PCTEST
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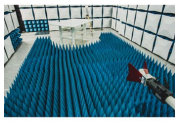

MEASUREMENT REPORT
FCC Part 90

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

Date of Testing:
9/23 – 11/20/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2009230152-04.A3L

FCC ID:	**A3LSMG998U**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-G998U
Additional Model(s):	SM-G998U1
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	§2.1049, §90
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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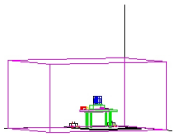
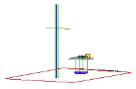


MEASUREMENT REPORT
FCC Part 22 & 90



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
LTE Band 26	15 MHz	QPSK	821.5	ERP	0.060	17.81	13M4G7D
		16QAM	821.5	ERP	0.048	16.84	13M4W7D
		64QAM	821.5	ERP	0.039	15.92	13M4W7D
		256QAM	821.5	ERP	0.026	14.20	13M4W7D
	15 MHz	QPSK	821.5	Conducted	0.336	25.26	13M4G7D
		16QAM	821.5	Conducted	0.256	24.09	13M4W7D
		64QAM	821.5	Conducted	0.223	23.48	13M4W7D
		256QAM	821.5	Conducted	0.106	20.25	13M4W7D
	10 MHz	QPSK	819.0	Conducted	0.324	25.10	8M99G7D
		16QAM	819.0	Conducted	0.265	24.23	8M94W7D
		64QAM	819.0	Conducted	0.222	23.46	8M97W7D
		256QAM	819.0	Conducted	0.100	20.02	8M95W7D
	5 MHz	QPSK	816.5 - 821.5	Conducted	0.339	25.30	4M49G7D
		16QAM	816.5 - 821.5	Conducted	0.296	24.72	4M48W7D
		64QAM	816.5 - 821.5	Conducted	0.225	23.52	4M49W7D
		256QAM	816.5 - 821.5	Conducted	0.109	20.37	4M48W7D
	3 MHz	QPSK	815.5 - 822.5	Conducted	0.330	25.18	2M69G7D
		16QAM	815.5 - 822.5	Conducted	0.272	24.35	2M70W7D
		64QAM	815.5 - 822.5	Conducted	0.226	23.54	2M69W7D
		256QAM	815.5 - 822.5	Conducted	0.111	20.44	2M69W7D
	1.4 MHz	QPSK	814.7 - 823.3	Conducted	0.329	25.17	1M08G7D
		16QAM	814.7 - 823.3	Conducted	0.267	24.27	1M09W7D
		64QAM	814.7 - 823.3	Conducted	0.222	23.47	1M08W7D
		256QAM	814.7 - 823.3	Conducted	0.104	20.17	1M08W7D
LTE Band 14	10 MHz	QPSK	793.0	ERP	0.101	20.02	9M03G7D
		16QAM	793.0	ERP	0.077	18.88	8M96W7D
		64QAM	793.0	ERP	0.067	18.23	9M01W7D
		256QAM	793.0	ERP	0.042	16.20	9M00W7D
	5 MHz	QPSK	790.5 - 795.5	ERP	0.100	20.00	4M53G7D
		16QAM	790.5 - 795.5	ERP	0.075	18.74	4M51W7D
		64QAM	790.5 - 795.5	ERP	0.063	18.02	4M52W7D
		256QAM	790.5 - 795.5	ERP	0.043	16.31	4M50W7D
CDMA BC10	N/A	CDMA	817.9 - 823.1	Conducted	0.283	24.52	1M27F9W

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

1.3 Test Facility / Accreditations

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

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

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

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG998U**. 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 and 90.

Test Device Serial No.: 0788M, 0722M, 0695M, 0706M, 0707M, 0752M, 0705M, 0144M

2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n5, n71, n41, n66, n2, n12, n25, n30, n77, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

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" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

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.

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

3.2 Radiated Power and Radiated Spurious Emissions

§2.1053

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

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

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

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

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

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.

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

4.0 MEASUREMENT UNCERTAINTY

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

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

5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx4	Licensed Transmitter Cable Set	7/9/2020	Annual	7/9/2021	LTx4
-	LTx5	LIcensed Transmitter Cable Set	4/9/2020	Annual	4/6/2021	LTx5
Agilent	N9020A	MXA Signal Analyzer	8/4/2020	Annual	8/4/2021	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	7/17/2020	Annual	7/17/2021	MY52350166
Anritsu	MT8820C	Radio Communication Analyzer	N/A			6201300731
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
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			836371/0079
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 5-1. Summary of Test Results

Notes:

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

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

6.0 SAMPLE CALCULATIONS

Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

Spurious Radiated Emission – BC10

Example: Channel 476 CDMA BC10 Mode 3rd Harmonic (2453.70MHz)

The average spectrum analzyer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 2453.70 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc.

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

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

QAM Modulation

Emission Designator = 8M45W7D

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

Spurious Radiated Emission – LTE Band

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

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

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMG998U

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

Mode(s): CDMA / LTE

Band: Band Class 10 / Band 26 / Band 14

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions (LTE Band 14)	2.1051, 90.691(a)	On all frequencies between 769-775 MHz and 799-805 MHz, attenuation by a factor not less than 65 + 10 log(P) dB in a 6.25 kHz band segment, for mobile and portable stations. On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, attenuation by at least 43 + 10 log(P) dB	PASS	Sections 7.3, 7.4
	Conducted Band Edge / Spurious Emissions (LTE Band 26)	2.1051, 90.543(a)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions except > 50 + 10 log10 (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	PASS	Sections 7.3, 7.4
	Conducted Band Edge / Spurious Emissions (CDMA BC10)			PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 90.213	< 2.5 ppm	PASS	Section 7.8
	Conducted Power	2.1046, 90.635	< 100 Watts	PASS	Section 7.5
RADIATED	Effective Radiated Power (LTE Band 14)	90.542(a)(7)	< 3 Watts max. ERP	PASS	Section 7.6
	Effective Radiated Power (LTE Band 26)	22.913(a.2)	< 7 Watts max. ERP	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 14)	2.1053, 90.543(e)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions except emissions in the 1559 - 1610MHz band are subject to a limit of -40dBm/MHz for wideband signals	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 26)	2.1053, 90.543(e)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions except > 50 + 10 log10 (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	PASS	Section 7.7
	Radiated Spurious Emissions (CDMA BC10)			PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "2G/3G Automation," Version 4.5.
5) For LTE B14 conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version.5.3.

7.2 Occupied Bandwidth

§2.1049

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.

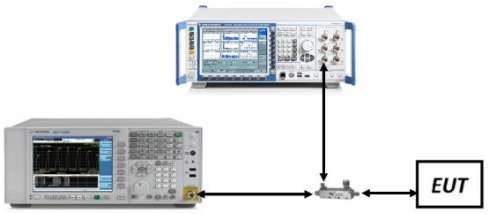
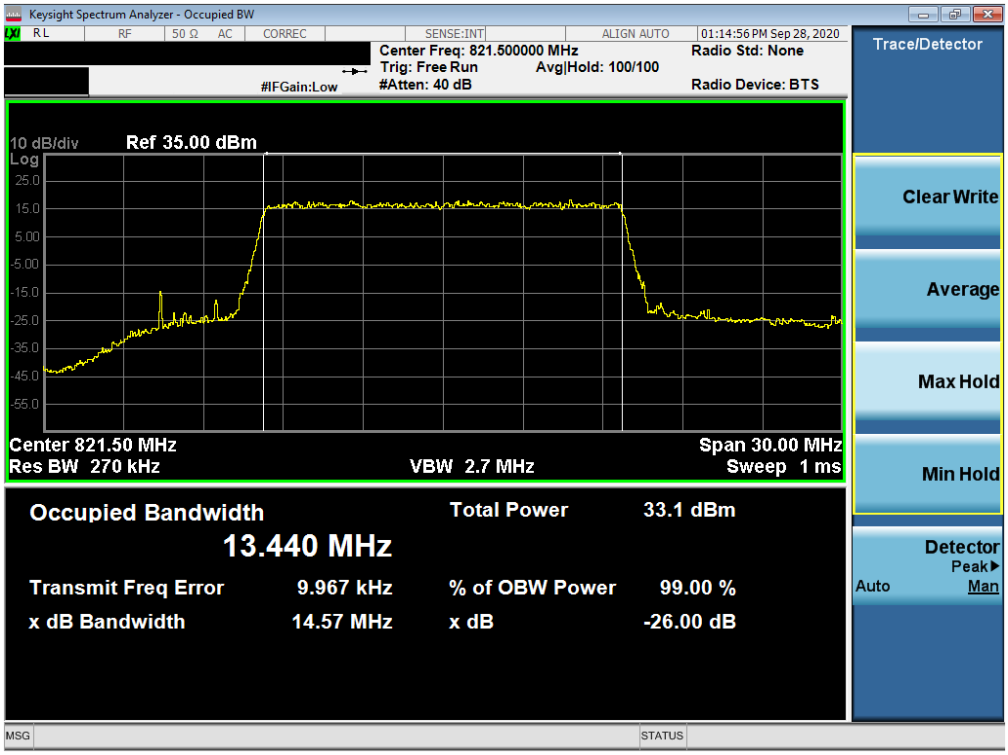


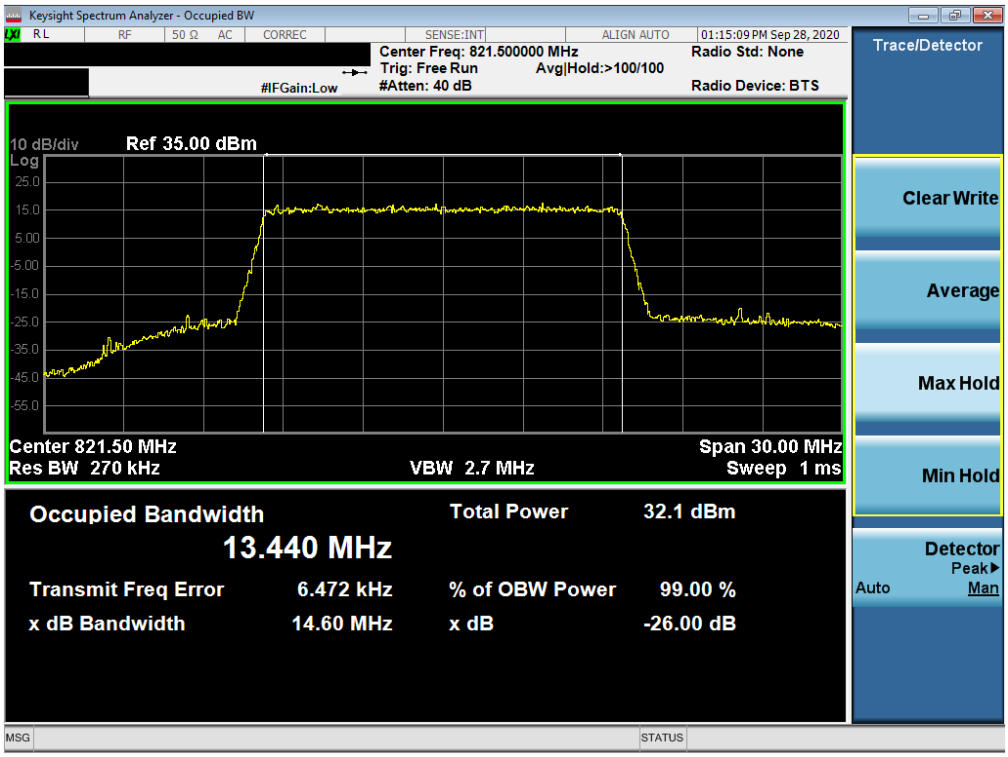
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

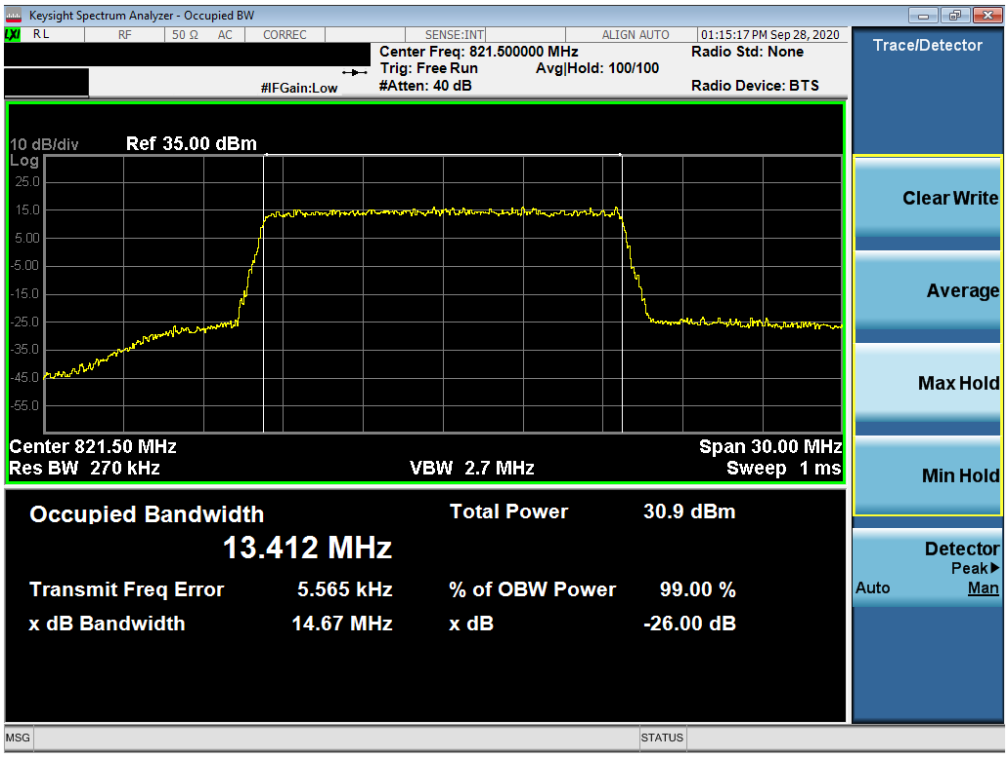
None.



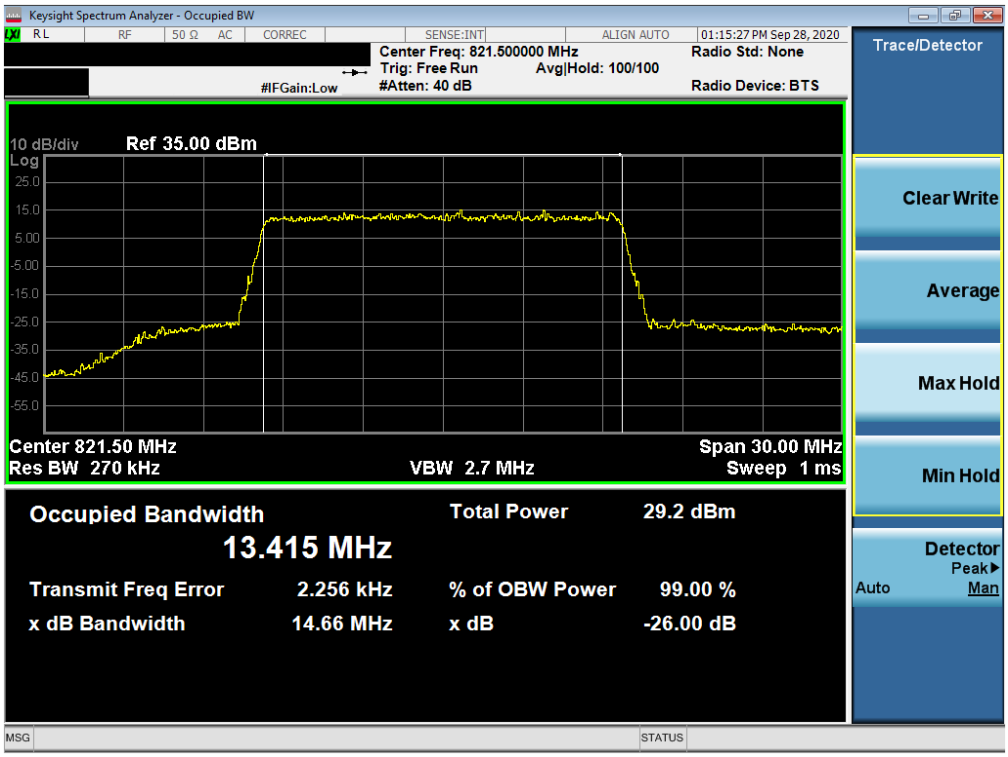
Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB Configuration)



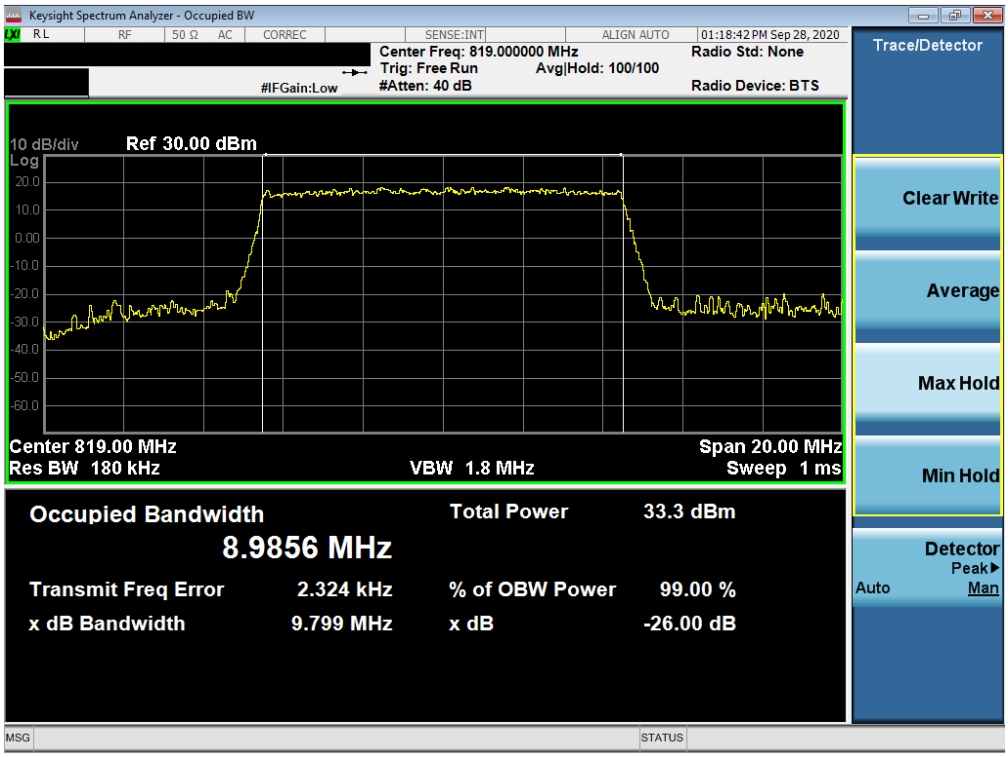
Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB Configuration)



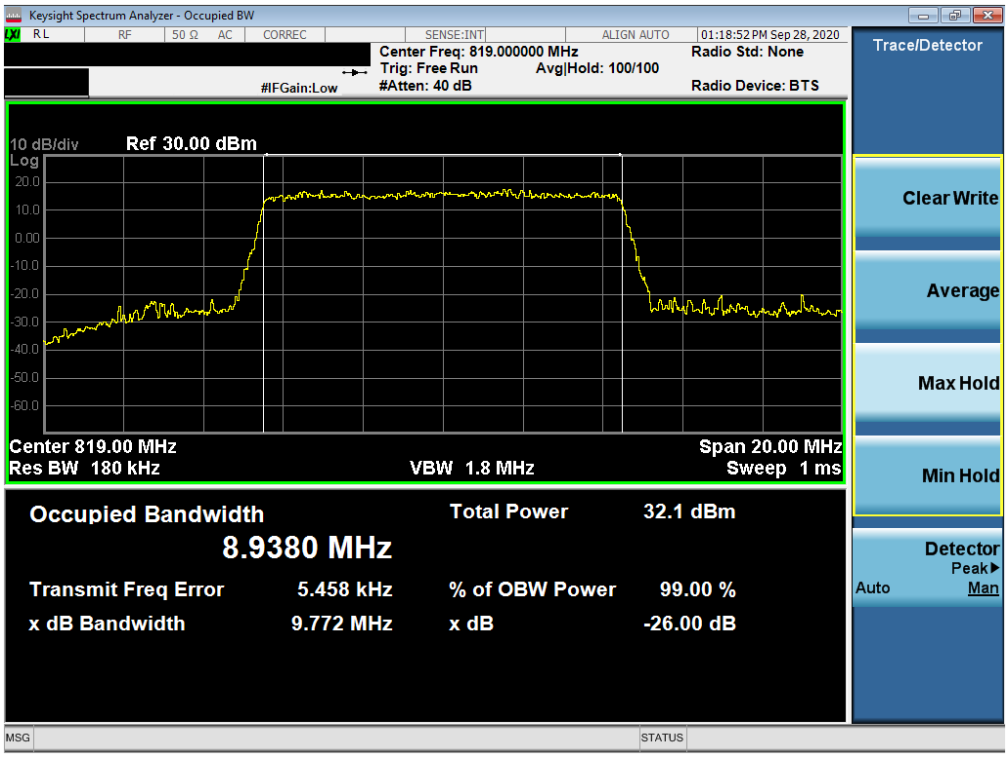
Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 64-QAM - Full RB Configuration)



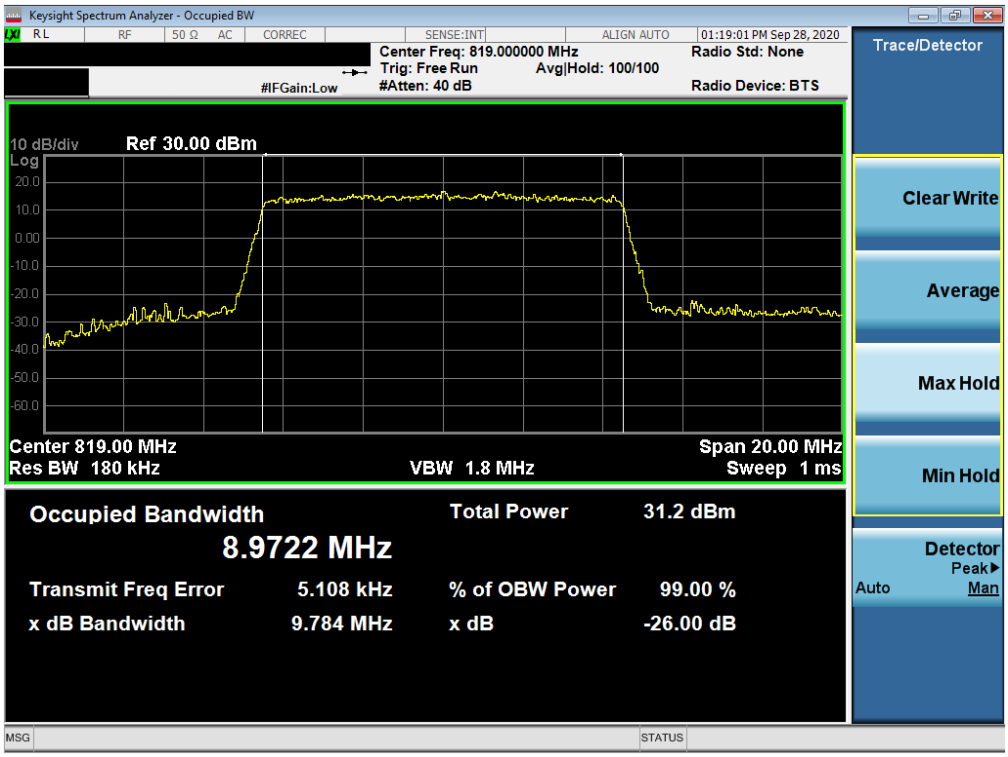
Plot 7-4. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 256-QAM - Full RB Configuration)



