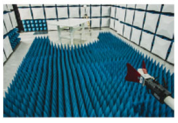
PCTEST
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com



MEASUREMENT REPORT
FCC Part 90

Applicant Name:
Microsoft Corporation
One Microsoft way
Redmond, WA, 98052
United States

Date of Testing:
5/25– 7/6/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2105200048-06-R1.C3K

FCC ID:	**C3K1995**
APPLICANT:	**Microsoft Corporation**

Application Type:	Certification
Model:	1995
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	§2.1049, §90(S), §90(R)
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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

Note: This revised Test Report (S/N: 1M2105060048-06-R1.C3K) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly

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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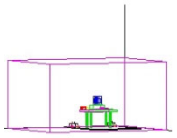
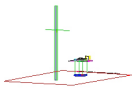


MEASUREMENT REPORT
FCC Part 22 & 90



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
LTE Band 14	10 MHz	QPSK	793.0	ERP	0.241	23.82	8M99G7D
		16QAM	793.0	ERP	0.208	23.17	8M99W7D
	5 MHz	QPSK	790.5 - 795.5	ERP	0.247	23.93	4M51G7D
		16QAM	790.5 - 795.5	ERP	0.210	23.23	4M51W7D
LTE Band 26	15 MHz	QPSK	821.5	ERP	0.142	21.51	13M5G7D
		16QAM	821.5	ERP	0.121	20.81	13M5W7D
	15 MHz	QPSK	821.5	Conducted	0.330	25.18	13M5G7D
		16QAM	821.5	Conducted	0.282	24.51	13M5W7D
	10 MHz	QPSK	819.0	Conducted	0.336	25.27	9M01G7D
		16QAM	819.0	Conducted	0.278	24.44	8M99W7D
	5 MHz	QPSK	816.5 - 821.5	Conducted	0.338	25.29	4M52G7D
		16QAM	816.5 - 821.5	Conducted	0.295	24.70	4M51W7D
	3 MHz	QPSK	815.5 - 822.5	Conducted	0.339	25.30	2M71G7D
		16QAM	815.5 - 822.5	Conducted	0.285	24.54	2M71W7D
	1.4 MHz	QPSK	814.7 - 823.3	Conducted	0.337	25.28	1M10G7D
		16QAM	814.7 - 823.3	Conducted	0.286	24.57	1M10W7D

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 **Microsoft Corporation Portable Handset FCC ID: C3K1995**. 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.

Test Device Serial No.: 45346, 48084, 47888, 46328, 50387

2.2 Device Capabilities

This device contains the following capabilities:

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

2.3 Test Configuration

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

This device supports open and closed configurations. Multiple angles are tested and the worst case radiated emissions data is shown in the report.

2.4 Software and Firmware

The firmware installed during testing was Build number developer - generic 2021.728.20.

2.5 EMI Suppression Device(s)/Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

3.2 Radiated Power and Radiated Spurious Emissions

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

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

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

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

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

For 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
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	AP1	EMC Cable and Switch System	3/9/2021	Annual	3/9/2022	AP1
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx4	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx4
-	LTx5	LIcensed Transmitter Cable Set	3/3/2021	Annual	3/3/2022	LTx5
Agilent	E5515C	Wireless Communications Test Set	N/A			GB45360985
Agilent	E5515C	Wireless Communications Test Set	N/A			GB46310798
Agilent	N9030A	50GHz PXA Signal Analyzer	1/20/2021	Annual	1/20/2022	US51350301
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6200901190
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
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
ETS Lindgren	3816/2NM	LISN	7/9/2020	Biennial	7/9/2022	00114451
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer	10/16/2020	Annual	10/16/2021	MY54490576
Keysight Technologies	N9030A	PXA Signal Analyzer	9/2/2020	Annual	9/2/2021	MY55410501
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/17/2020	Annual	9/17/2021	MY57141001
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	2/10/2021	Annual	2/10/2022	103187

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

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: Microsoft Corporation

FCC ID: C3K1995

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

Mode(s): LTE

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.	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
	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

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 EMC Software Tool Beta 8.

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.

