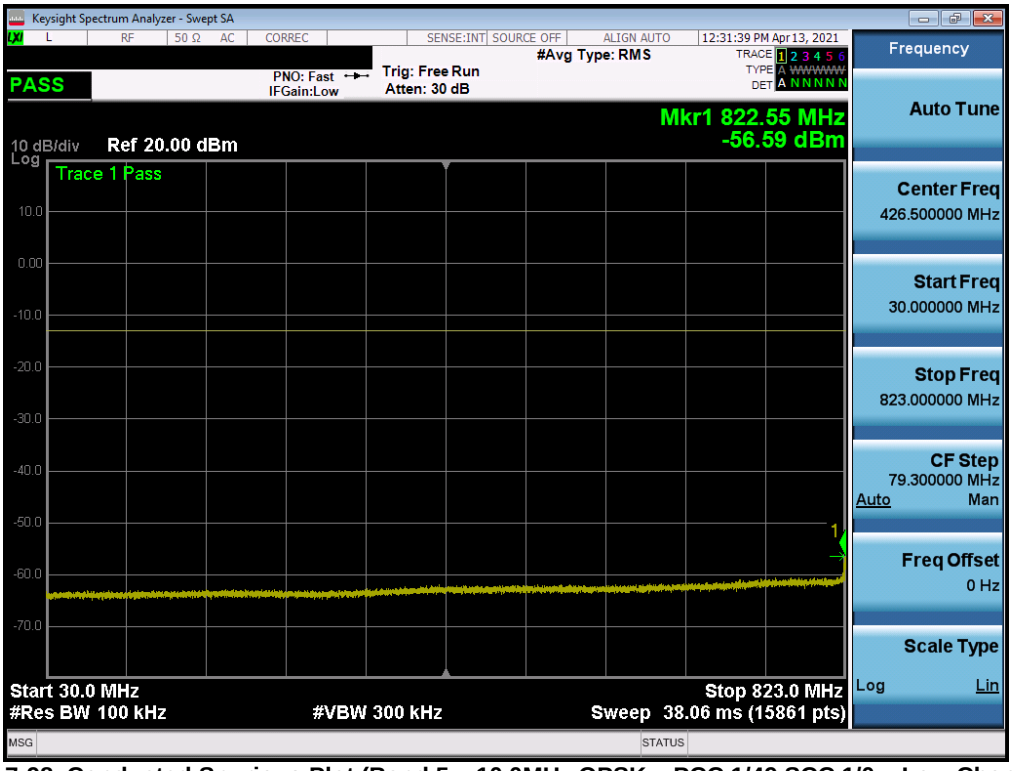
1. Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation with both carriers set to transmit using 1RB.

2. 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.