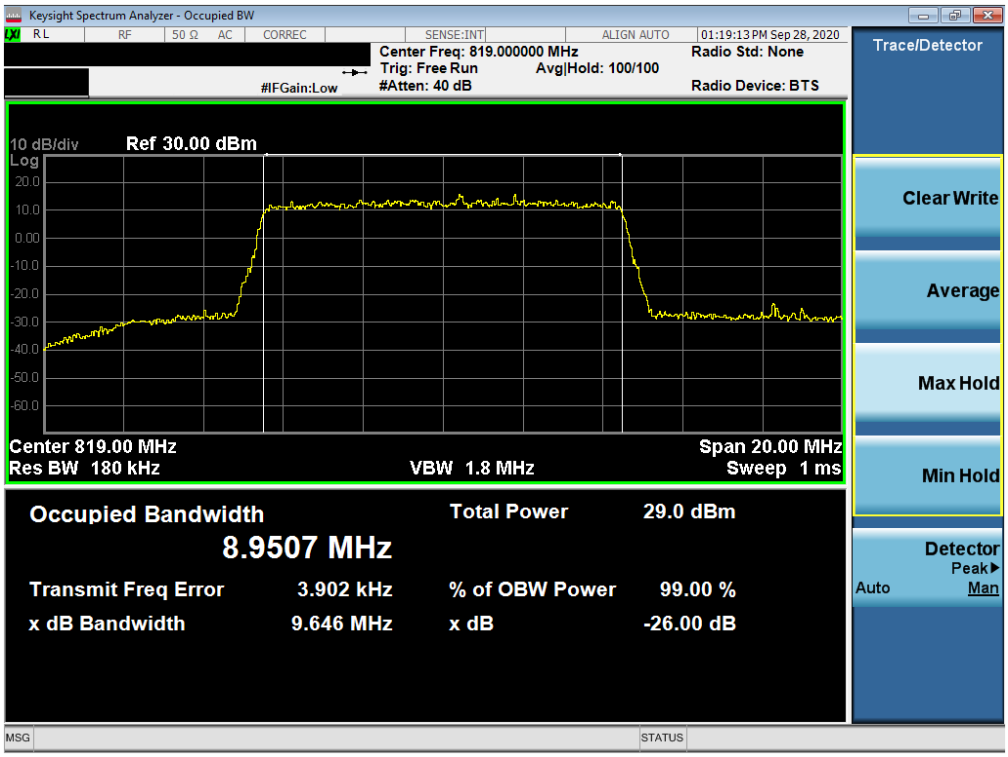
Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 10MHz QPSK - Full RB Configuration)



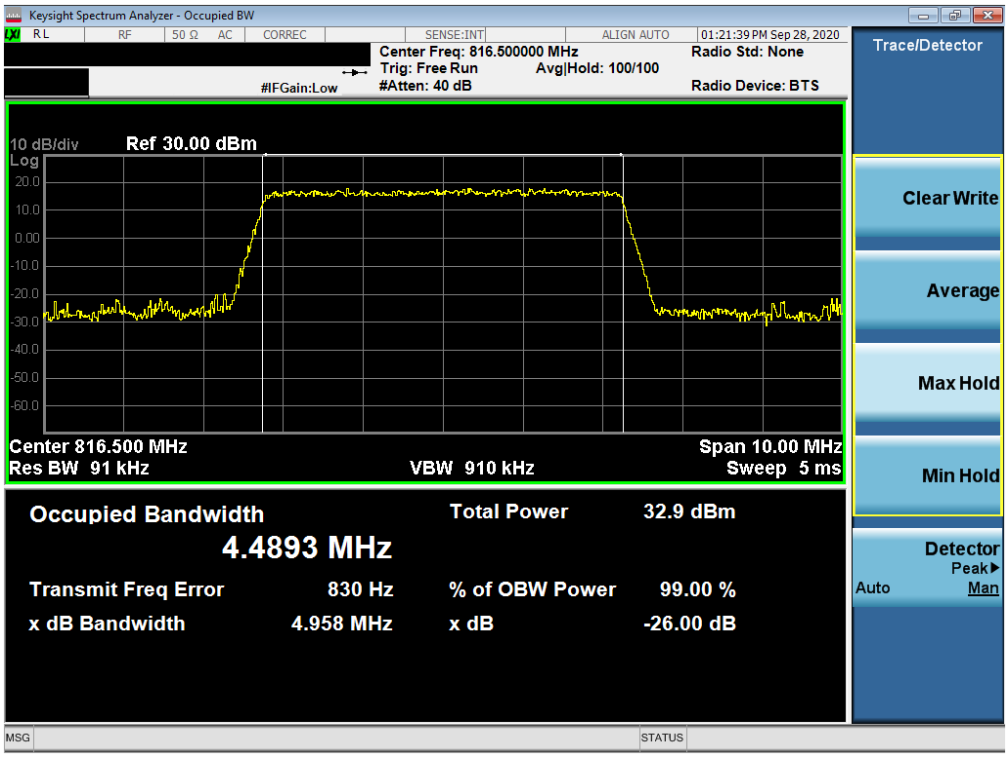
Plot 7-6. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB Configuration)



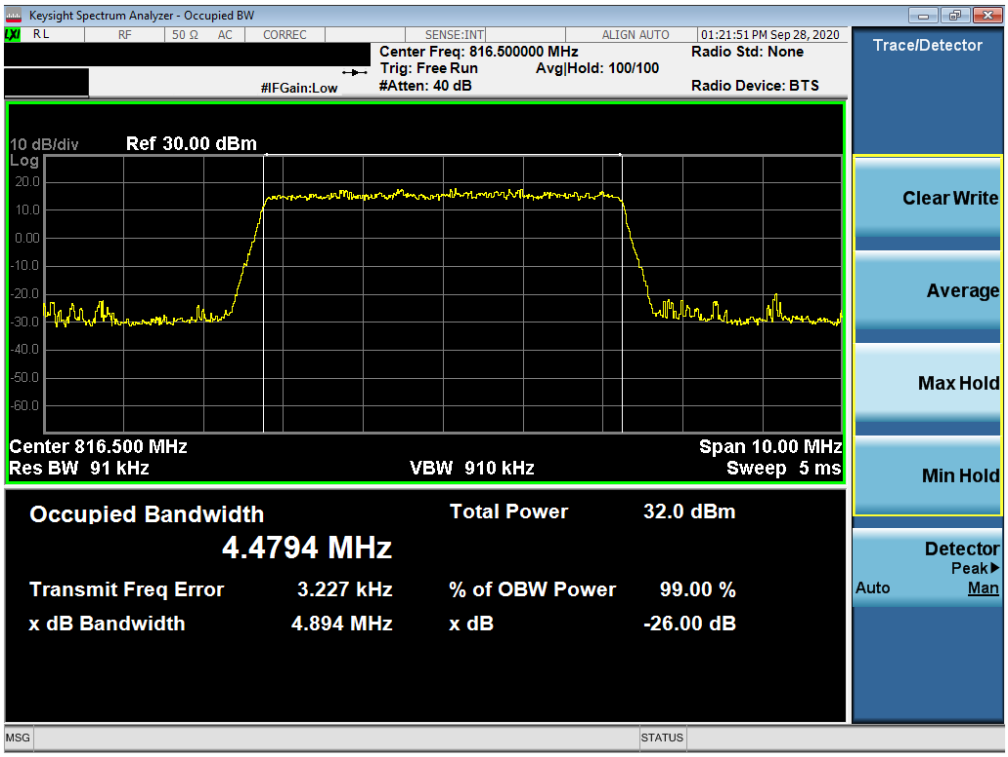
Plot 7-7. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 64-QAM - Full RB Configuration)



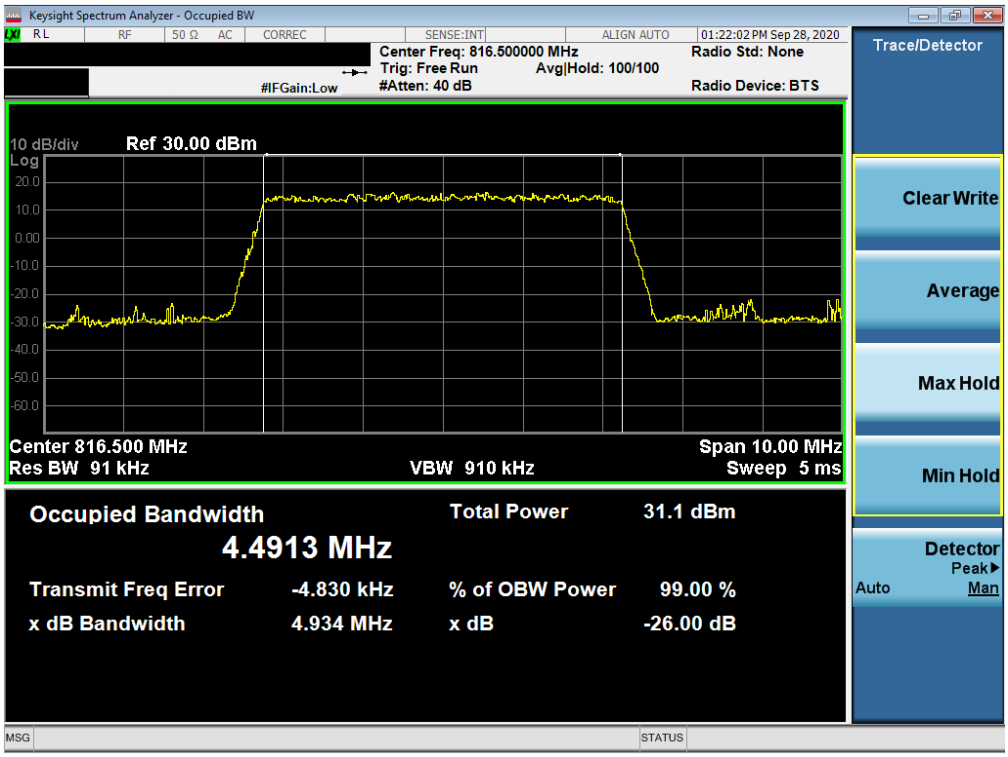
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 256-QAM - Full RB Configuration)



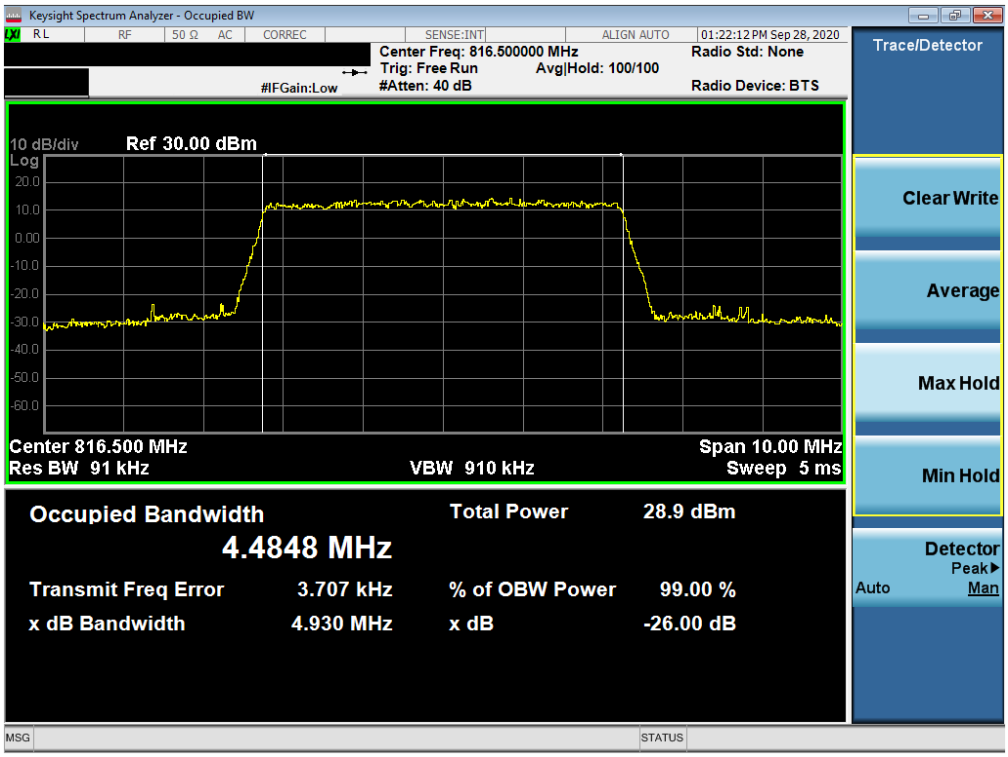
Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 5MHz QPSK - Full RB Configuration)



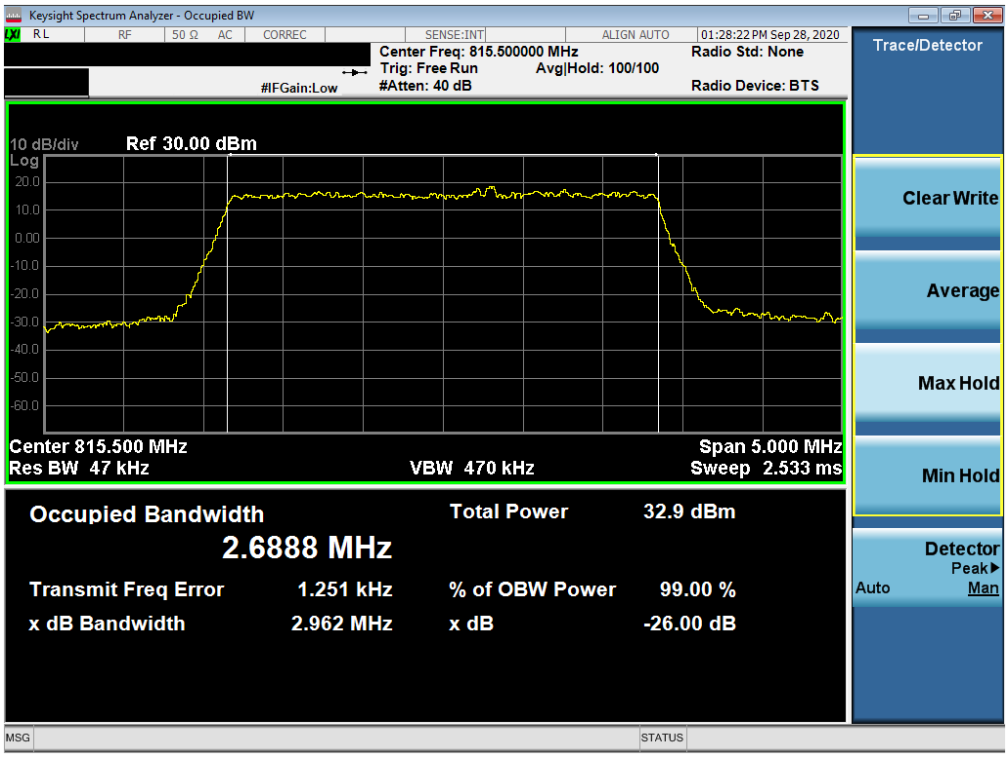
Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 16-QAM - Full RB Configuration)



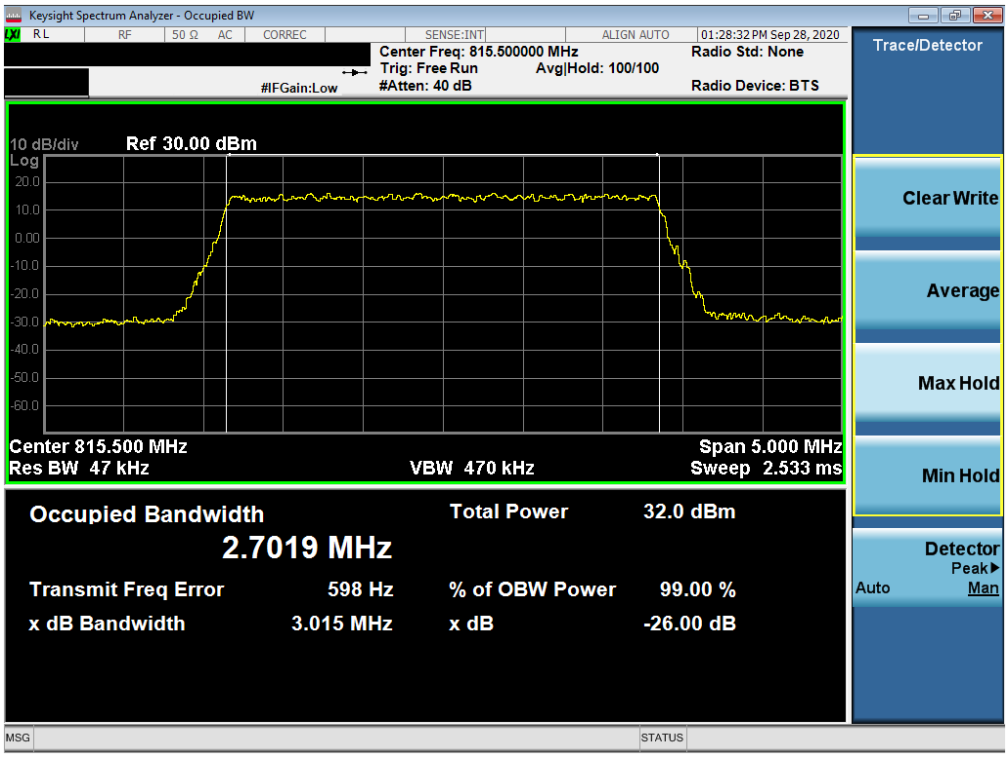
Plot 7-11. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 64-QAM - Full RB Configuration)



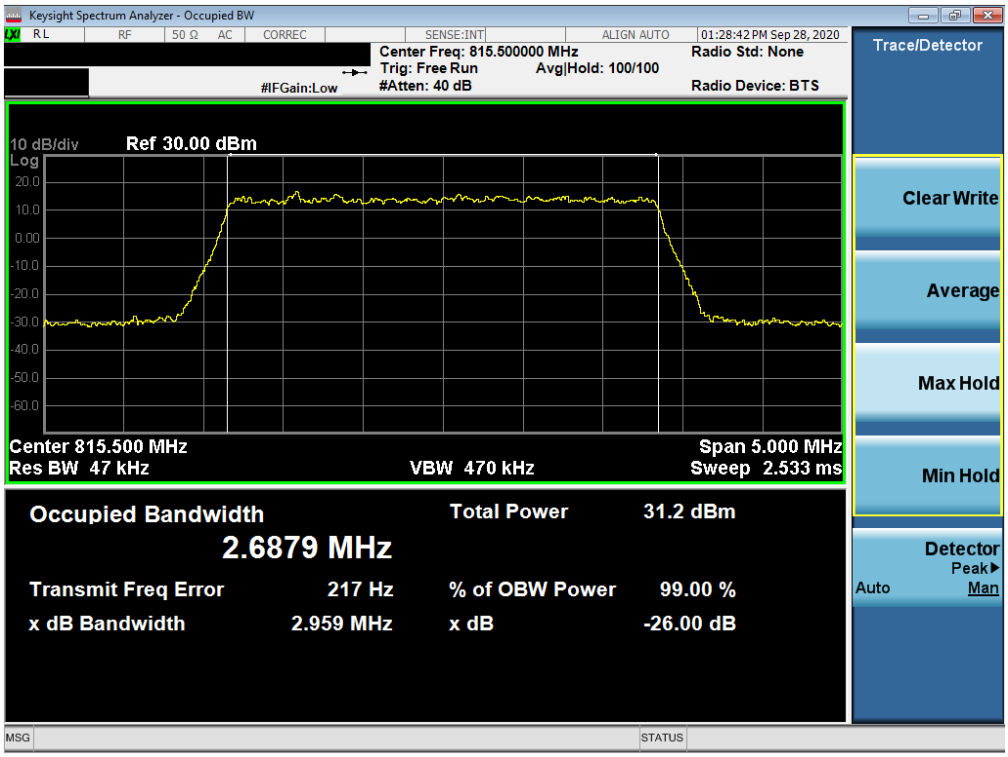
Plot 7-12. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 256-QAM - Full RB Configuration)



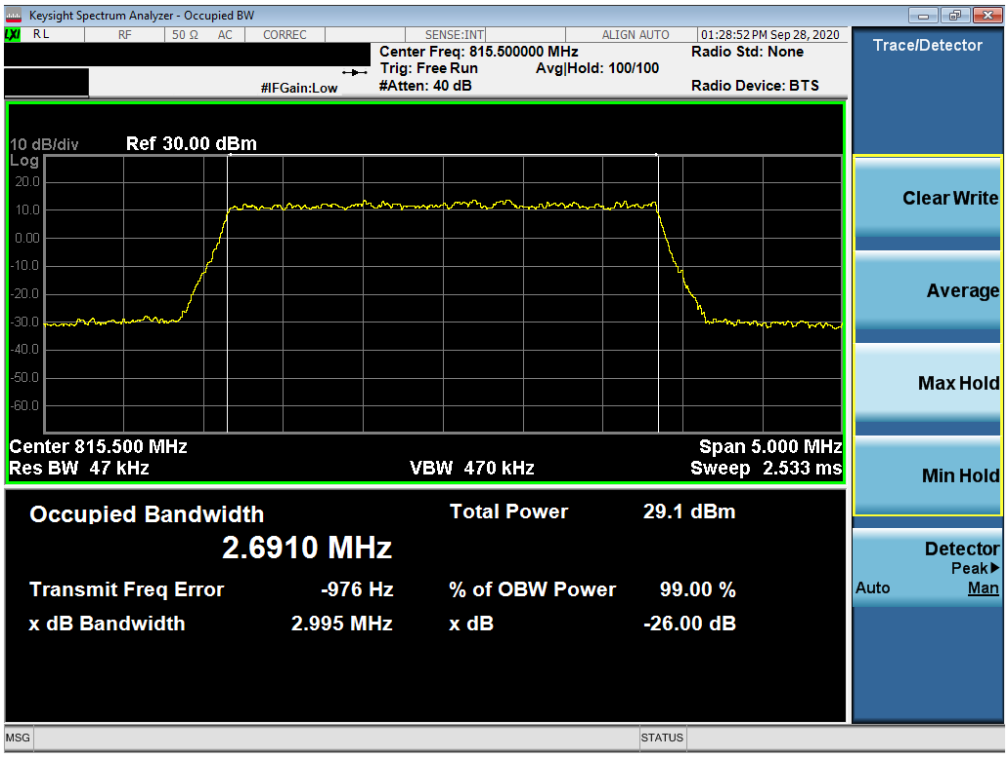
Plot 7-13. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB Configuration)