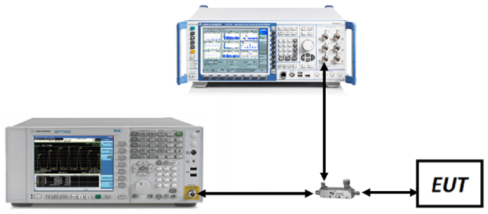
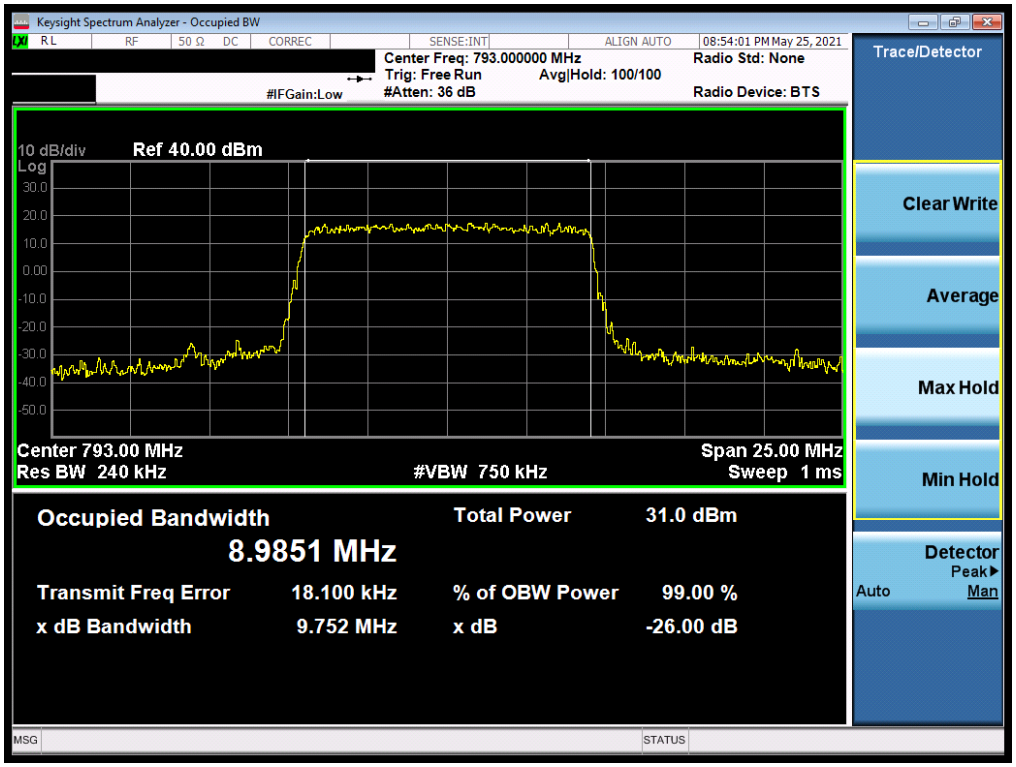


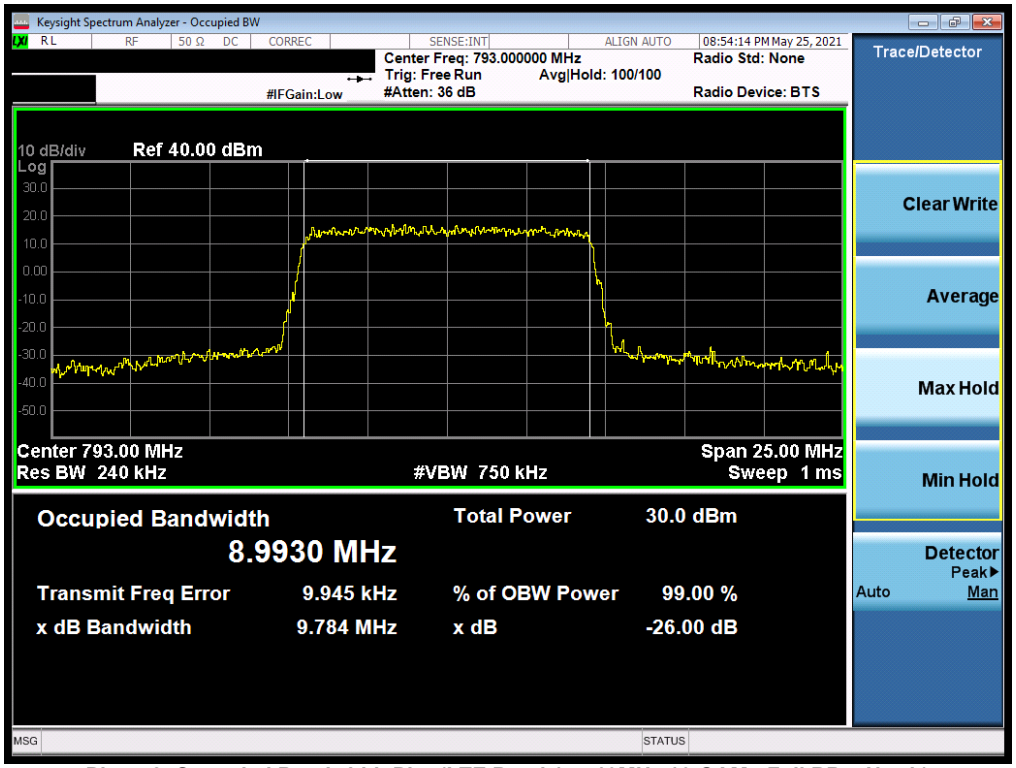
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