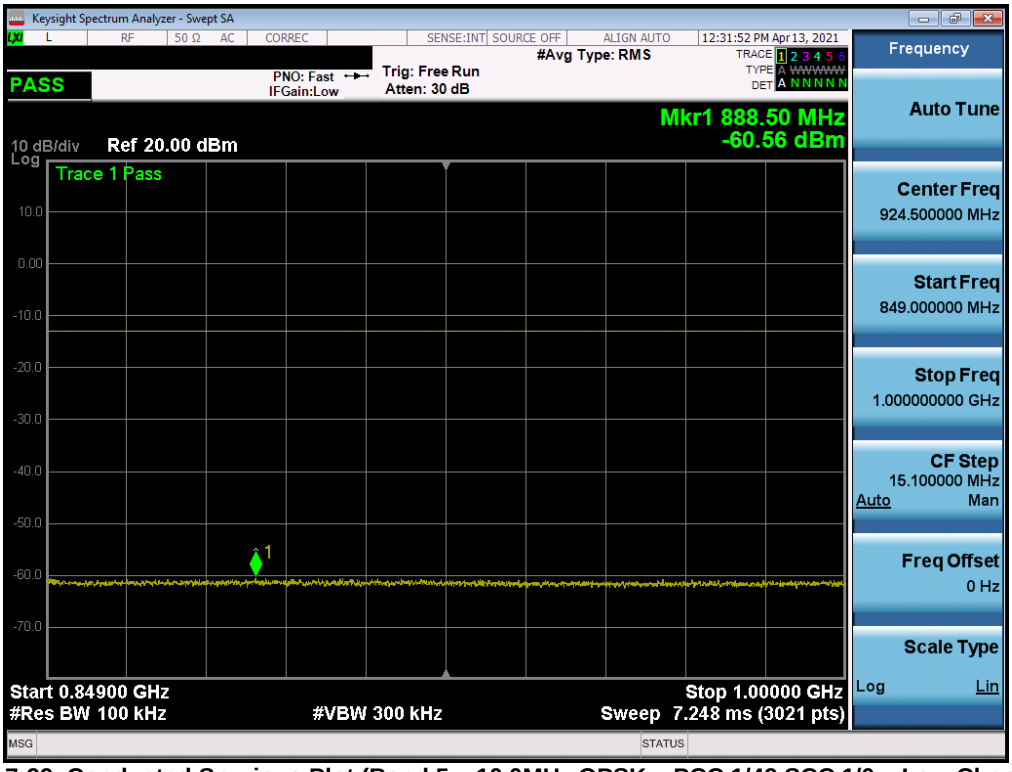
Uplink CA Configuration 5B

Power State	Band	Bandwidth (PCC + SCC)	PCC					SCC					ULCA Tx. Power [dBm]
			Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	
Max	LTE B5	10MHz + 10MHz	QPSK	20450	829.0	1	49	QPSK	20549	838.9	1	0	24.71
				20475	831.5	1	49		20574	841.4	1	0	24.74
				20600	844.0	1	0		20501	834.1	1	49	24.76
			QPSK	20600	844	50	0	QPSK	20501	834.1	50	0	22.85
			16-QAM	20600	844	50	0	16-QAM	20501	834.1	50	0	21.92
			64-QAM	20600	844	50	0	64-QAM	20501	834.1	50	0	21.85
			256-QAM	20600	844	50	0	256-QAM	20501	834.1	50	0	19.86

Table 7-7. Conducted Power Output Data (ULCA LTE Band 5)

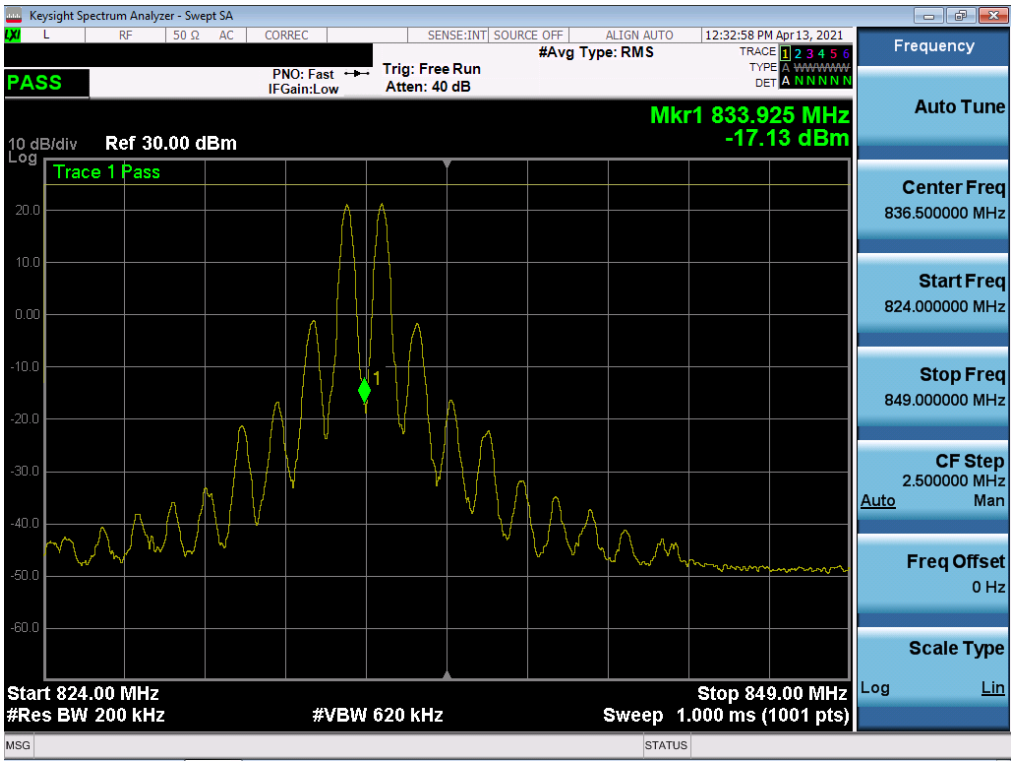


Plot 7-98. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/49 SCC 1/0 – Low Channel)