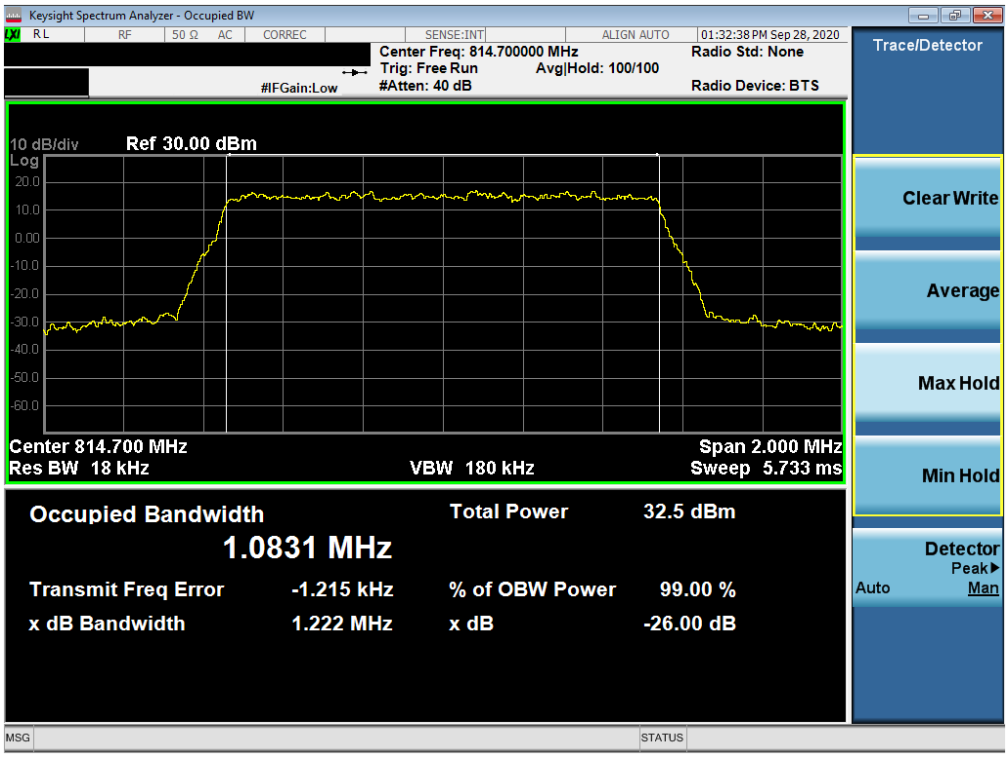
Plot 7-14. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 16-QAM - Full RB Configuration)



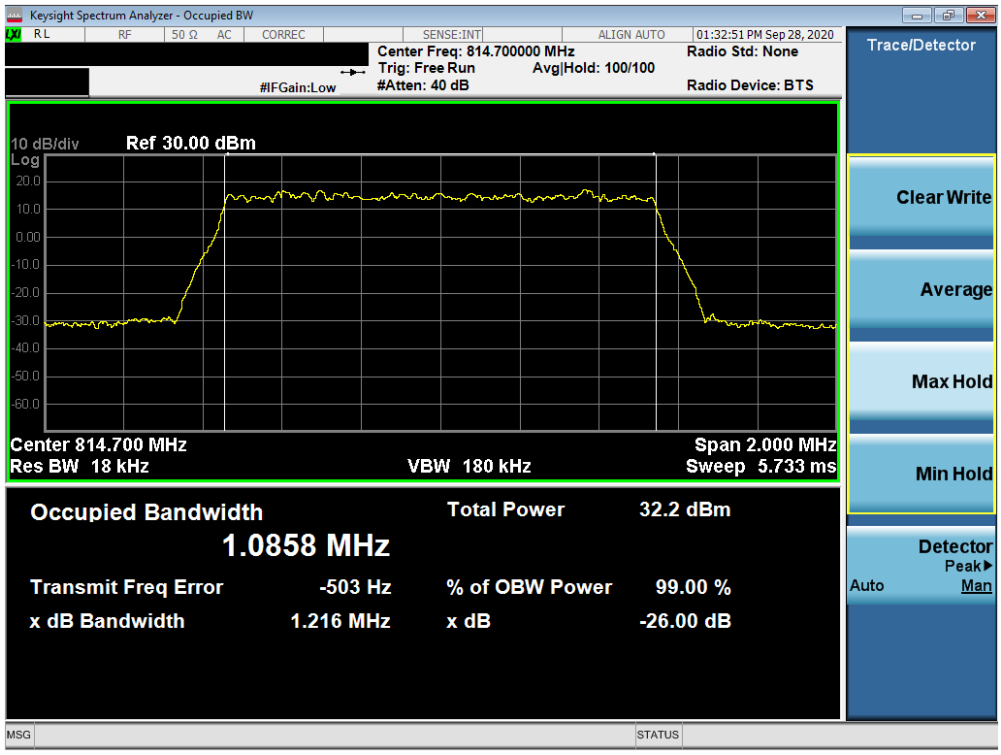
Plot 7-15. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 64-QAM - Full RB Configuration)



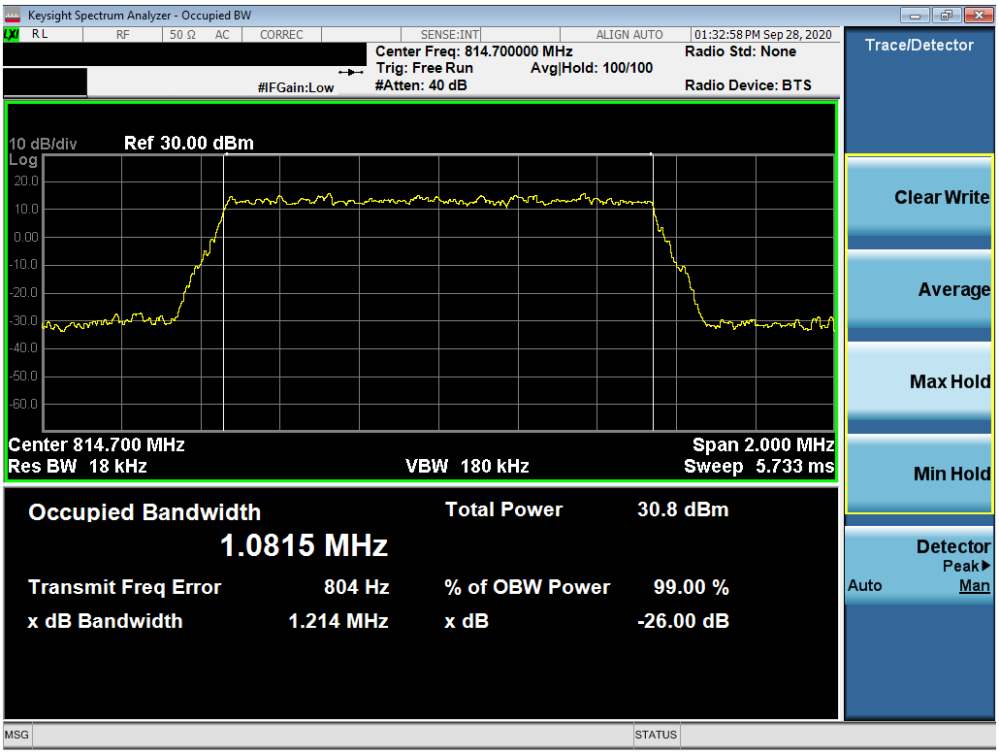
Plot 7-16. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 256-QAM - Full RB Configuration)



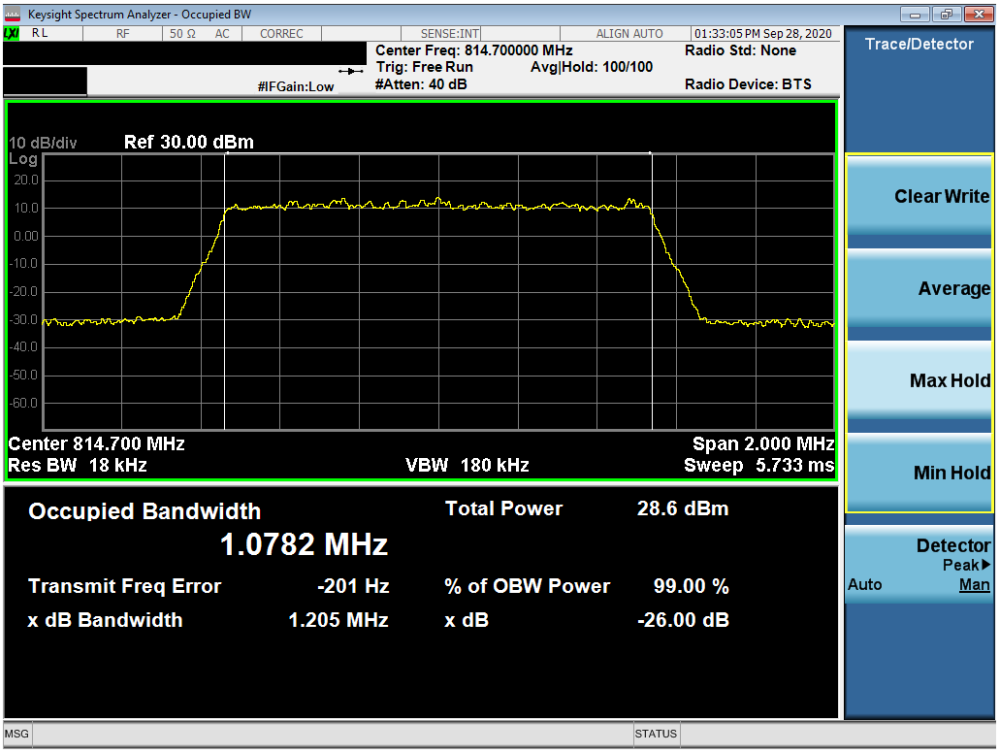
Plot 7-17. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB Configuration)



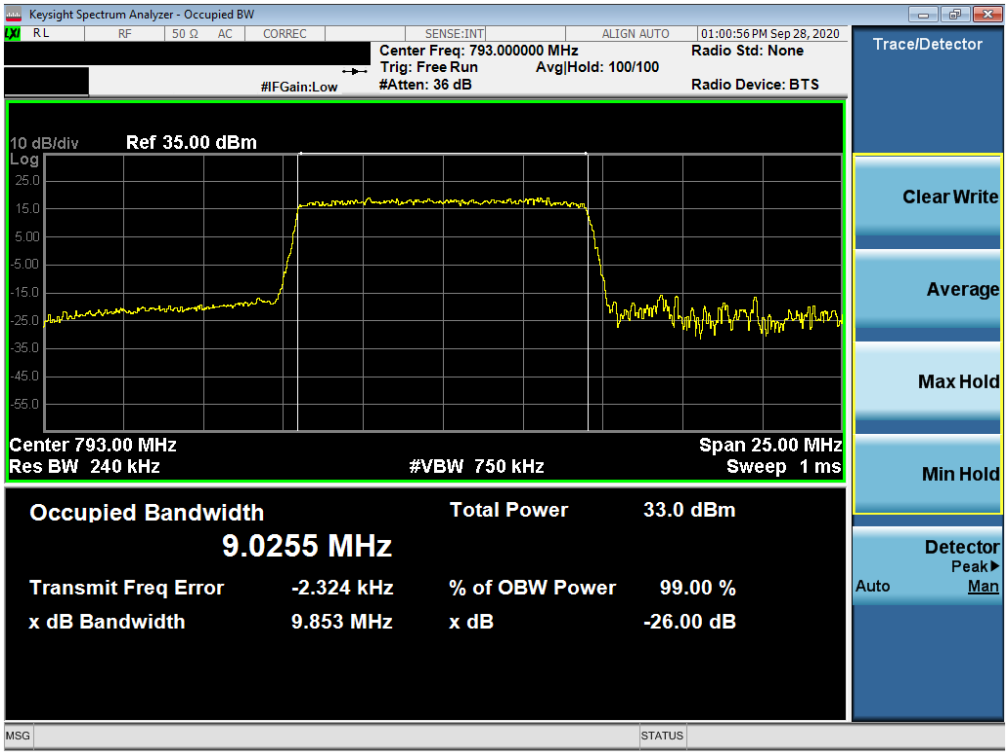
Plot 7-18. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB Configuration)



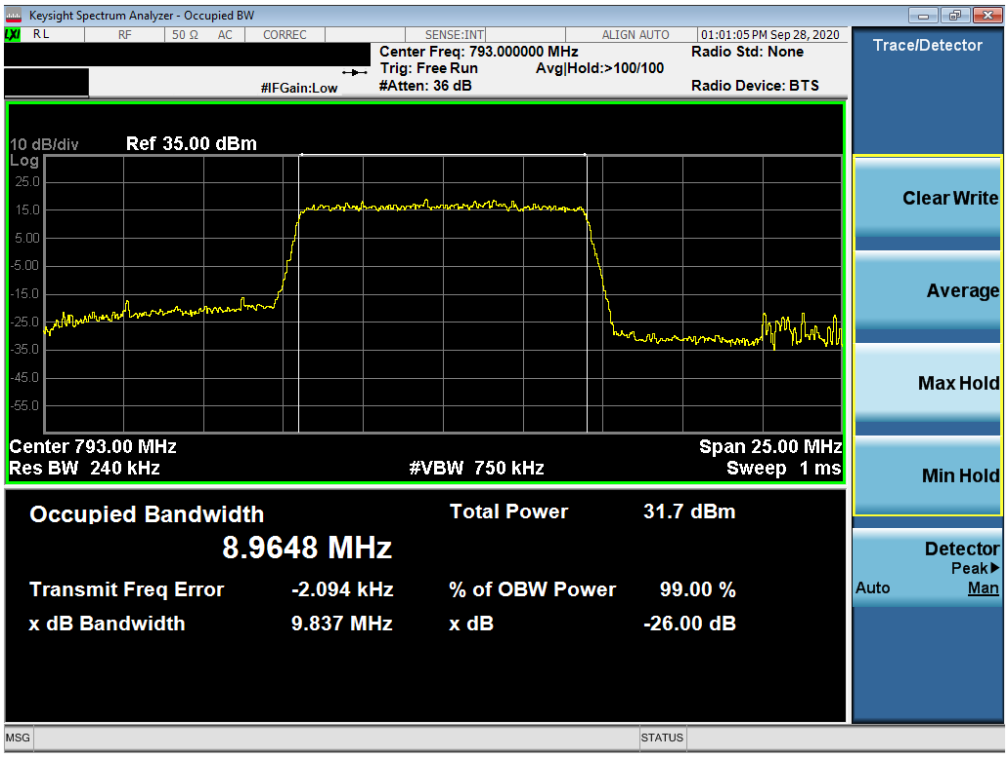
Plot 7-19. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 64-QAM - Full RB Configuration)



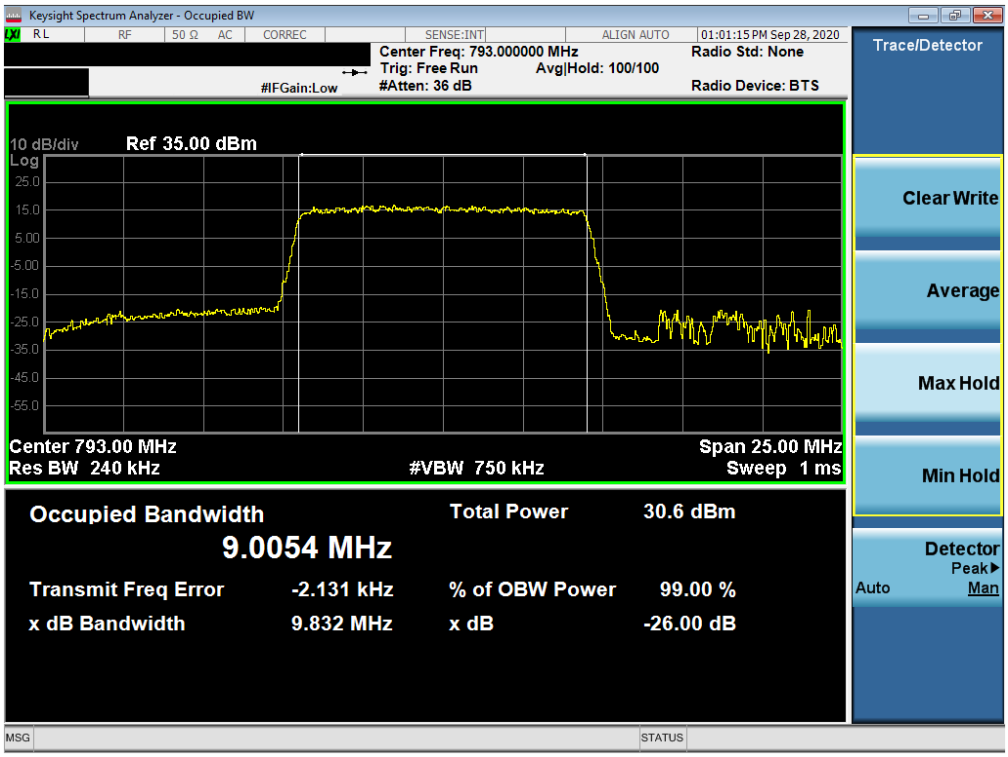
Plot 7-20. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 256-QAM - Full RB Configuration)



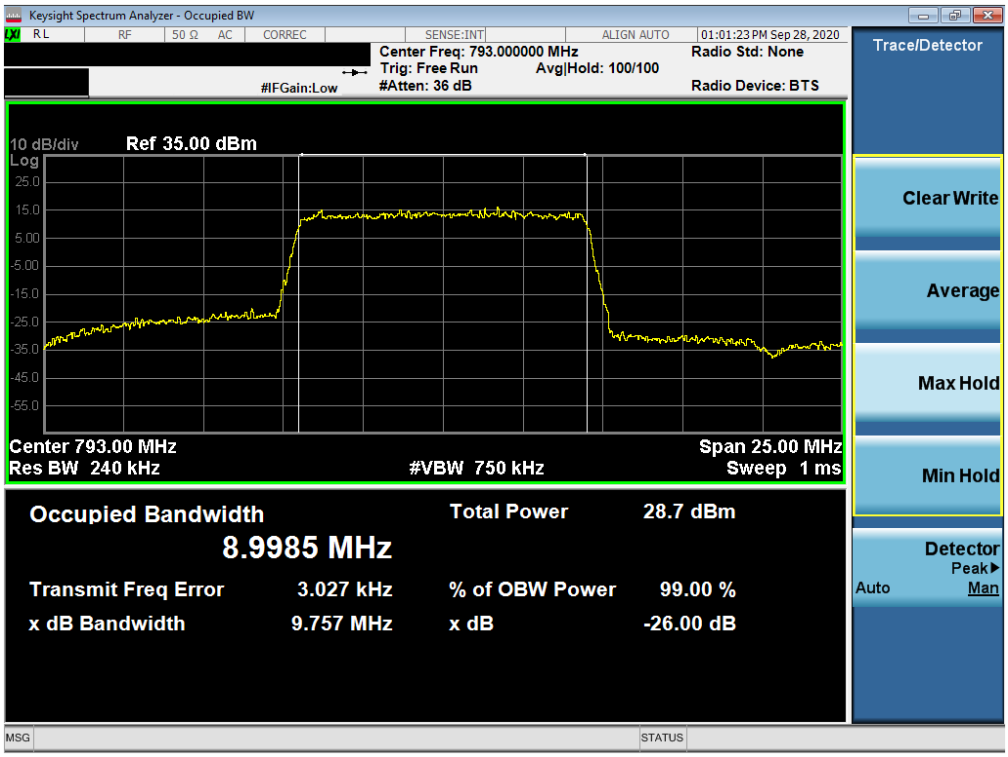
Plot 7-21. Occupied Bandwidth Plot (LTE Band 14 - 10MHz QPSK - Full RB Configuration)



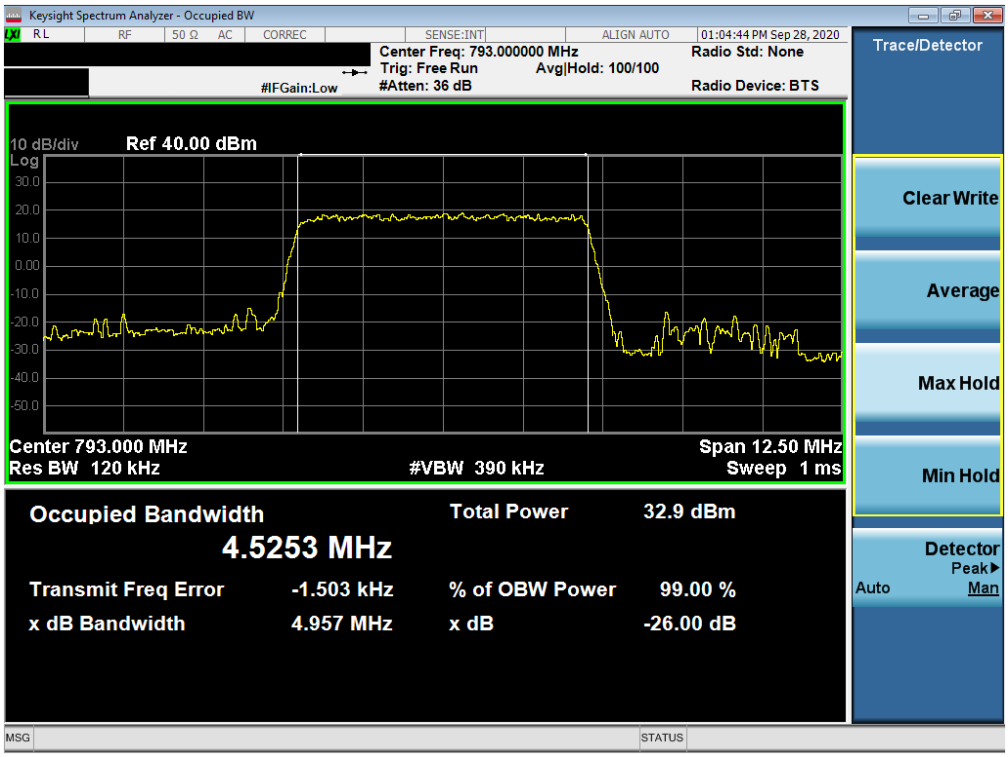
Plot 7-22. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 16-QAM - Full RB Configuration)



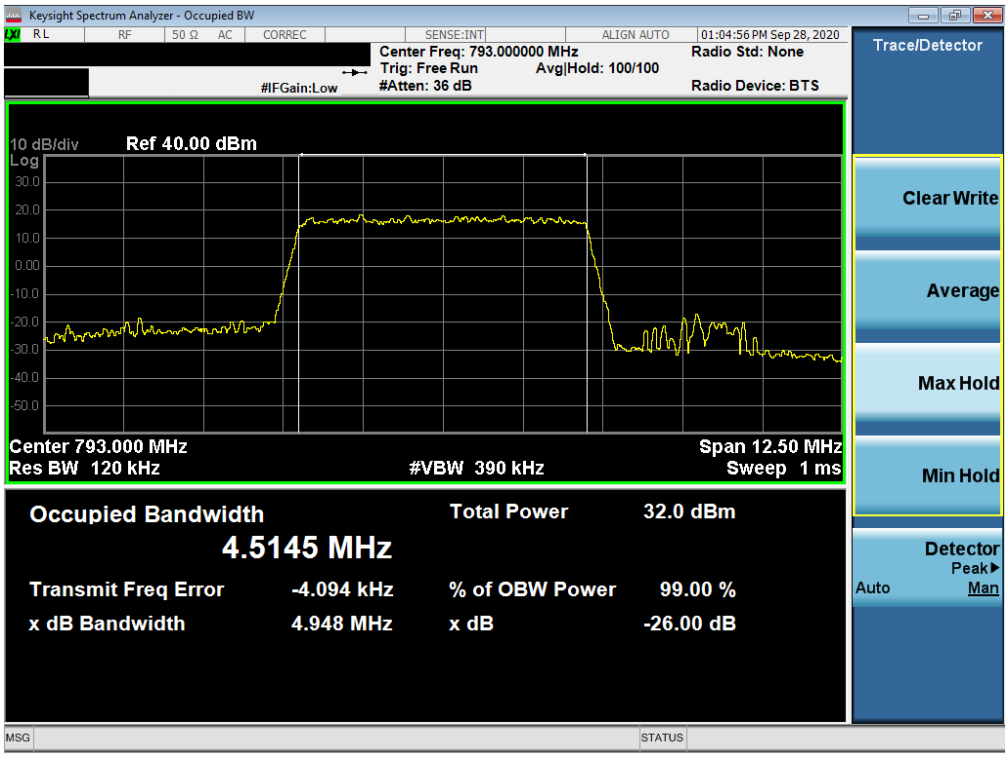
Plot 7-23. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 64-QAM - Full RB Configuration)