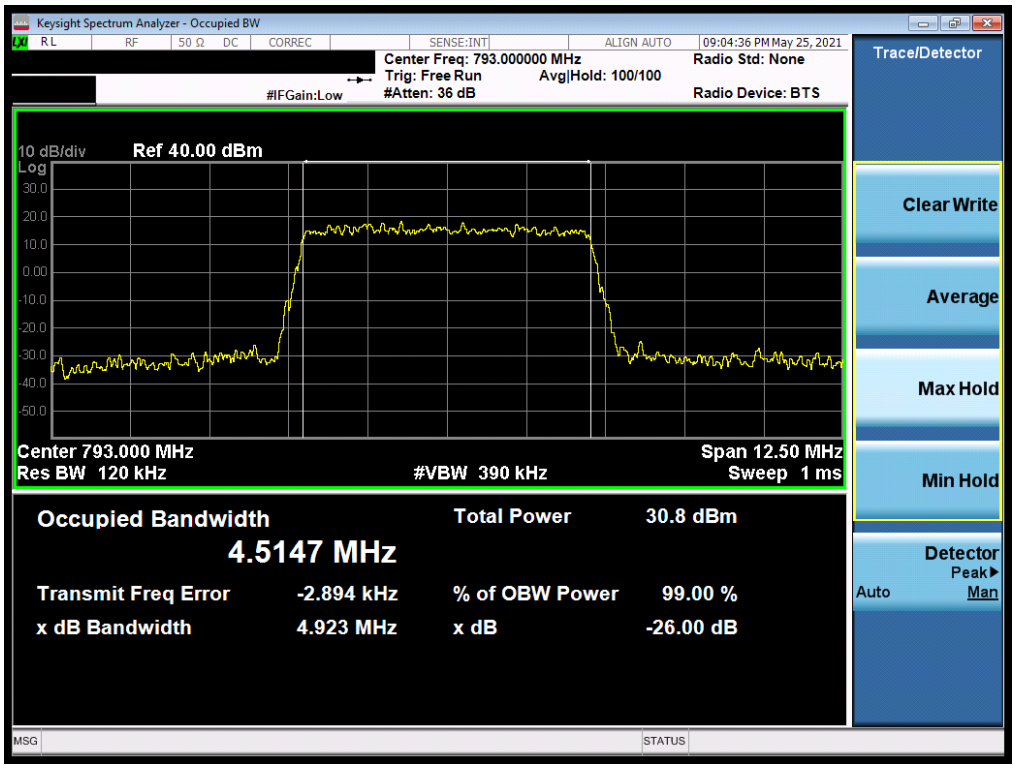
None.



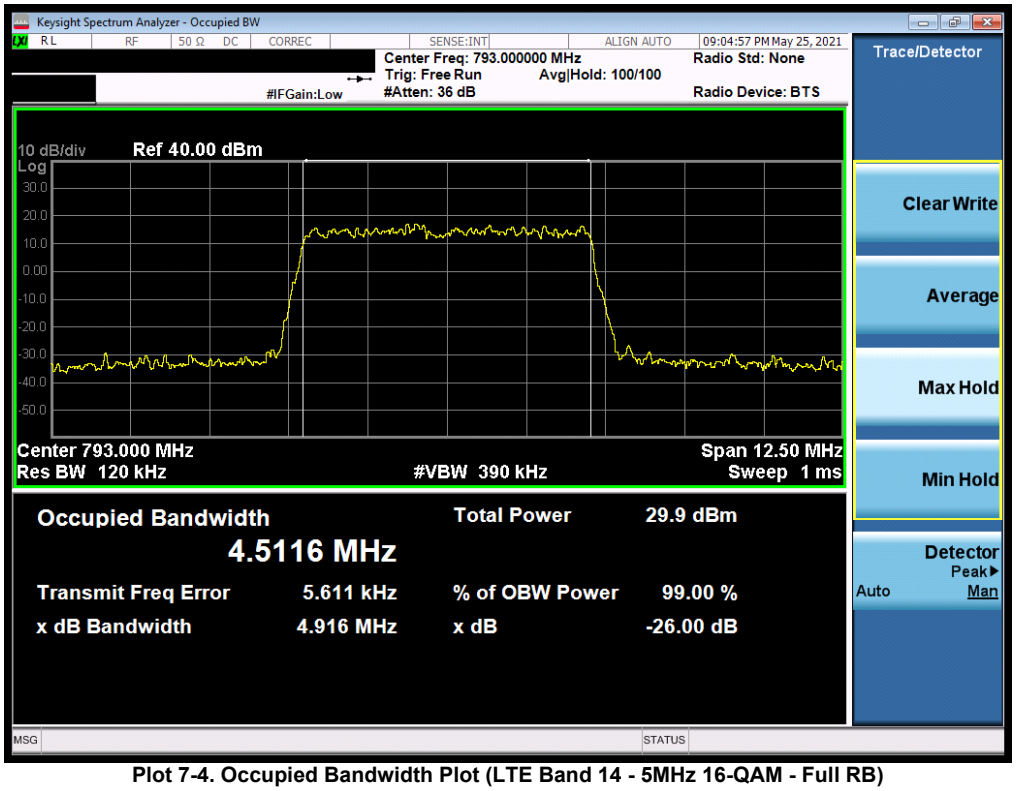
Plot 7-1. Occupied Bandwidth Plot (LTE Band 14 - 10MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 16-QAM - Full RB – North)