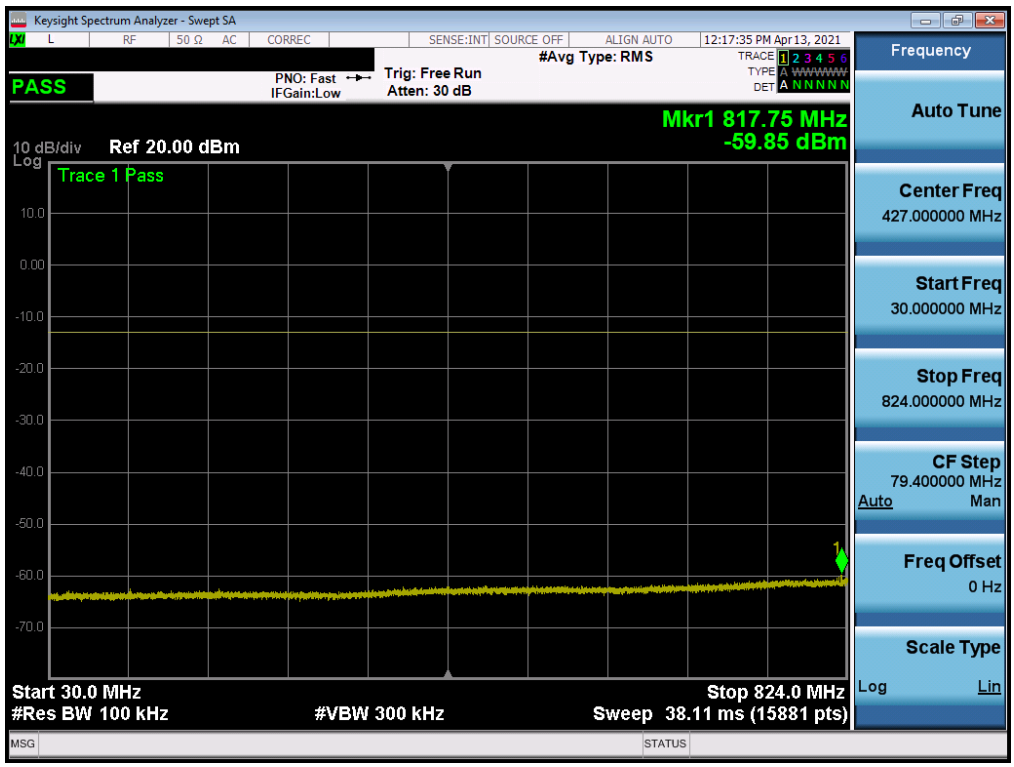


Plot 7-99. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/49 SCC 1/0 – Low Channel)

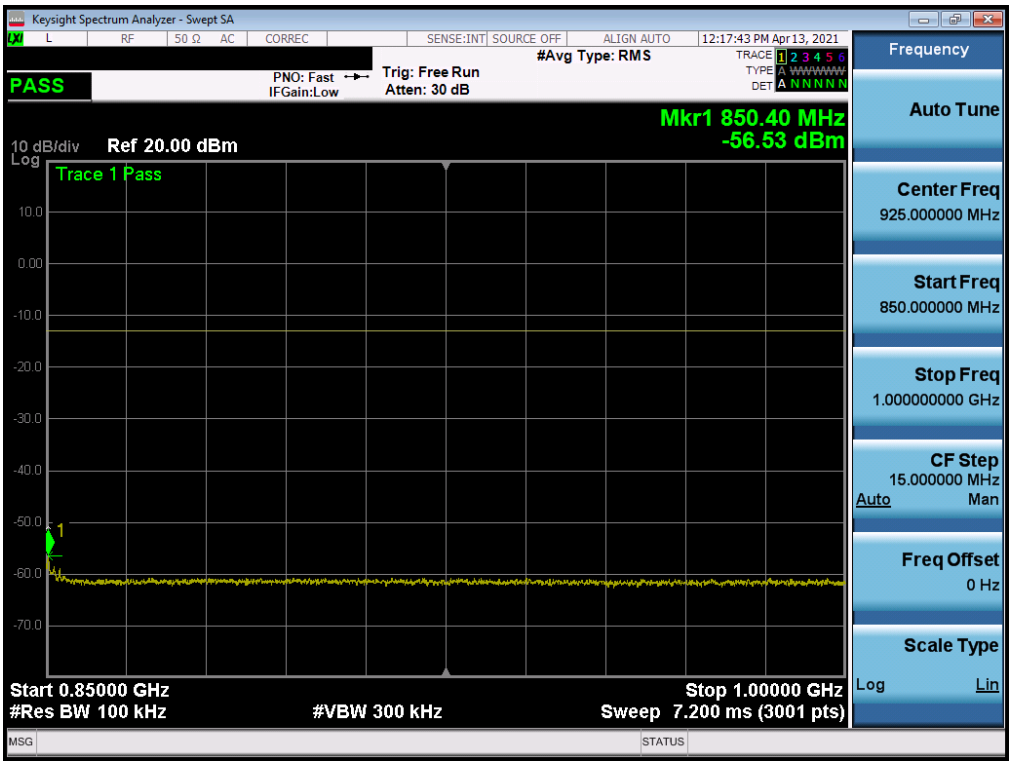
Plot 7-100. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/49 SCC 1/0 – Low Channel)



Plot 7-101. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/49 SCC 1/0 – Low Channel)



Plot 7-102. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/0 SCC 1/49 – High Channel)



Plot 7-103. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/0 SCC 1/49 – High Channel)

Plot 7-104. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – PCC 1/0 SCC 1/49 – High Channel)