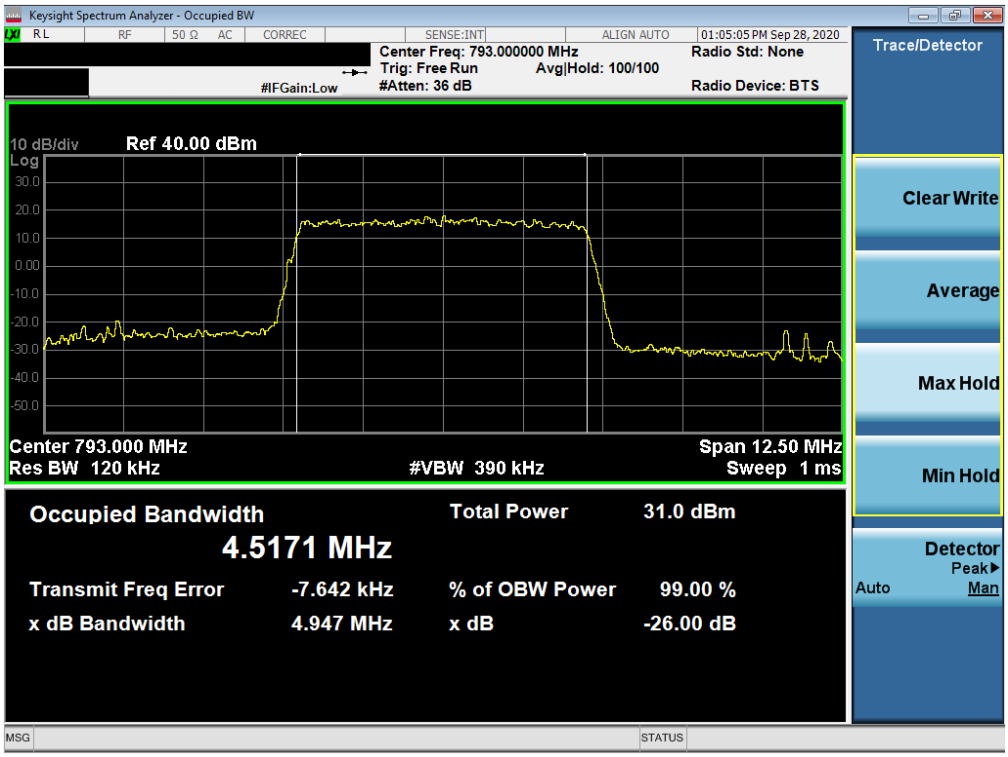
Plot 7-24. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 256-QAM - Full RB Configuration)



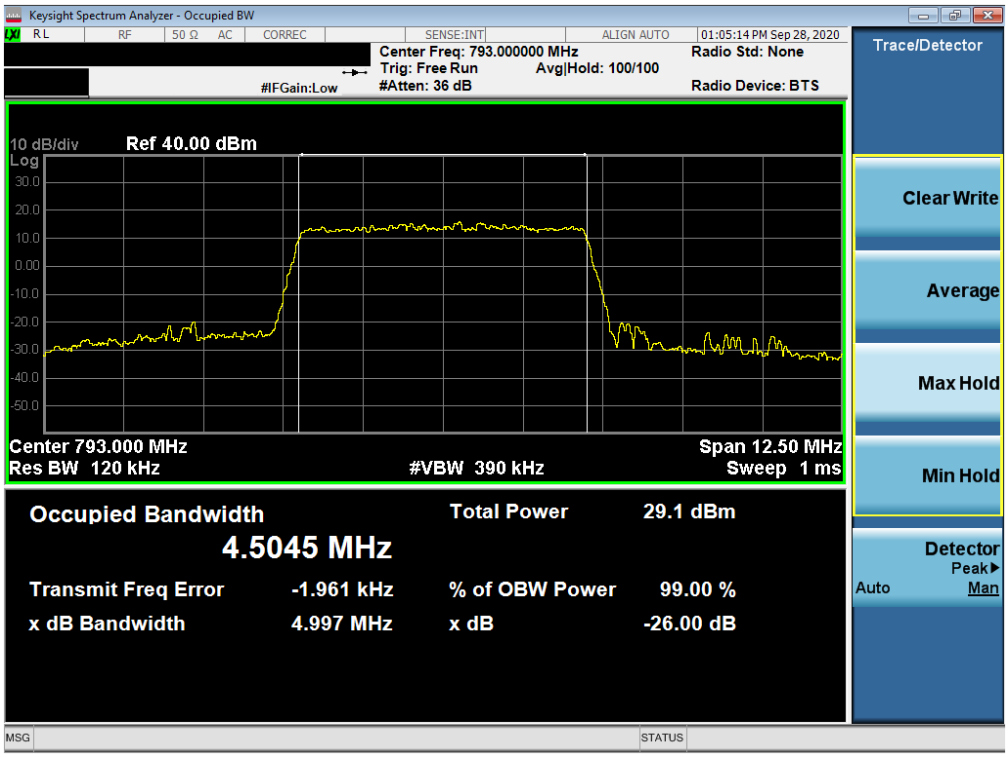
Plot 7-25. Occupied Bandwidth Plot (LTE Band 14 - 5MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 16-QAM - Full RB Configuration)

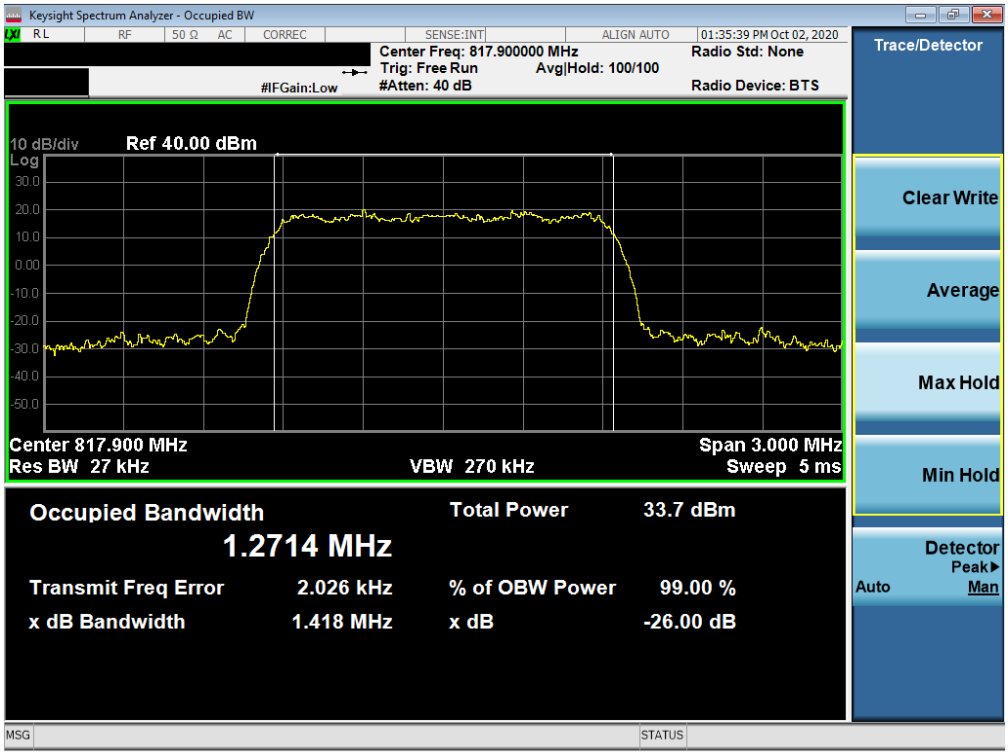


Plot 7-27. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 64-QAM - Full RB Configuration)

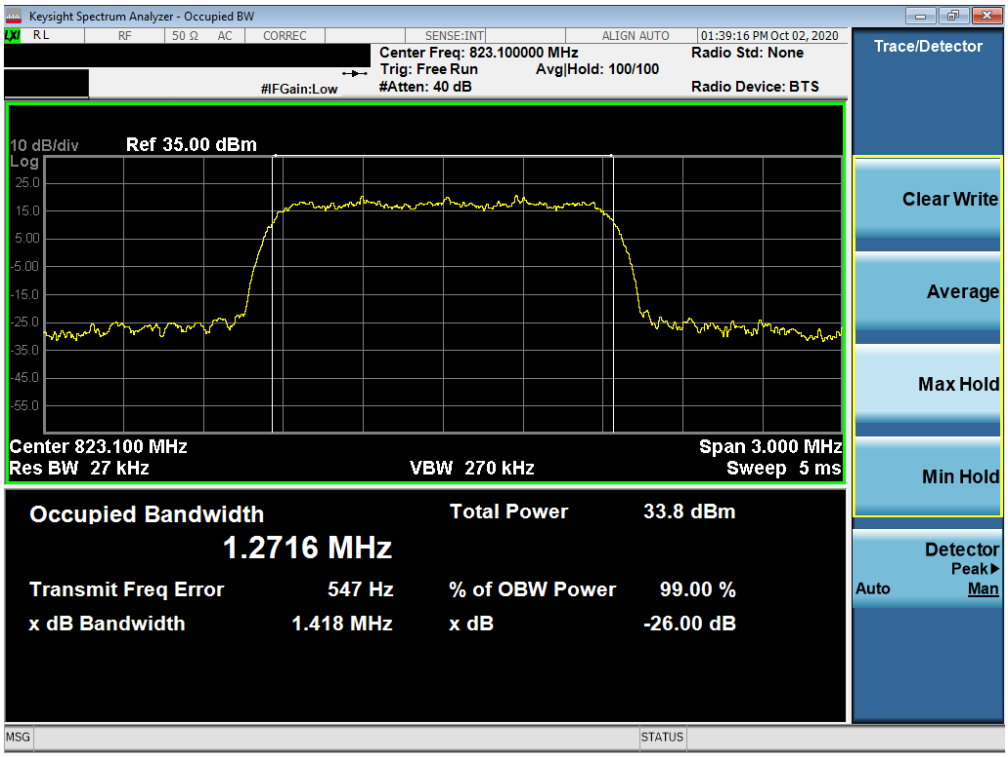


Plot 7-28. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 256-QAM - Full RB Configuration)

CDMA BC10



Plot 7-29. Occupied Bandwidth Plot (CDMA, Ch. 476)



Plot 7-30. Occupied Bandwidth Plot (CDMA, Ch. 684)

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §90.691(a) §90.543(e)

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. RBW ≥ 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

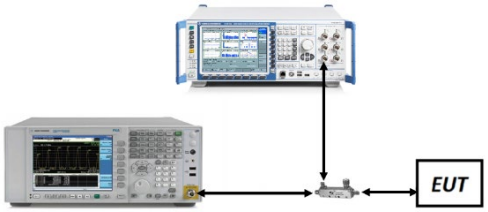
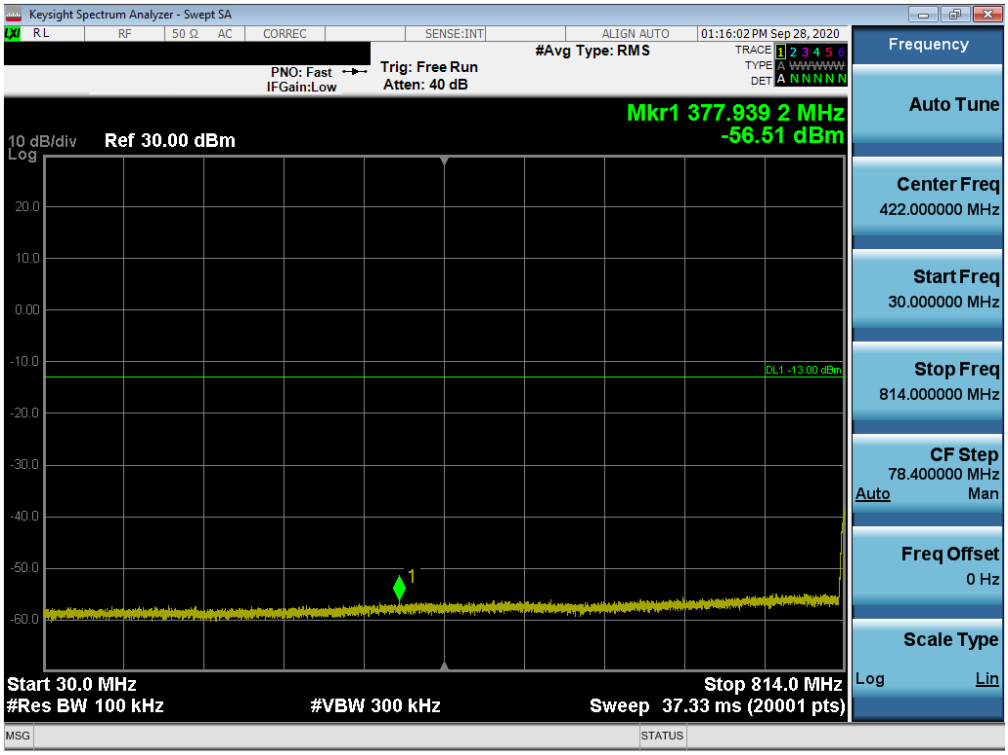
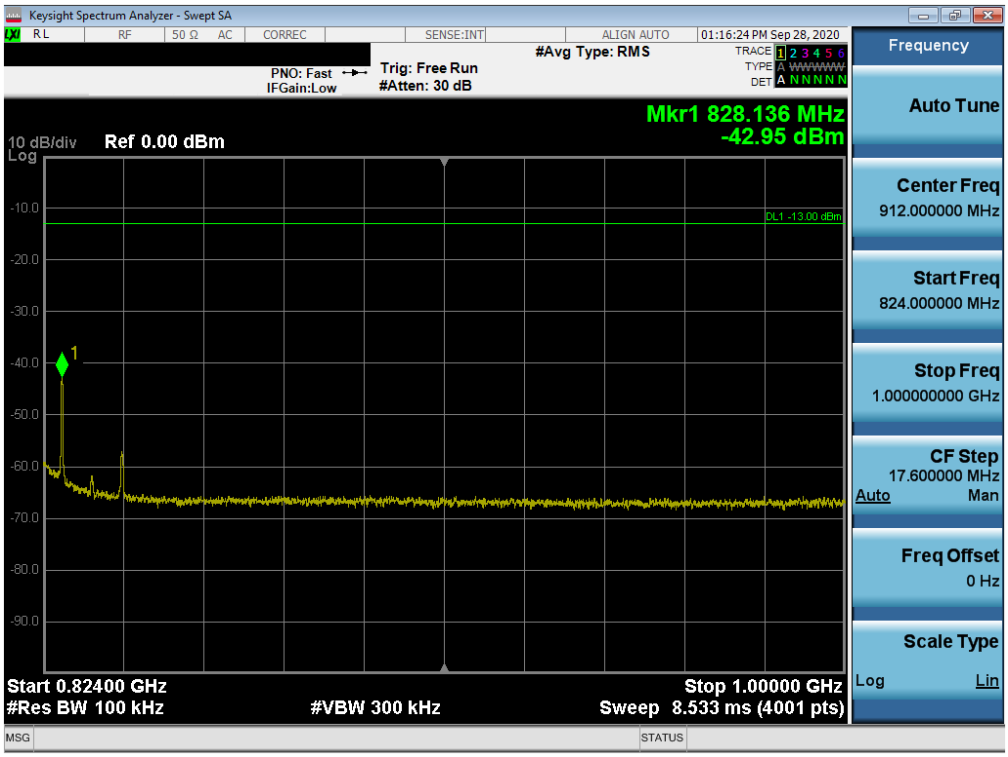