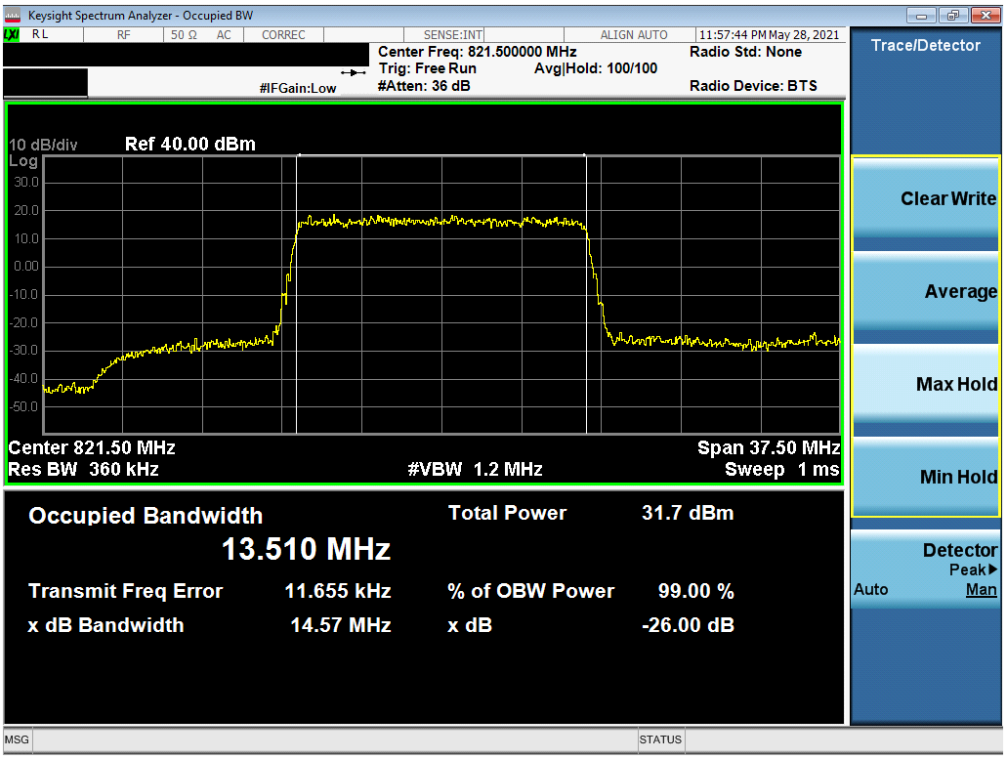


Plot 7-3. Occupied Bandwidth Plot (LTE Band 14 - 5MHz QPSK - Full RB)