Figure 7-2. Test Instrument & Measurement Setup

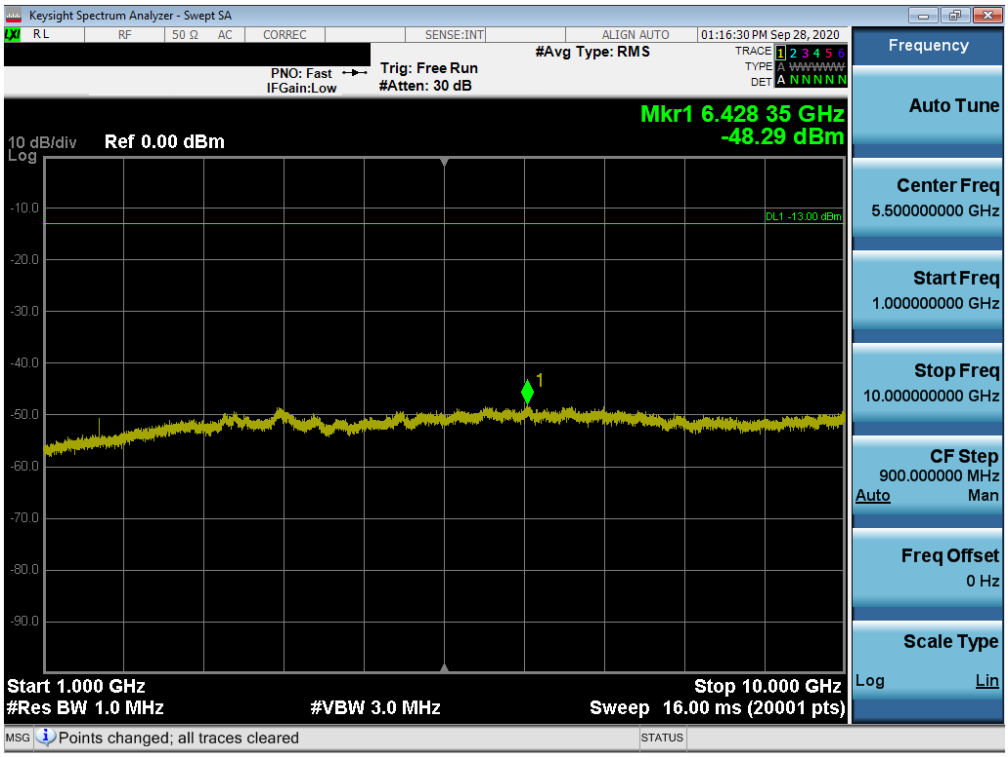
LTE Band 26



Plot 7-31. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

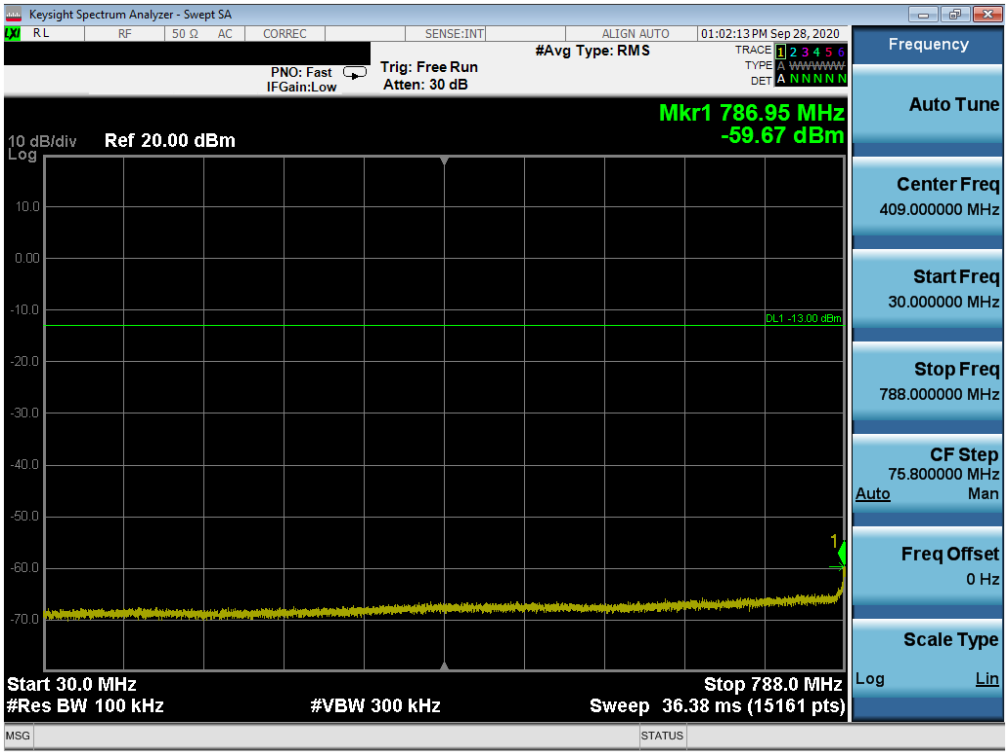


Plot 7-32. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

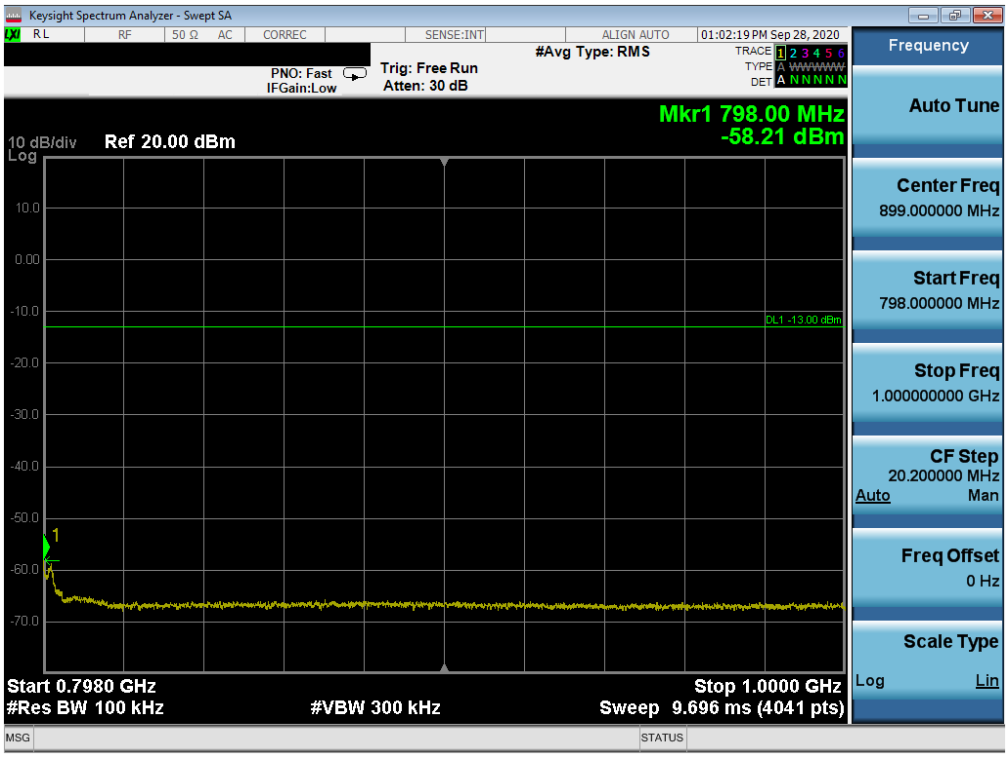


Plot 7-33. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

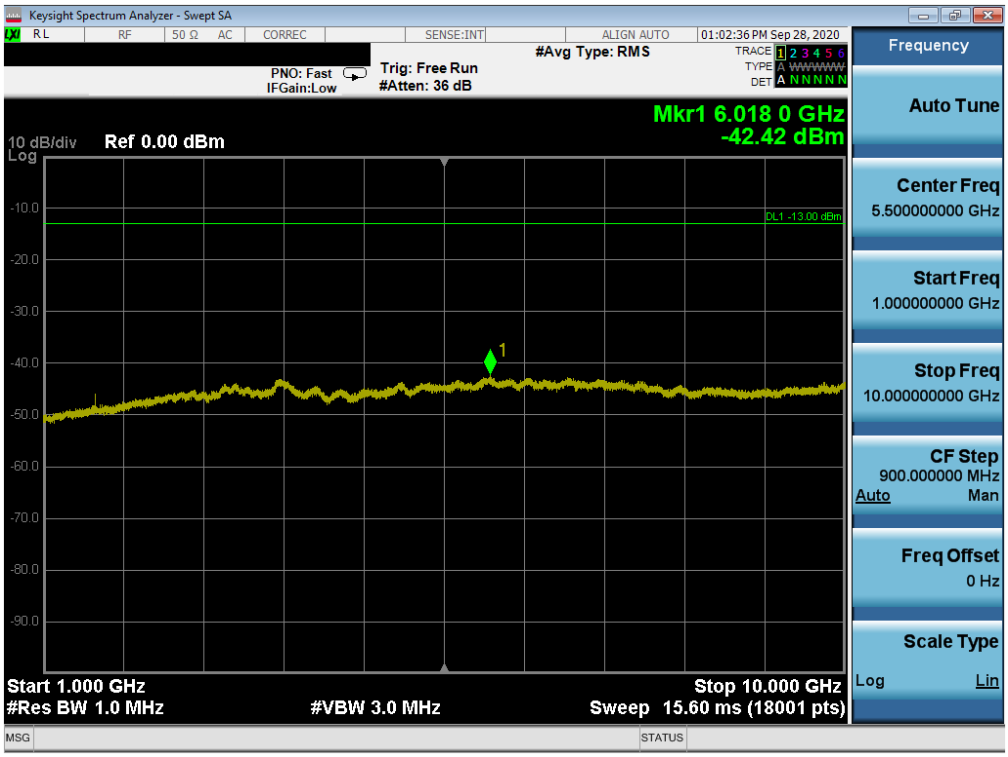
LTE Band 14



Plot 7-34. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

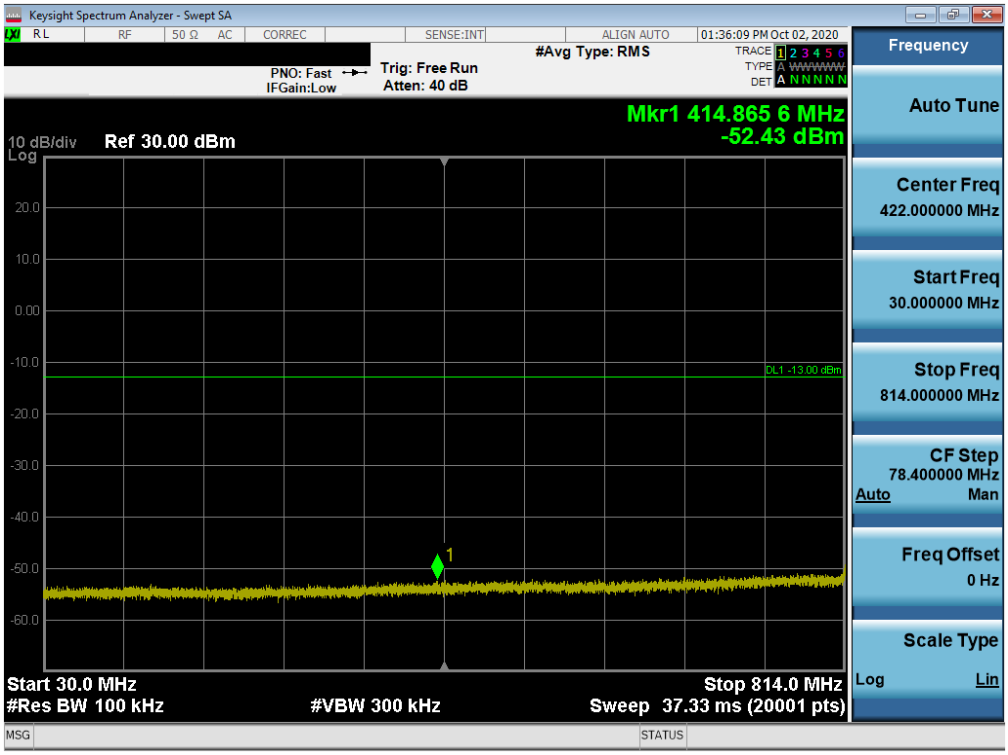


Plot 7-35. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

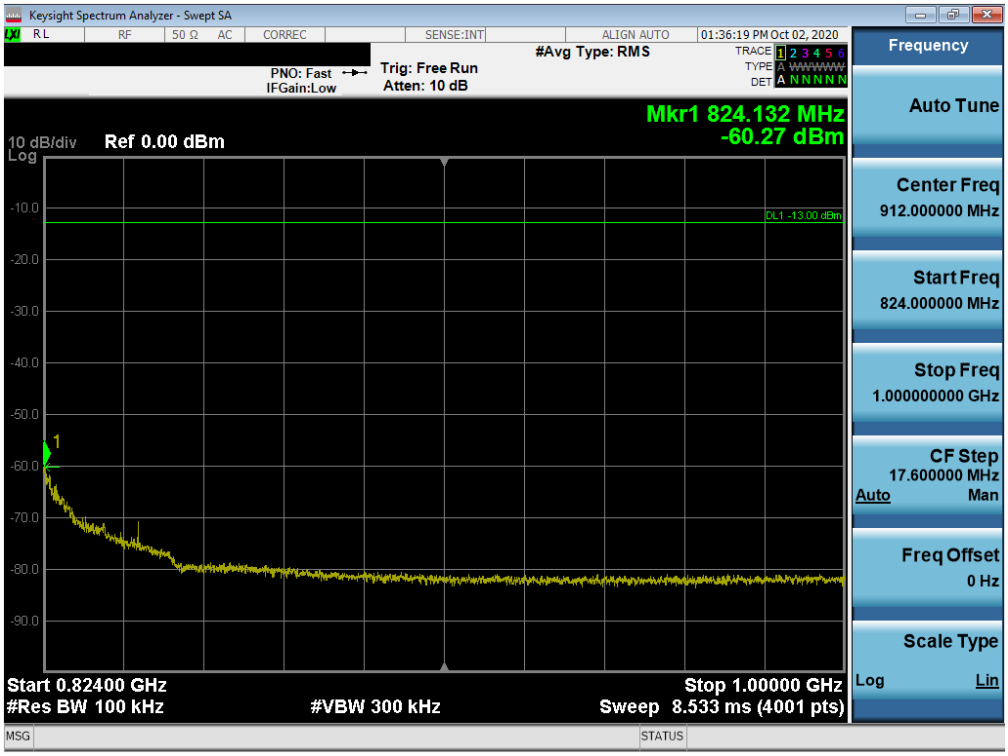


Plot 7-36. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

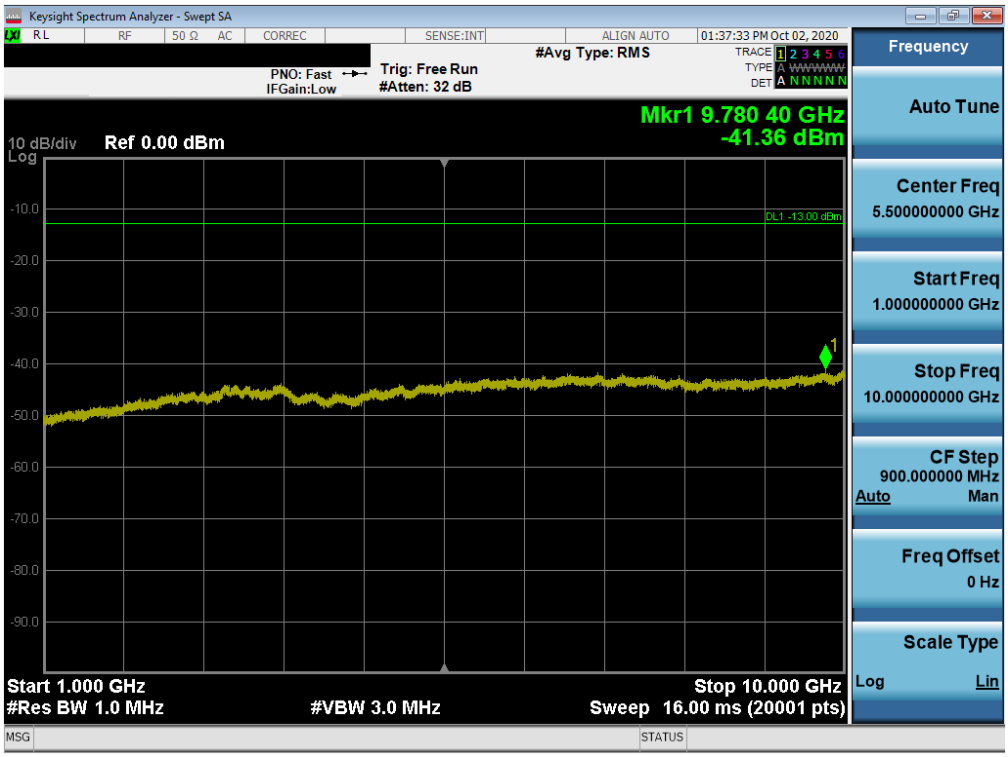
CDMA BC10



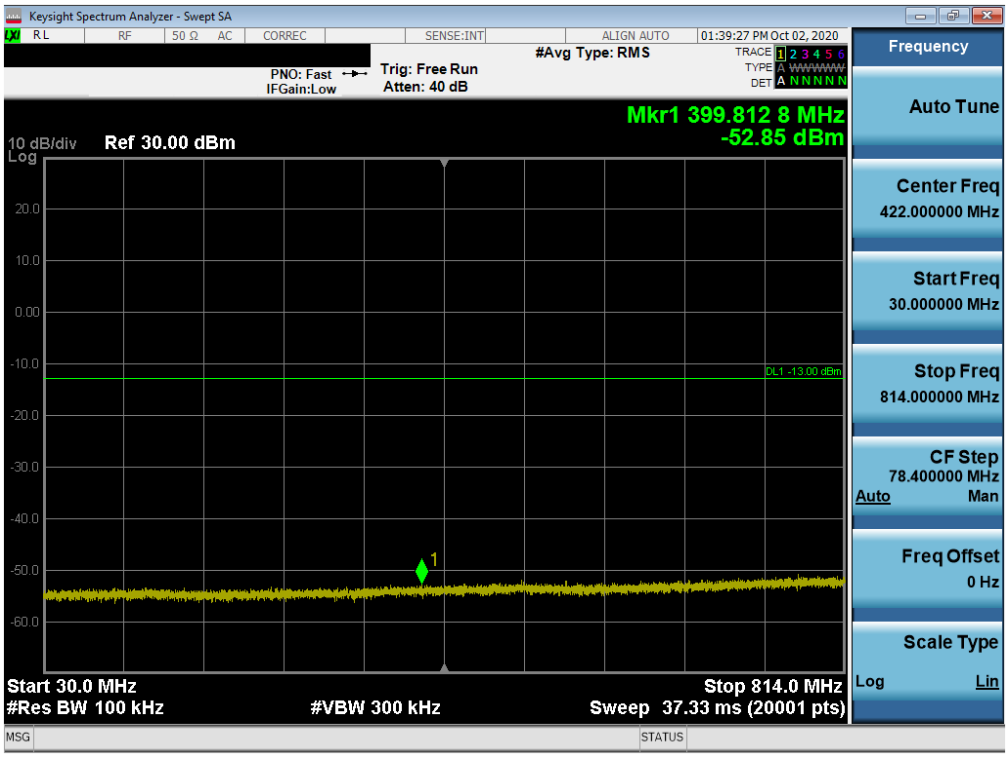
Plot 7-37. Conducted Spurious Plot (CDMA Ch. 476- Low Channel)



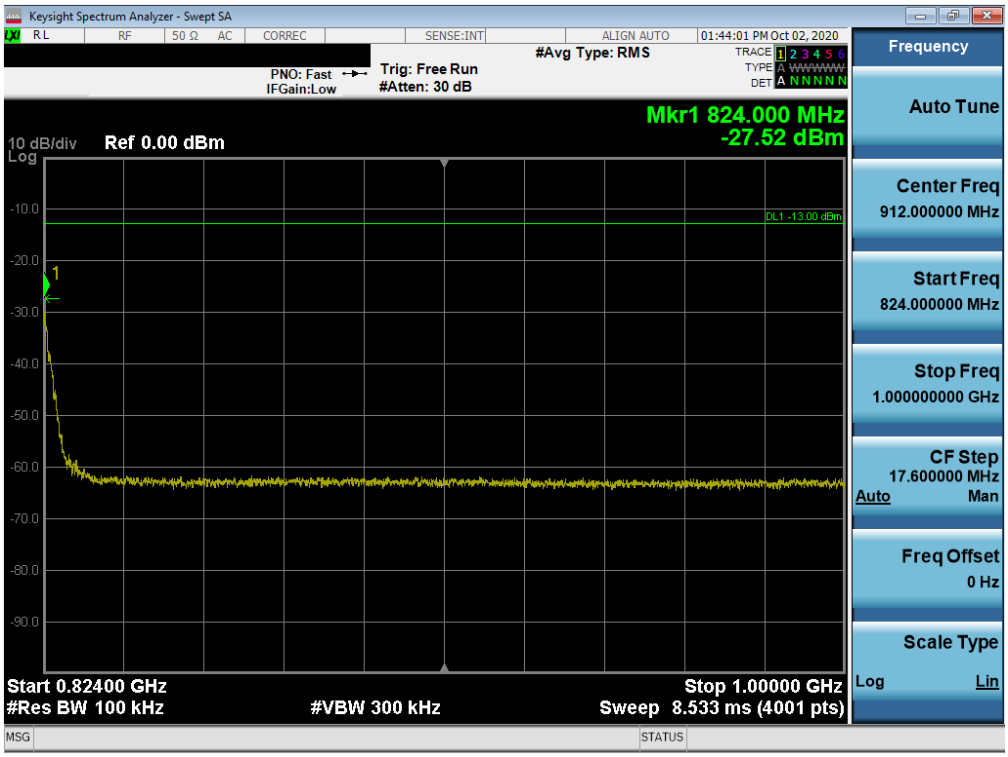
Plot 7-38. Conducted Spurious Plot (CDMA Ch. 476- Low Channel)



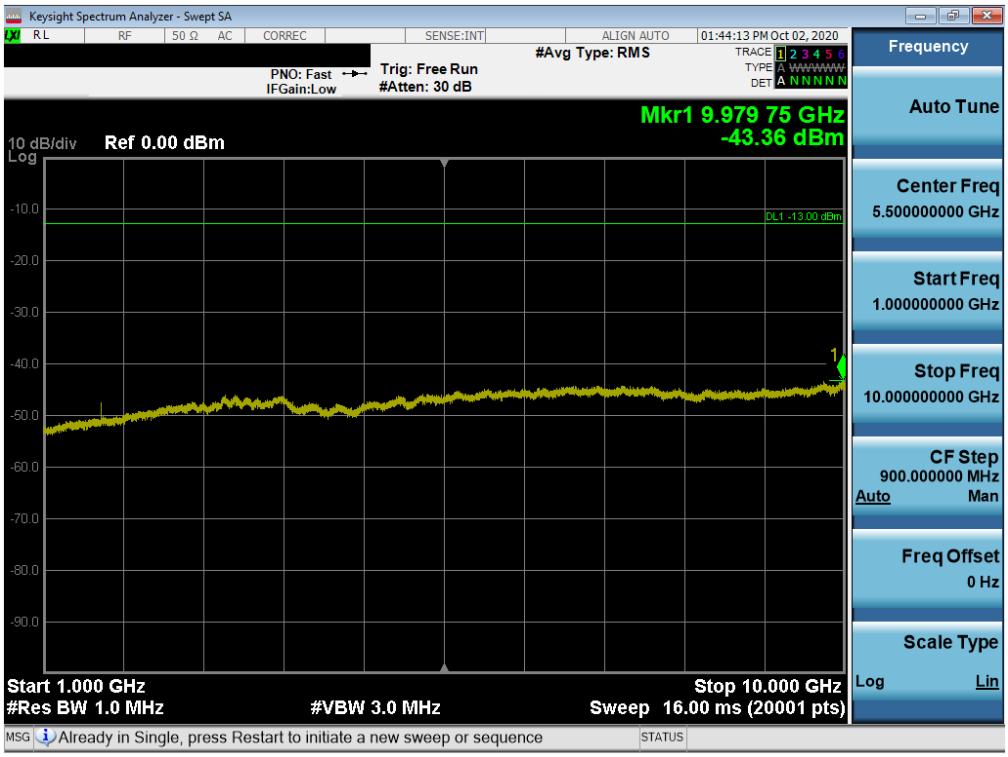
Plot 7-39. Conducted Spurious Plot (CDMA Ch. 476- Low Channel)



Plot 7-40. Conducted Spurious Plot (CDMA Ch. 684- High Channel)



Plot 7-41. Conducted Spurious Plot (CDMA Ch. 684- High Channel)



Plot 7-42. Conducted Spurious Plot (CDMA Ch. 684- High Channel)

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §90.691(a) §90.543(e)

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.

For LTE B26 operation under Part 90.691, the minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by greater than 37.5 kHz is 43 + 10log$_{10}$(P$_{[Watts]}$), where P is the transmitter power in Watts. The minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by up to and including 37.5 kHz is 50 + 10log$_{10}$(P$_{[Watts]}$), where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Span was set large enough so as to capture all out of band emissions near the band edge
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Detector = RMS
5. Trace mode = trace average
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

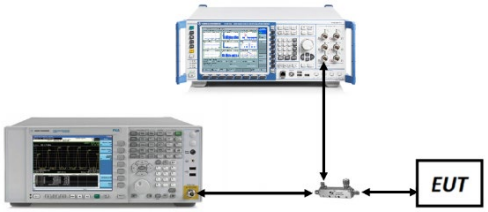


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

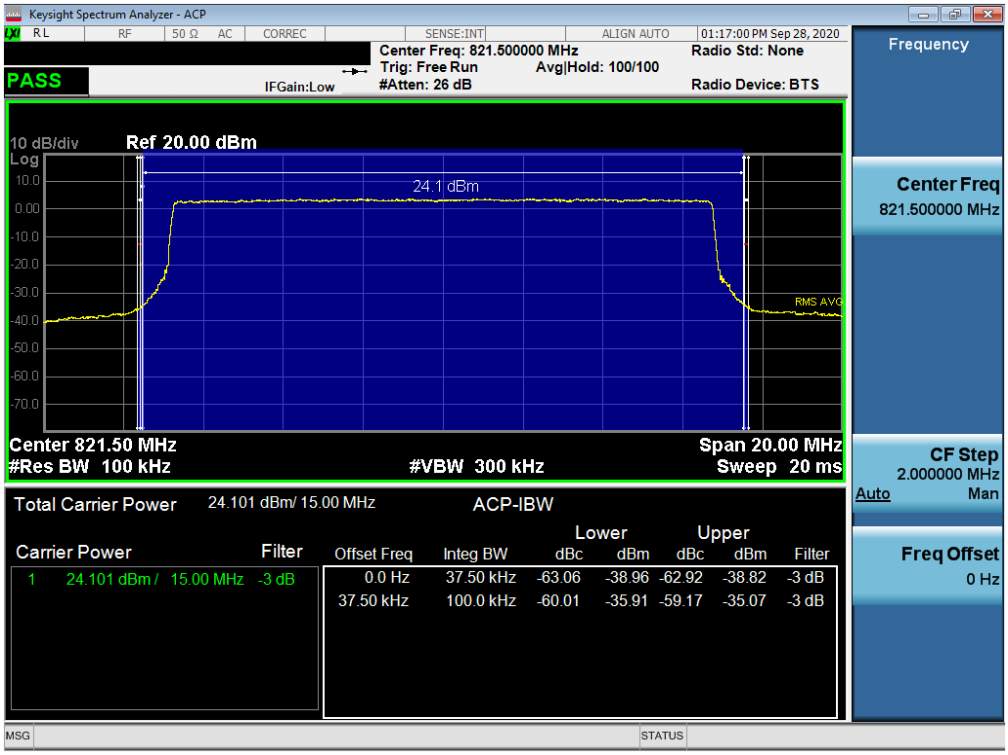
For channel edge emission, the signal analyzer's "ACP" measurement capability is used.

Per 22.917(b) 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.

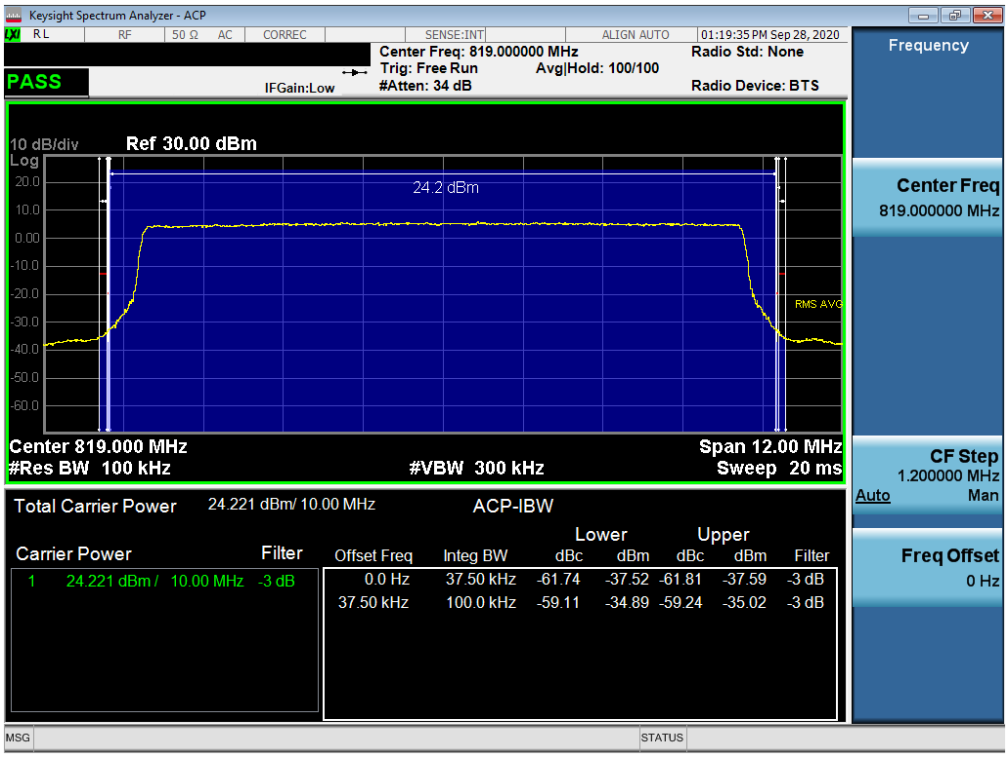
For LTE Band 14 operation under Part 90.543, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Additionally, for LTE Band 14 operation, on all frequencies between 769-775 MHz and 799-805 MHz, the power of any emission shall be attenuated by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

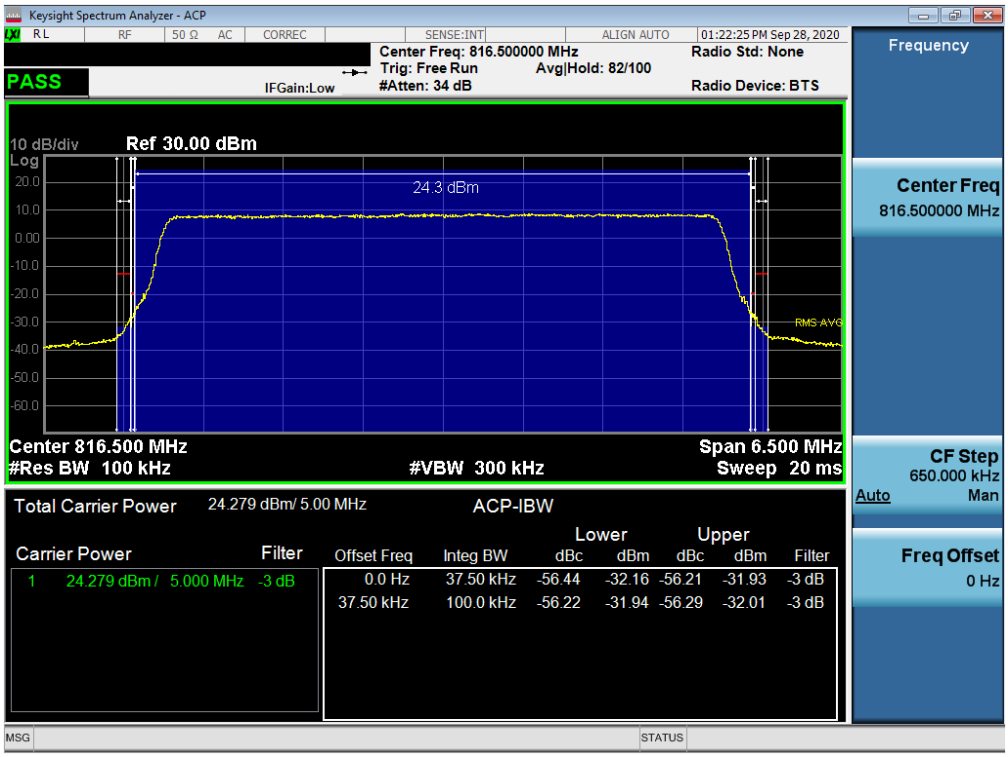
LTE Band 26



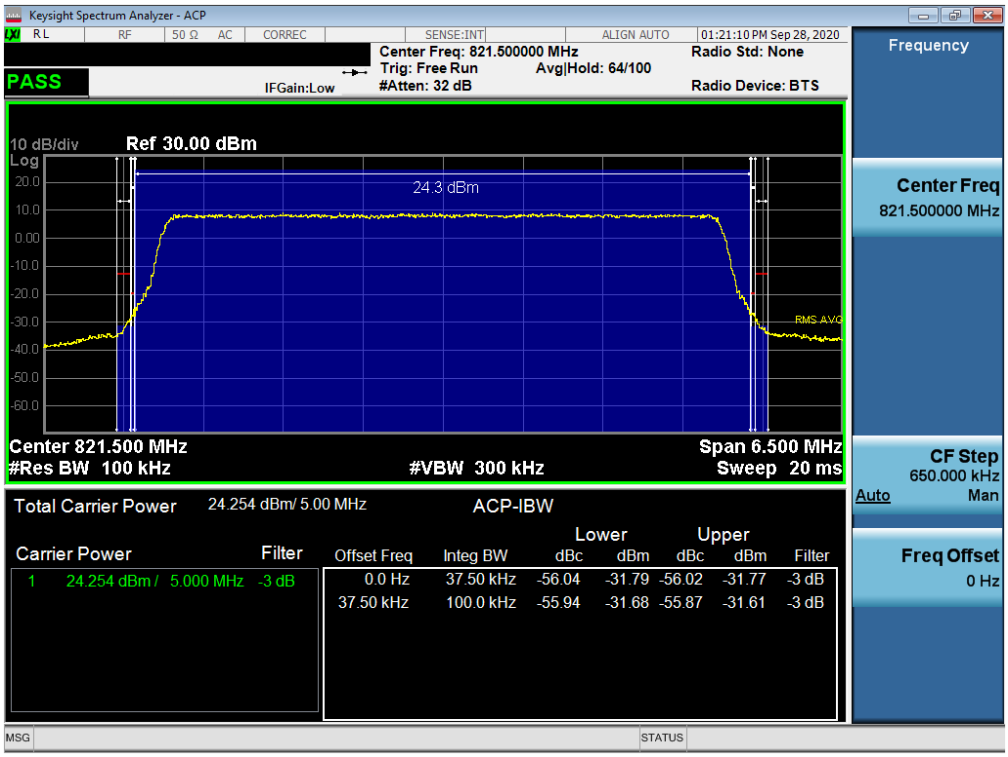
Plot 7-43. Channel Edge Plot (LTE Band 26 - 15MHz QPSK - Mid Channel)



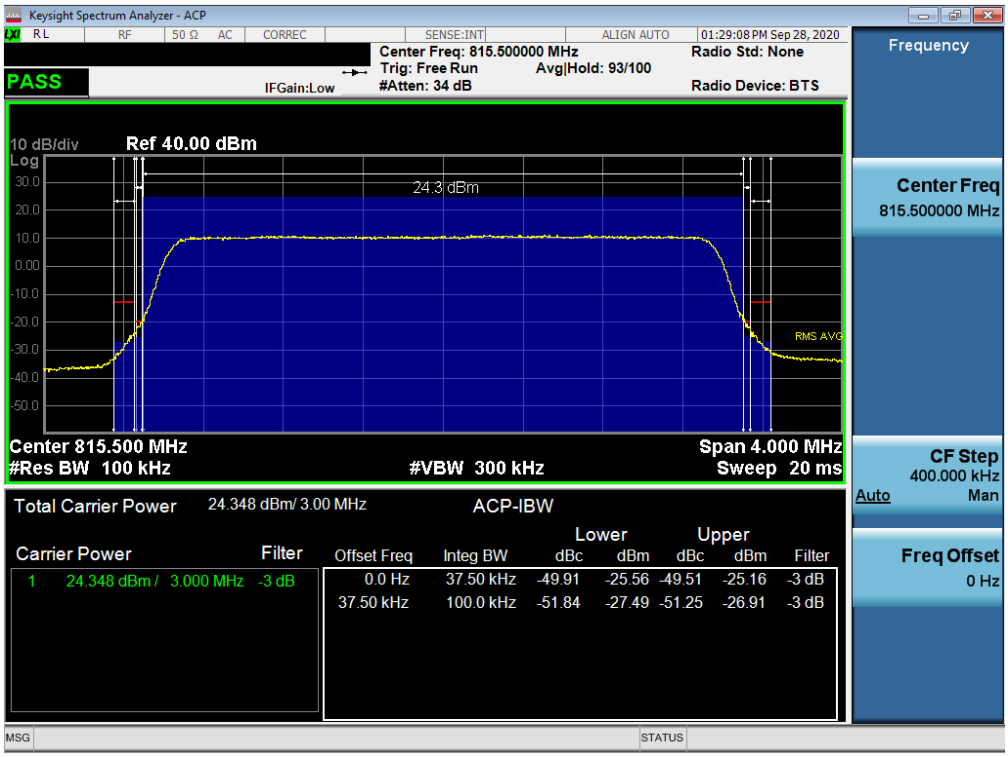
Plot 7-44. Channel Edge Plot (LTE Band 26 - 10MHz QPSK - Mid Channel)



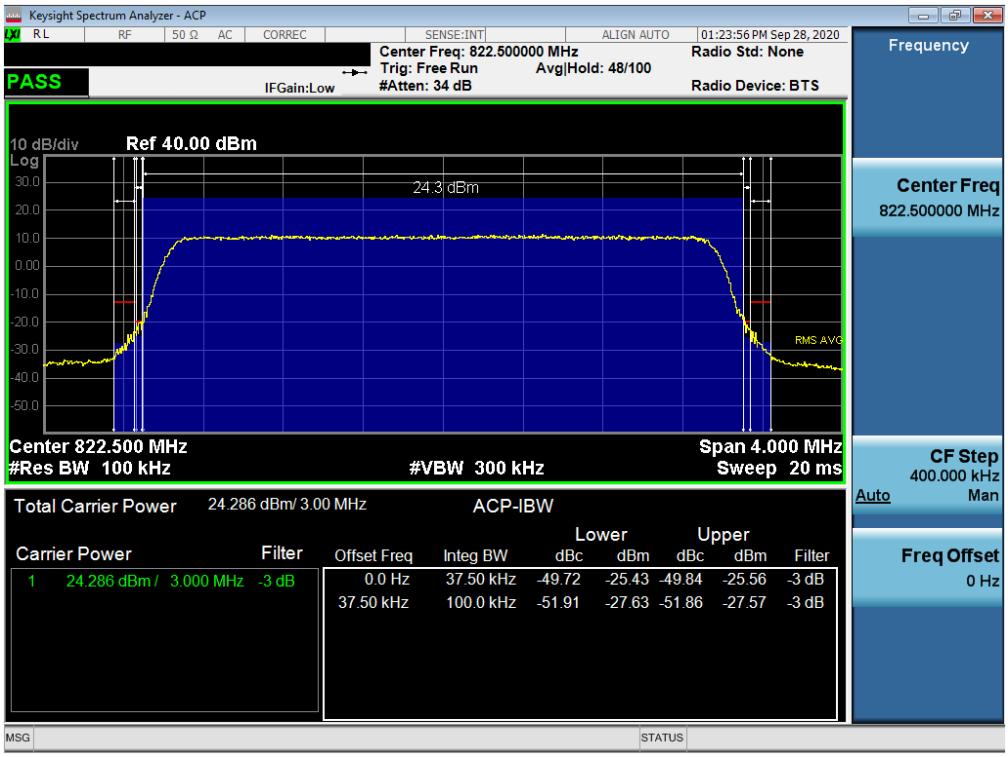
Plot 7-45. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - Low Channel)



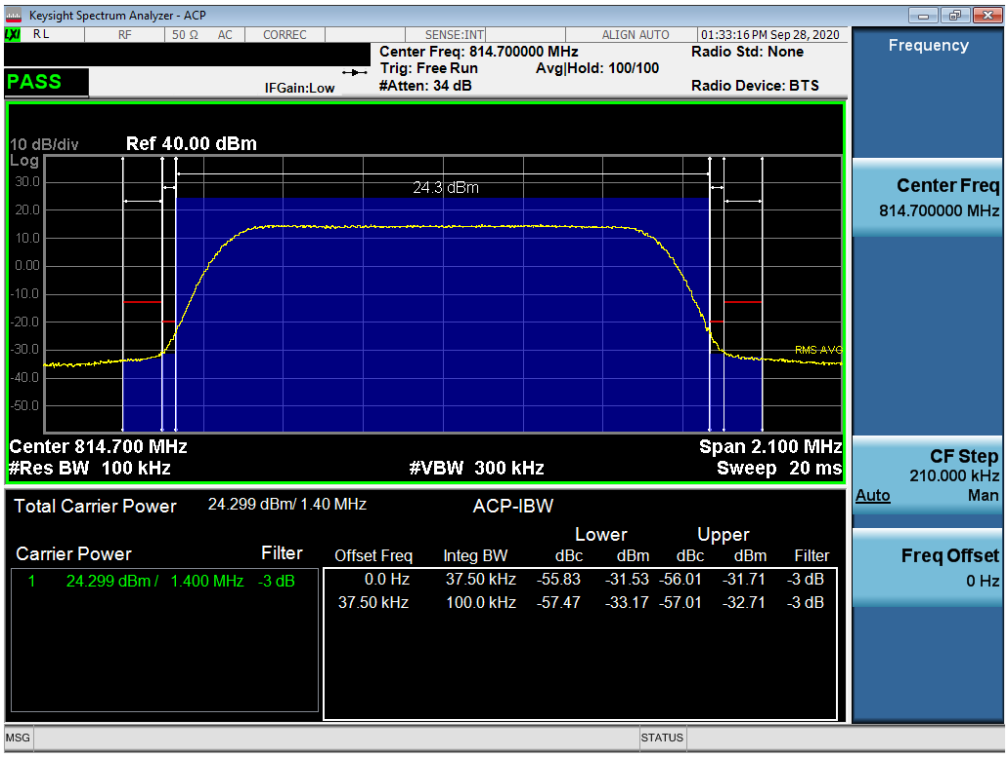
Plot 7-46. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - High Channel)



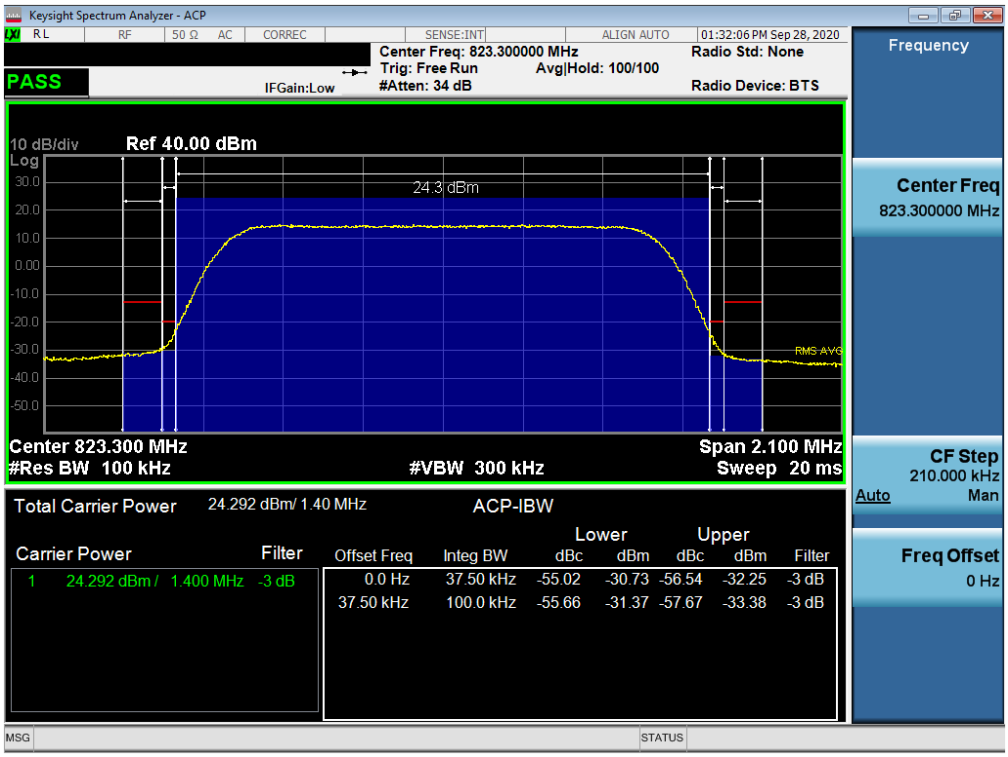
Plot 7-47. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - Low Channel)



Plot 7-48. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - High Channel)

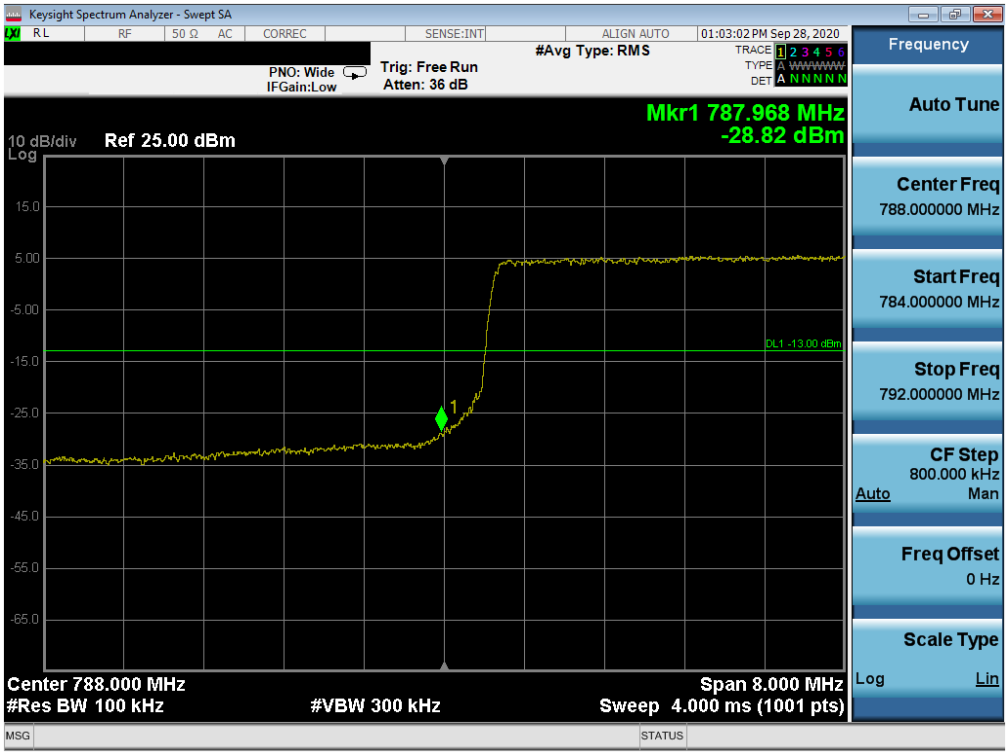


Plot 7-49. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - Low Channel)

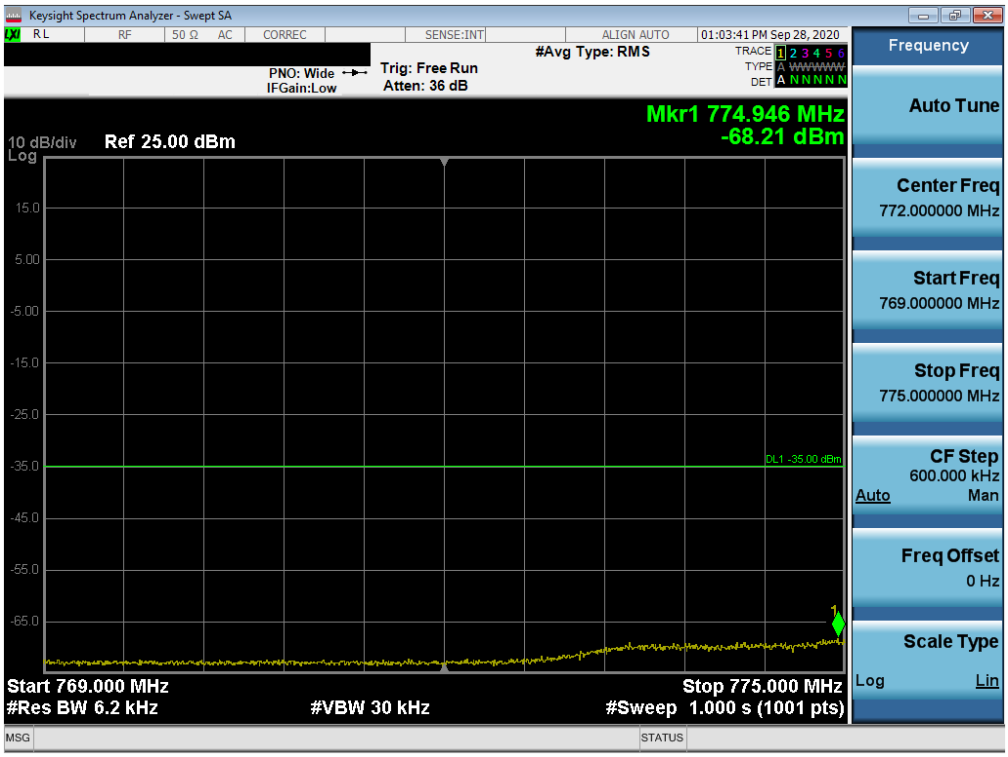


Plot 7-50. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - High Channel)

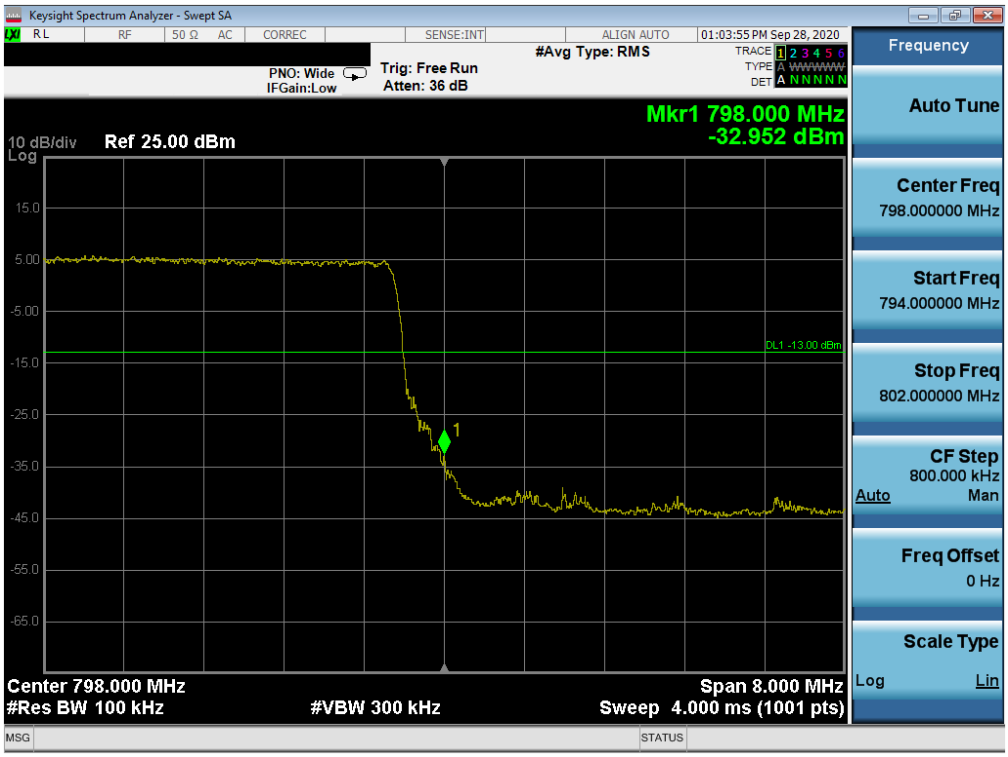
LTE Band 14



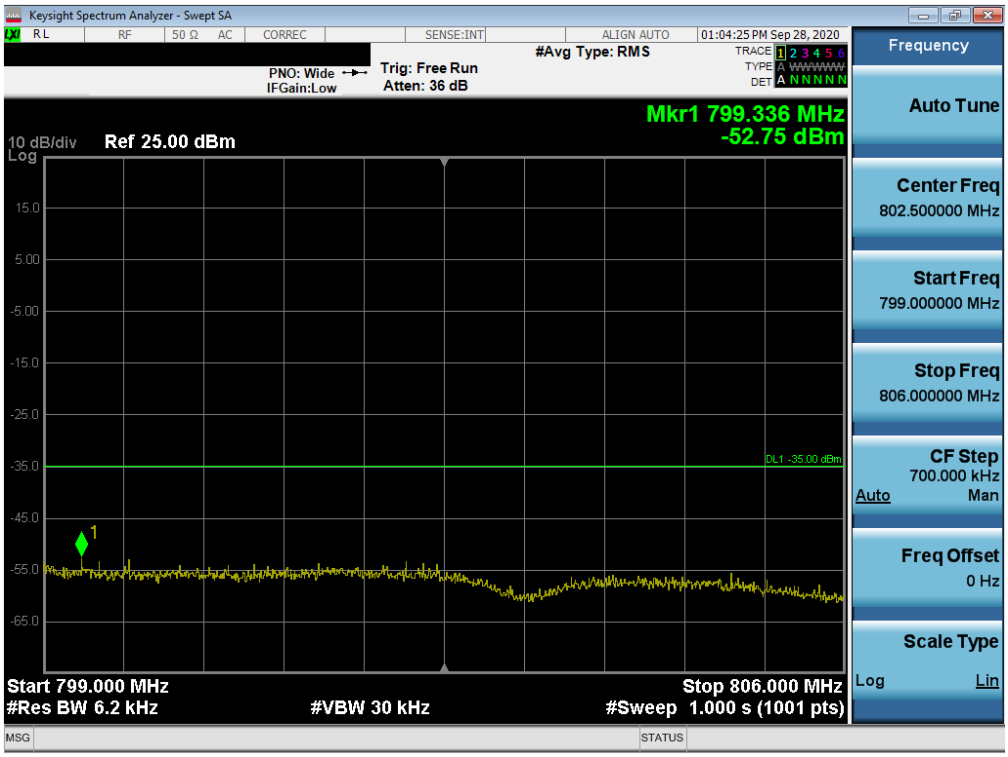
Plot 7-51. Lower Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



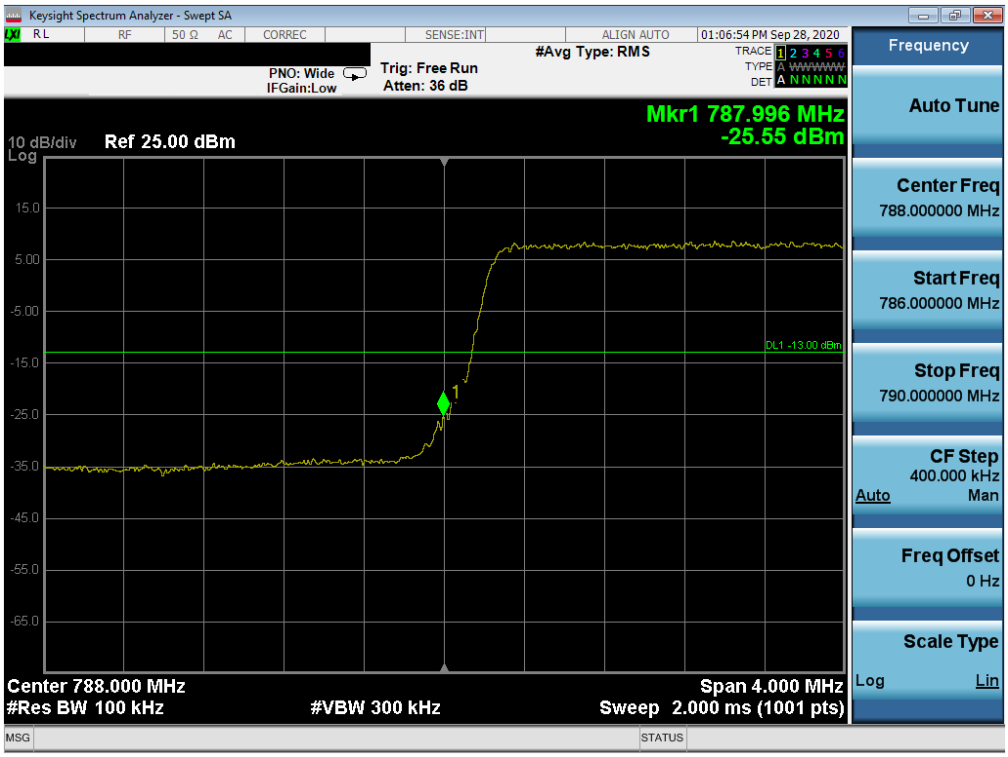
Plot 7-52. Lower Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



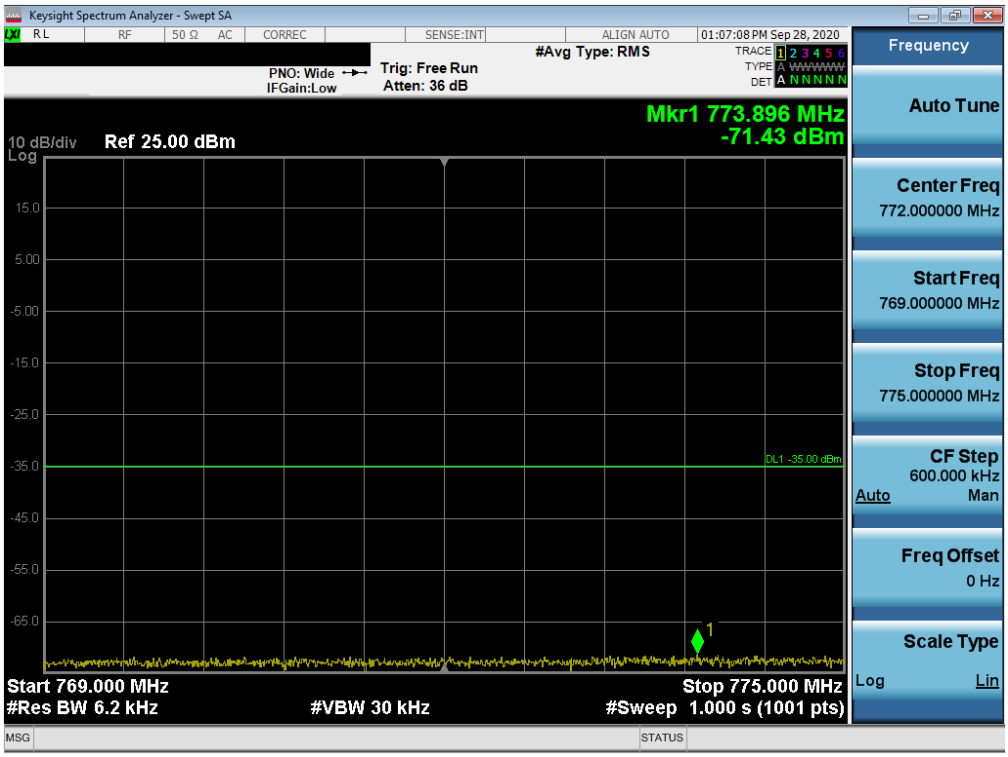
Plot 7-53. Upper Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



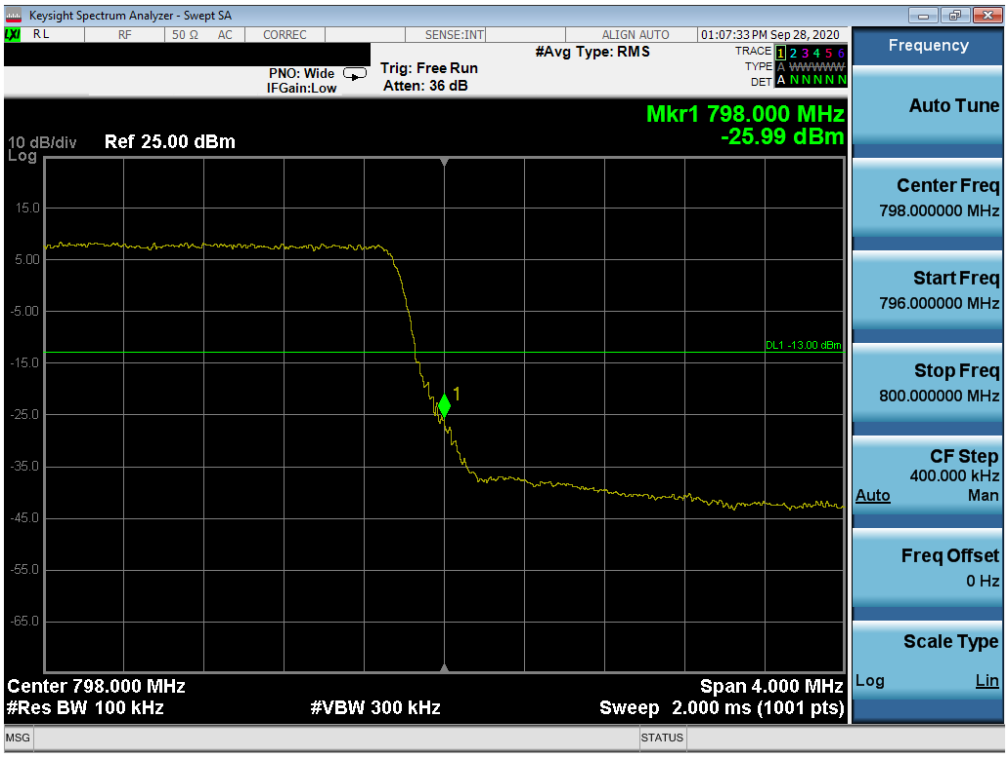
Plot 7-54. Upper Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



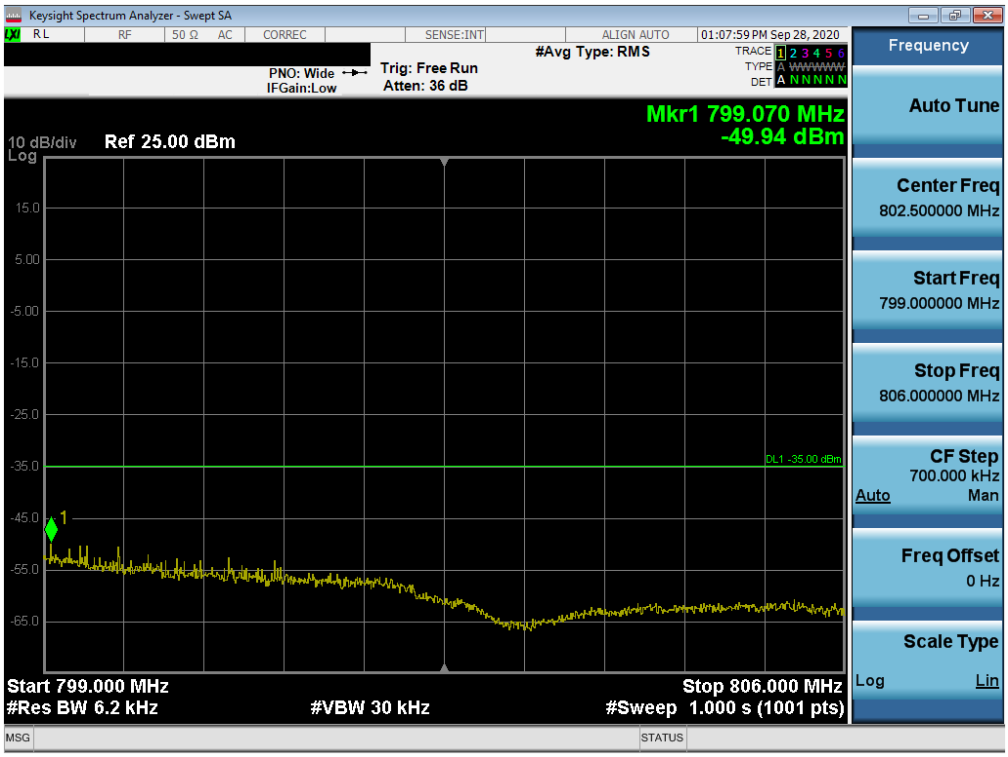
Plot 7-55. Lower Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)



Plot 7-56. Lower Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

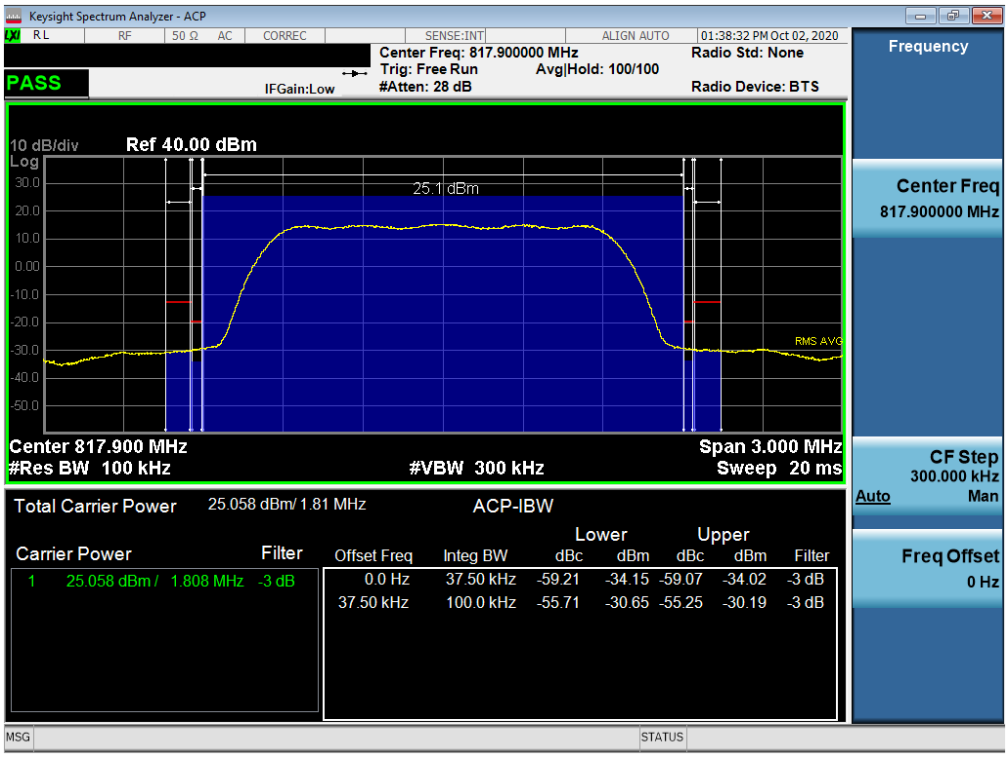


Plot 7-57. Upper Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

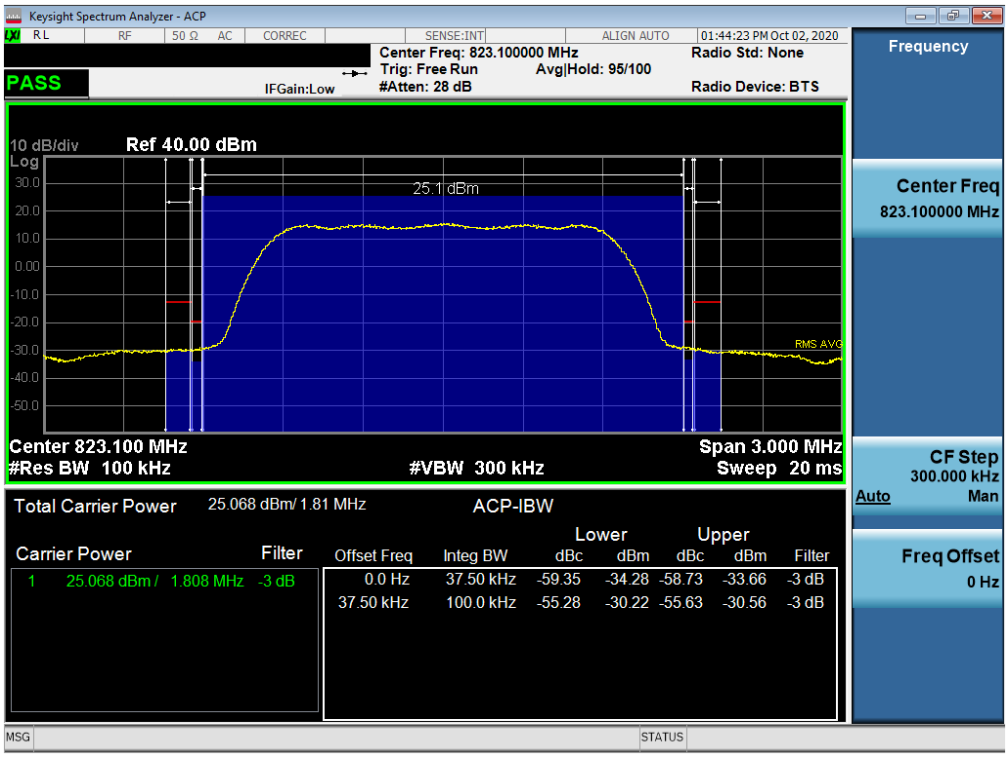


Plot 7-58. Upper Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

CDMA BC10



Plot 7-59. Channel Edge Plot (CDMA BC10 – Ch. 476)



Plot 7-60. Channel Edge Plot (CDMA BC10 – Ch. 684)

7.5 Conducted Power Output Data

§2.1046 §2.1046 §90.635

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Conducted Power [Watts]	Conducted Power Limit [dBm]	Margin [dB]
15 MHz	QPSK	26765	821.5	1 / 36	25.26	0.336	50.00	-24.74
	16-QAM	26765	821.5	1 / 36	24.09	0.256	50.00	-25.91
	64-QAM	26765	821.5	1 / 36	23.48	0.223	50.00	-26.52
	256-QAM	26765	821.5	1 / 36	20.25	0.106	50.00	-29.75
10 MHz	QPSK	26740	819.0	1 / 0	25.10	0.324	50.00	-24.90
	16-QAM	26740	819.0	1 / 0	24.23	0.265	50.00	-25.77
	64-QAM	26740	819.0	1 / 0	23.46	0.222	50.00	-26.54
	256-QAM	26740	819.0	1 / 49	20.02	0.100	50.00	-29.98
5 MHz	QPSK	26715	816.5	1 / 24	25.30	0.339	50.00	-24.70
		26765	821.5	1 / 24	25.20	0.331	50.00	-24.80
	16-QAM	26765	821.5	1 / 24	24.72	0.296	50.00	-25.28
	64-QAM	26765	821.5	1 / 24	23.52	0.225	50.00	-26.48
	256-QAM	26715	816.5	1 / 24	20.37	0.109	50.00	-29.63
3 MHz	QPSK	26705	815.5	1 / 0	25.18	0.330	50.00	-24.82
		26775	822.5	1 / 7	25.16	0.328	50.00	-24.84
	16-QAM	26775	822.5	1 / 14	24.35	0.272	50.00	-25.65
	64-QAM	26705	815.5	1 / 14	23.54	0.226	50.00	-26.46
	256-QAM	26775	822.5	1 / 7	20.44	0.111	50.00	-29.56
1.4 MHz	QPSK	26697	814.7	1 / 0	25.16	0.328	50.00	-24.84
		26783	823.3	1 / 0	25.17	0.329	50.00	-24.83
	16-QAM	26697	814.7	1 / 0	24.27	0.267	50.00	-25.73
	64-QAM	26697	814.7	1 / 0	23.47	0.222	50.00	-26.53
	256-QAM	26783	823.3	1 / 0	20.17	0.104	50.00	-29.83

Table 7-2. Conducted Power Output Data (LTE Band 26)

Frequency [MHz]	Channel	Battery Type	Conducted Power [dBm]	Conducted Power [Watts]	Conducted Power Limit [dBm]	Margin [dB]
817.90	476	Standard	24.51	0.282	50.00	-25.49
823.10	684	Standard	24.52	0.283	50.00	-25.48

Table 7-3. Conducted Power Output Data (CDMA BC10)

NOTES:

1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.

7.6 Radiated Power (ERP)

§90.542(a)(7), §22.913(a)(2)

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. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

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

Test Setup

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

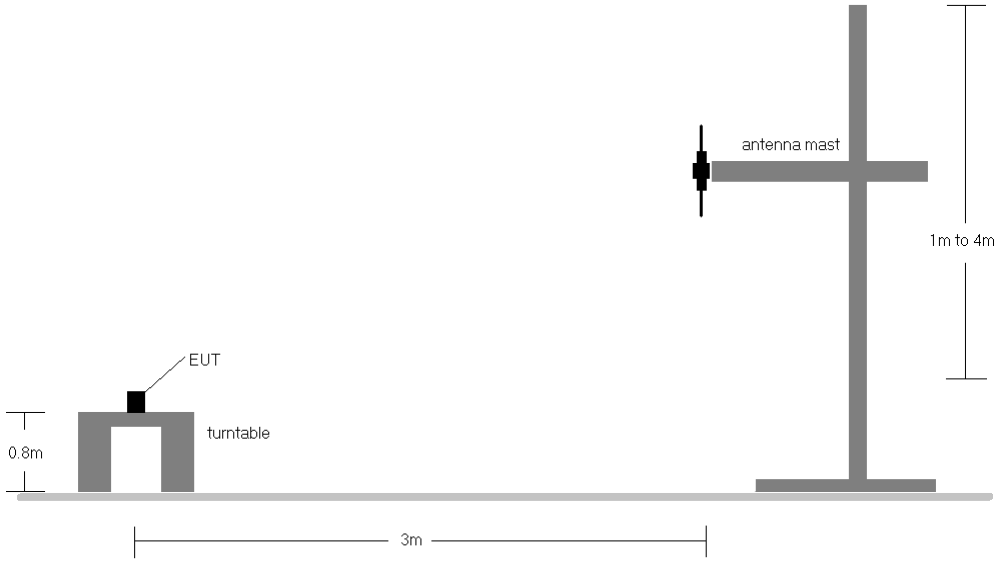


Figure 7-4. Radiated Test Setup <1GHz

Test Notes

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

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]
15 MHz	QPSK	821.5	V	155	248	6.32	1 / 37	13.64	17.81	0.060	38.45	-20.64
	16-QAM	821.5	V	155	248	6.32	1 / 37	12.67	16.84	0.048	38.45	-21.61
	64-QAM	821.5	V	155	248	6.32	1 / 37	11.75	15.92	0.039	38.45	-22.53
	256-QAM	821.5	V	155	248	6.32	1 / 37	14.11	18.28	0.067	38.45	-20.17
10 MHz	QPSK	819.0	V	155	248	6.29	1 / 0	13.51	17.65	0.058	38.45	-20.80
	16-QAM	819.0	V	155	248	6.29	1 / 0	12.84	16.98	0.050	38.45	-21.47
	64-QAM	819.0	V	155	248	6.29	1 / 0	11.76	15.90	0.039	38.45	-22.55
	256-QAM	819.0	V	155	248	6.29	1 / 49	13.91	18.05	0.064	38.45	-20.40
5 MHz	QPSK	816.5	V	155	248	6.27	1 / 24	13.73	17.85	0.061	38.45	-20.60
		821.5	V	155	248	6.32	1 / 24	13.58	17.75	0.060	38.45	-20.70
	16-QAM	821.5	V	155	248	6.32	1 / 24	13.30	17.47	0.056	38.45	-20.98
	64-QAM	821.5	V	155	248	6.32	1 / 24	11.79	15.96	0.039	38.45	-22.49
	256-QAM	816.5	V	155	248	6.27	1 / 24	14.28	18.40	0.069	38.45	-20.05
3 MHz	QPSK	815.5	V	155	248	6.26	1 / 0	13.62	17.73	0.059	38.45	-20.72
		822.5	V	155	248	6.33	1 / 7	13.53	17.71	0.059	38.45	-20.74
	16-QAM	822.5	V	155	248	6.33	1 / 14	12.92	17.10	0.051	38.45	-21.35
	64-QAM	815.5	V	155	248	6.26	1 / 14	11.87	15.98	0.040	38.45	-22.47
	256-QAM	822.5	V	155	248	6.33	1 / 7	14.29	18.47	0.070	38.45	-19.98
1.4 MHz	QPSK	814.7	V	155	248	6.25	1 / 0	13.61	17.71	0.059	38.45	-20.74
		823.3	V	155	248	6.34	1 / 0	13.53	17.72	0.059	38.45	-20.73
	16-QAM	814.7	V	155	248	6.25	1 / 0	12.92	17.02	0.050	38.45	-21.43
	64-QAM	814.7	V	155	248	6.25	1 / 0	11.81	15.91	0.039	38.45	-22.54
	256-QAM	823.3	V	155	248	6.34	1 / 0	14.01	18.20	0.066	38.45	-20.25
	QPSK	816.5	H	233	64	6.32	1 / 37	12.66	16.83	0.048	38.45	-21.62
	QPSK (WCP)	821.5	V	214	302	6.32	1 / 37	12.54	16.71	0.047	38.45	-21.74

Table 7-4. ERP Data (LTE Band 26)

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]
10 MHz	QPSK	793.0	V	139	296	6.11	1 / 25	16.06	20.02	0.101	34.77	-14.75
	16-QAM	793.0	V	139	296	6.11	1 / 25	14.92	18.88	0.077	34.77	-15.89
	64-QAM	793.0	V	139	296	6.11	1 / 25	14.27	18.23	0.067	34.77	-16.54
	256-QAM	793.0	V	139	296	6.11	1 / 25	12.24	16.20	0.042	34.77	-18.57
5 MHz	QPSK	790.5	V	139	296	6.09	1 / 0	15.92	19.85	0.097	34.77	-14.92
		793.0	V	139	296	6.11	1 / 0	16.04	20.00	0.100	34.77	-14.77
		795.5	V	139	296	6.24	1 / 0	15.74	19.83	0.096	34.77	-14.94
	16-QAM	793.0	V	139	296	6.11	1 / 0	14.78	18.74	0.075	34.77	-16.03
	64-QAM	793.0	V	139	296	6.11	1 / 0	14.06	18.02	0.063	34.77	-16.75
	256-QAM	793.0	V	139	296	6.11	1 / 0	12.35	16.31	0.043	34.77	-18.46
	QPSK	795.5	H	191	245	5.91	1 / 25	13.18	16.94	0.049	34.77	-17.83
	QPSK (WCP)	790.5	V	170	75	5.91	1 / 25	11.27	15.03	0.032	34.77	-19.74

Table 7-5. ERP Data (LTE Band 14)

7.7 Radiated Spurious Emissions Measurements

§2.1053

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically 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 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

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

Test Setup

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

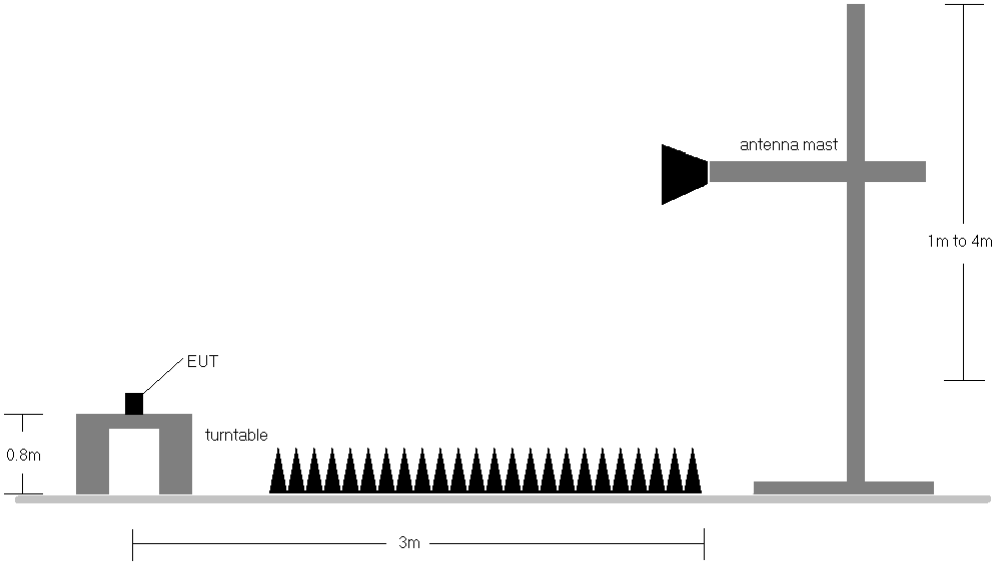


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.

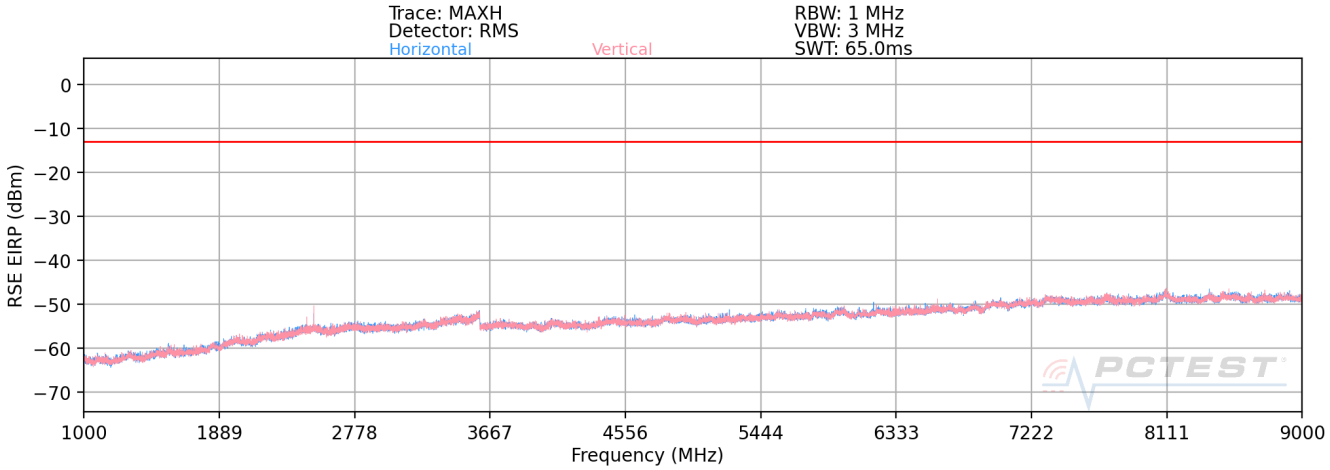
3. This unit was tested with its standard battery.

4. 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.

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

6. Per 90(f), emissions in the 1559 – 1610MHz band are subject to a limit of -40dBm/MHz for wideband signals. These emission measurements are shown in this section below.

LTE Band 26



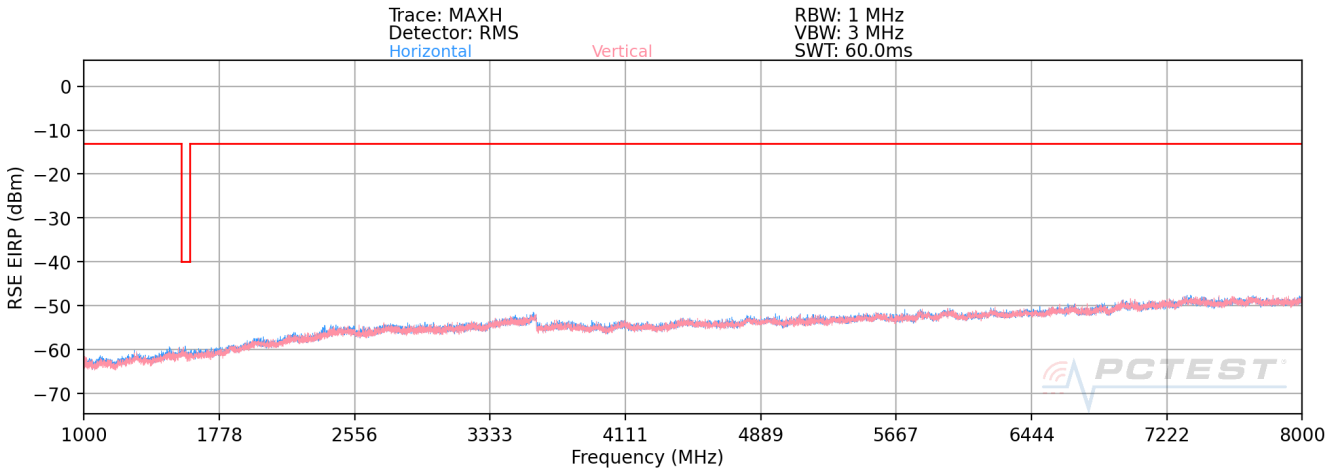
Plot 7-61. Radiated Spurious Plot (LTE Band 26)

Bandwidth (MHz):	10
Frequency (MHz):	819.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1638.0	V	-	-	-67.62	-1.44	37.94	-57.31	-13.00	-44.31
2457.0	V	142	255	-63.24	3.13	46.89	-48.36	-13.00	-35.36
3276.0	V	-	-	-70.01	4.14	41.13	-54.13	-13.00	-41.13
4095.0	V	-	-	-74.48	6.43	38.95	-56.30	-13.00	-43.30

Table 7-6. Radiated Spurious Data (LTE Band 26)

LTE Band 14



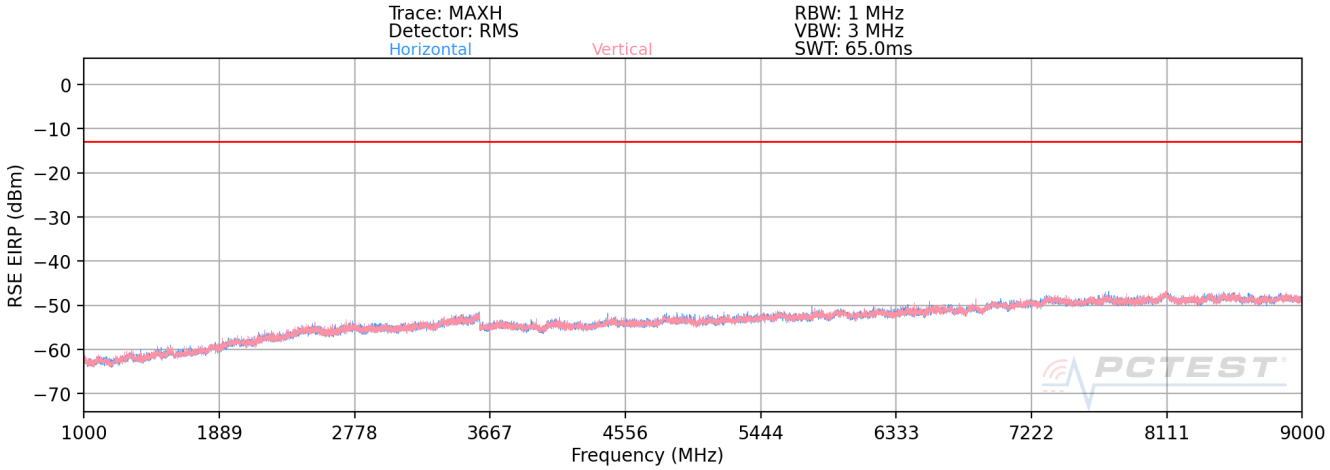
Plot 7-62. Radiated Spurious Plot (LTE Band 14)

Bandwidth (MHz):	10
Frequency (MHz):	793.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1586.0	H	-	-	-70.01	-1.11	35.88	-59.37	-40.00	-19.37
2379.0	H	120	231	-55.34	2.34	54.00	-41.26	-13.00	-28.26
3172.0	H	-	-	-69.16	3.85	41.69	-53.57	-13.00	-40.57
3965.0	H	-	-	-74.83	5.78	37.95	-57.31	-13.00	-44.31

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

CDMA BC10



Plot 7-63. Radiated Spurious Plot (CDMA BC10)

Frequency (MHz):	817.9
Modulation:	CDMA BC10

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1635.8	H	-	-	-66.22	0.52	41.30	-53.95	-13.00	-40.95
2453.7	H	-	-	-66.65	4.86	45.21	-50.05	-13.00	-37.05

Table 7-8. Radiated Spurious Data (CDMA BC10 – Ch. 476)

Frequency (MHz):	820.5
Modulation:	CDMA BC10

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1641.0	H	-	-	-66.66	0.51	40.85	-54.40	-13.00	-41.40
2461.5	H	-	-	-66.37	4.90	45.53	-49.73	-13.00	-36.73
3282.0	H	-	-	-66.89	6.80	46.91	-48.35	-13.00	-35.35

Table 7-9. Radiated Spurious Data (CDMA BC10 – Ch. 580)

Frequency (MHz):	823.1
Modulation:	CDMA BC10

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1646.2	H	-	-	-66.58	0.50	40.92	-54.34	-13.00	-41.34
2469.3	H	-	-	-67.91	4.99	44.08	-51.18	-13.00	-38.18

Table 7-10. Radiated Spurious Data (CDMA BC10 – Ch. 684)

7.8 Frequency Stability / Temperature Variation

§2.1055 §90.213

Test Overview and Limit

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

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

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

The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

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

Test Setup

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

Test Notes

None

Frequency Stability / Temperature Variation

LTE Band 26

Operating Frequency (Hz):	819,000,000
Ref. Voltage (VDC):	4.18
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.18	- 30	818,999,827	-184	-0.0000225
		- 20	818,999,979	-32	-0.0000039
		- 10	818,999,817	-194	-0.0000237
		0	818,999,873	-138	-0.0000168
		+ 10	819,000,154	143	0.0000175
		+ 20 (Ref)	819,000,011	0	0.0000000
		+ 30	819,000,116	105	0.0000128
		+ 40	818,999,855	-156	-0.0000190
		+ 50	819,000,074	63	0.0000077
Battery Endpoint	2.98	+ 20	819,000,236	225	0.0000275

Table 7-9. LTE Band 26 Frequency Stability Data

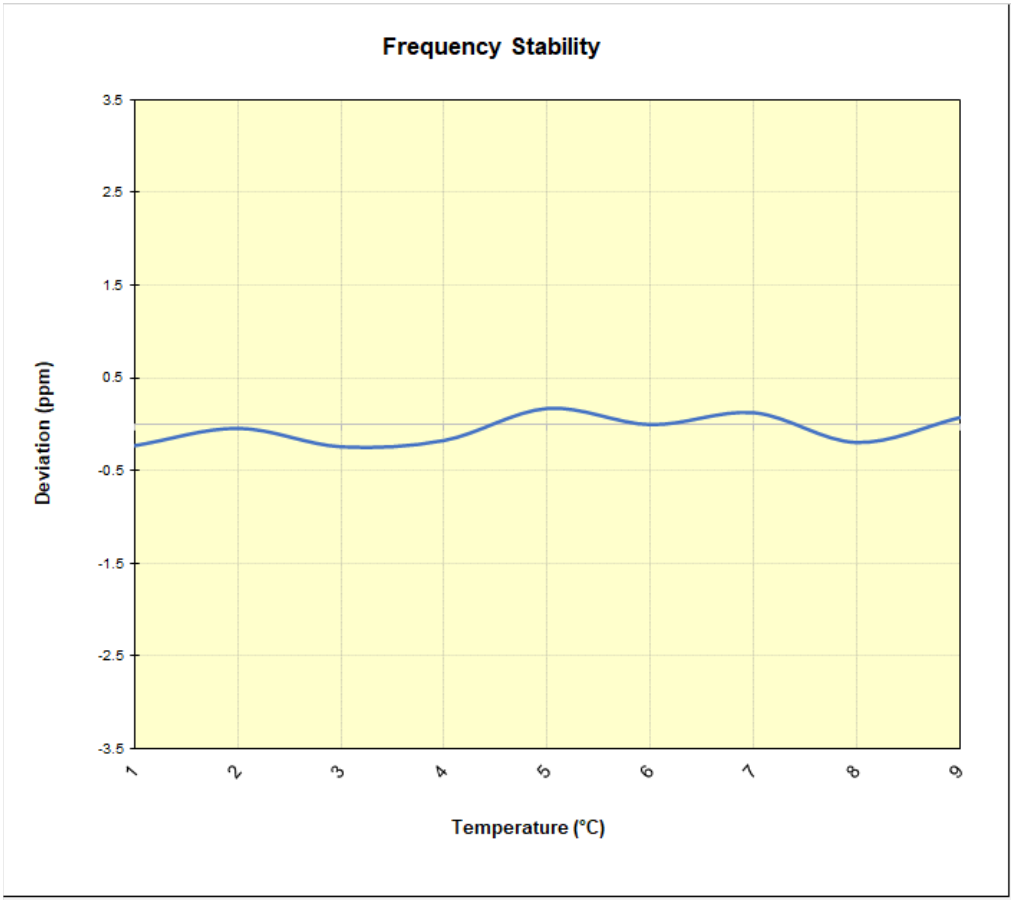


Table 7-9. LTE Band 26 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 14

Operating Frequency (Hz):	793,000,000
Ref. Voltage (VDC):	4.18

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.18	- 30	792,999,677	-250	-0.0000315
		- 20	793,000,064	137	0.0000173
		- 10	793,000,099	172	0.0000217
		0	792,999,928	1	0.0000001
		+ 10	792,999,880	-47	-0.0000059
		+ 20 (Ref)	792,999,927	0	0.0000000
		+ 30	792,999,990	63	0.0000079
		+ 40	792,999,871	-56	-0.0000071
		+ 50	792,999,587	-340	-0.0000429
Battery Endpoint	2.98	+ 20	793,000,091	164	0.0000207

Table 7-9. LTE Band 14 Frequency Stability Data

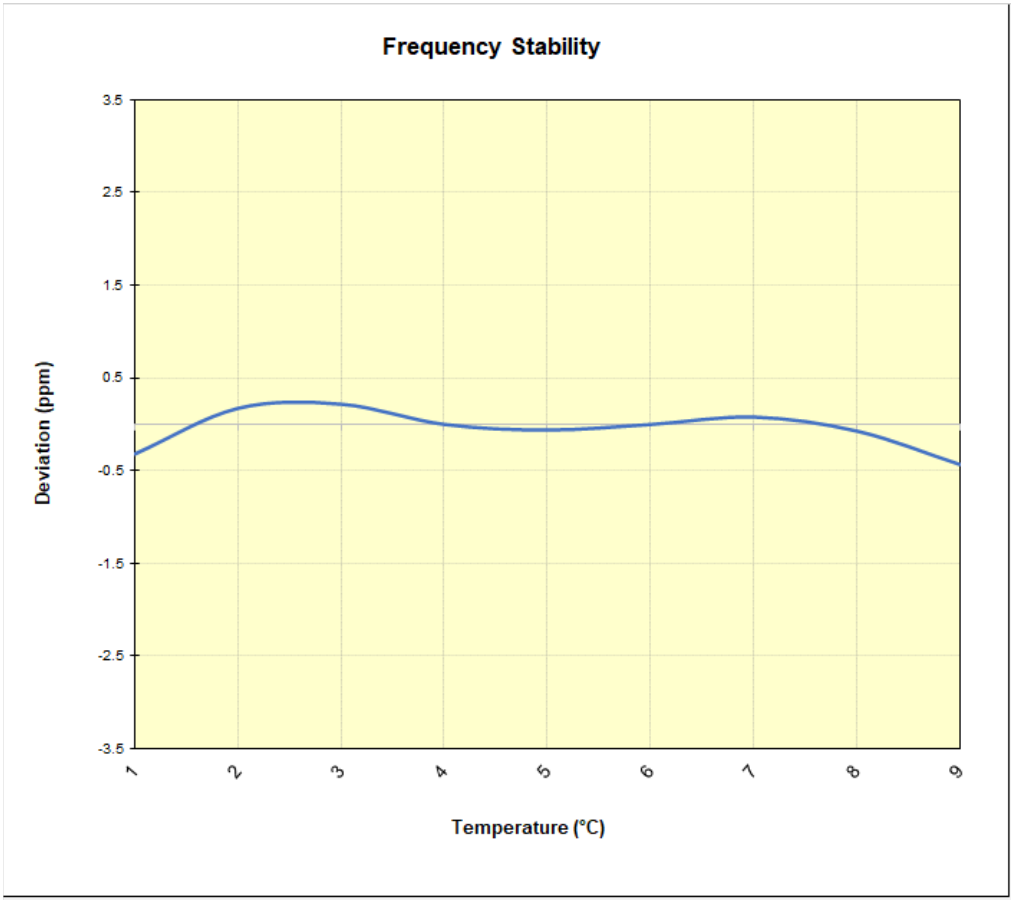


Table 7-9. LTE Band 14 Frequency Stability Chart

Frequency Stability / Temperature Variation

CDMA BC10

Operating Frequency (Hz):	817,900,000
Ref. Voltage (VDC):	4.18
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.18	- 30	818,999,827	-184	-0.0000225
		- 20	818,999,979	-32	-0.0000039
		- 10	818,999,817	-194	-0.0000237
		0	818,999,873	-138	-0.0000168
		+ 10	819,000,154	143	0.0000175
		+ 20 (Ref)	819,000,011	0	0.0000000
		+ 30	819,000,116	105	0.0000128
		+ 40	818,999,855	-156	-0.0000190
		+ 50	819,000,074	63	0.0000077
Battery Endpoint	2.98	+ 20	819,000,236	225	0.0000275

Table 7-9. CDMA BC10 Frequency Stability Data

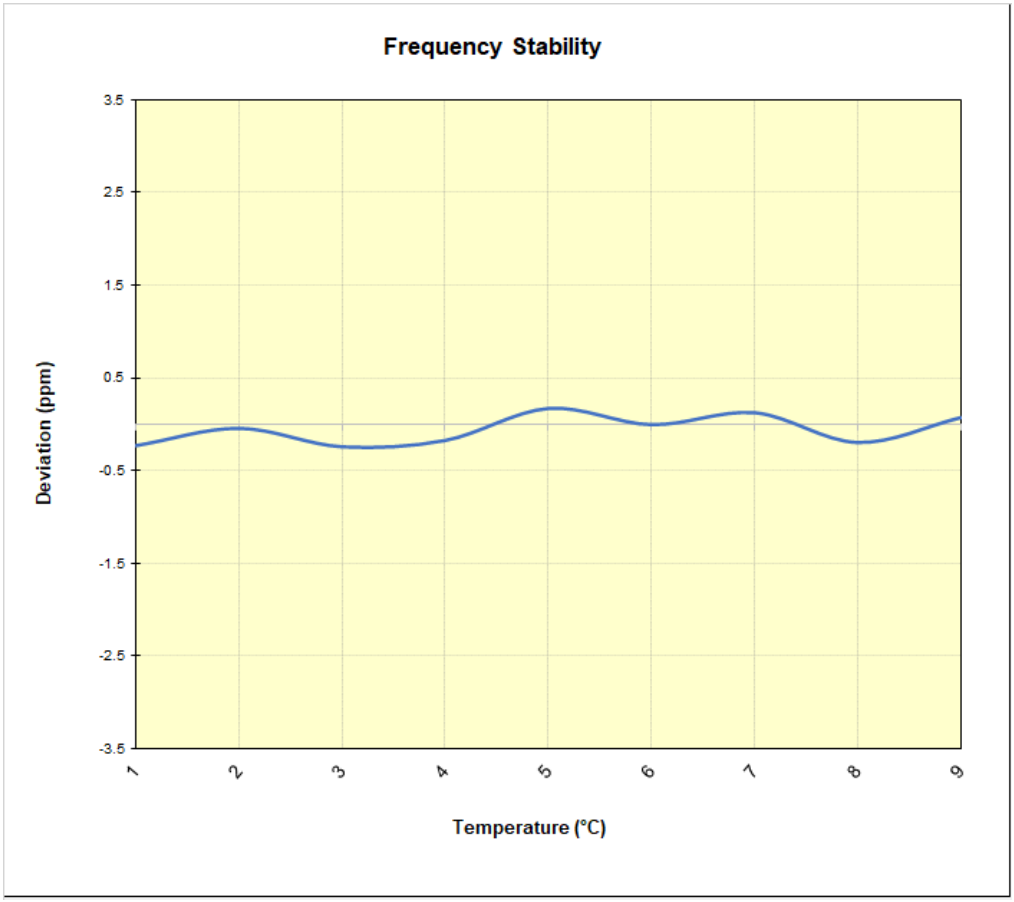


Table 7-9. CDMA BC10 Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG998U** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.