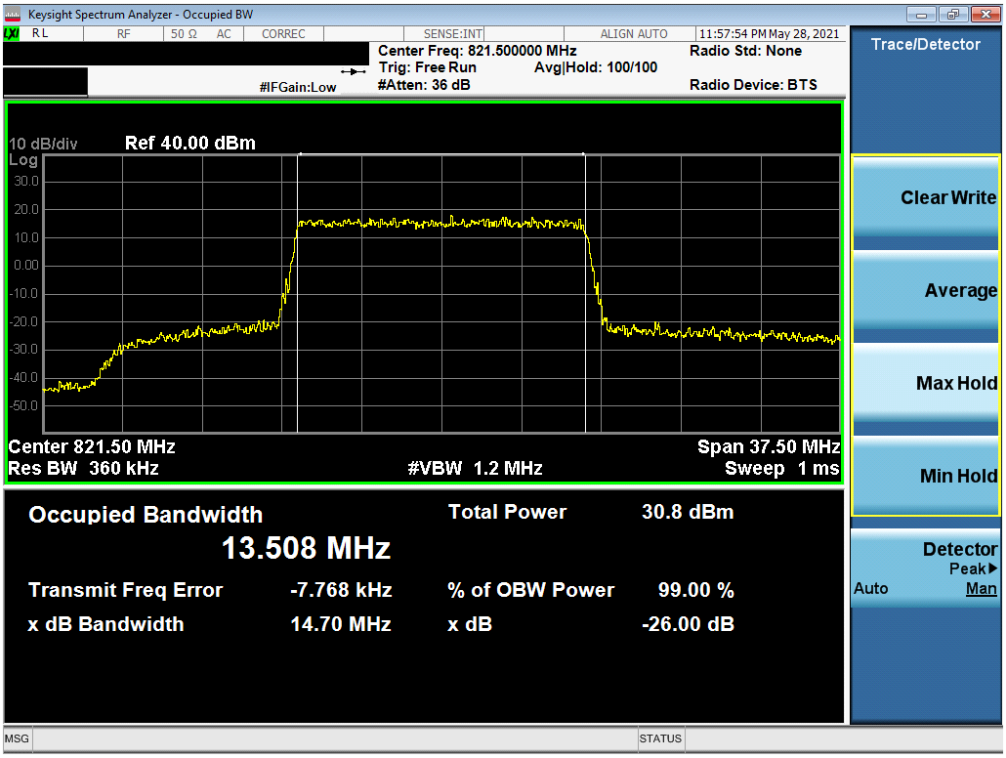


Plot 7-4. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 16-QAM - Full RB)

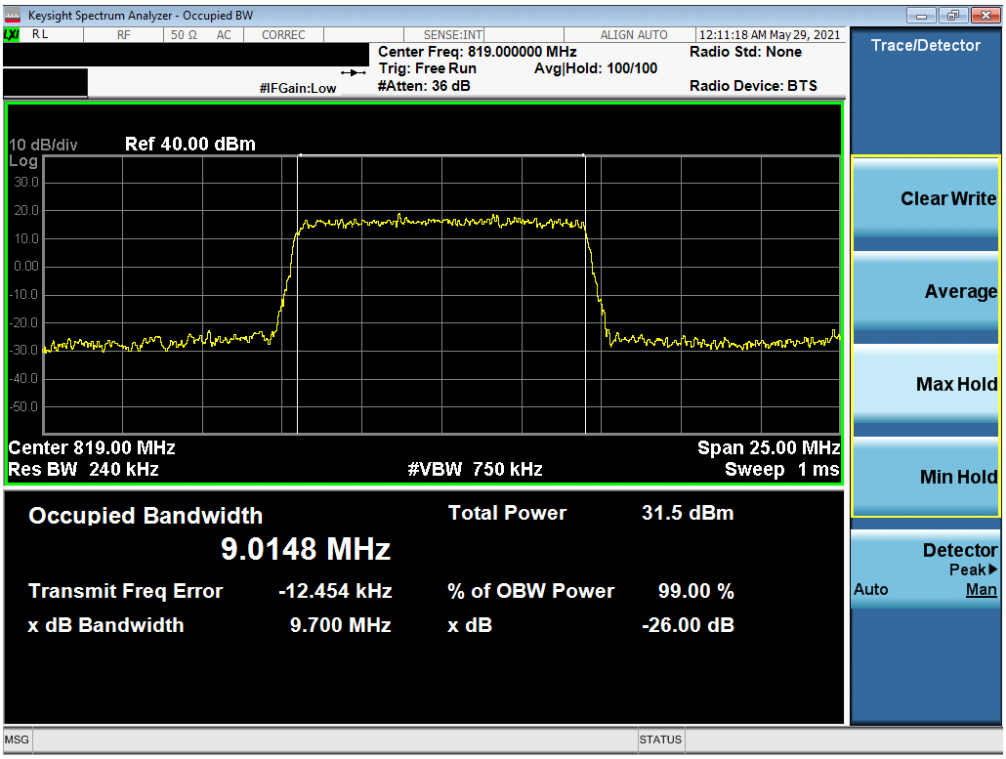
LTE Band 26



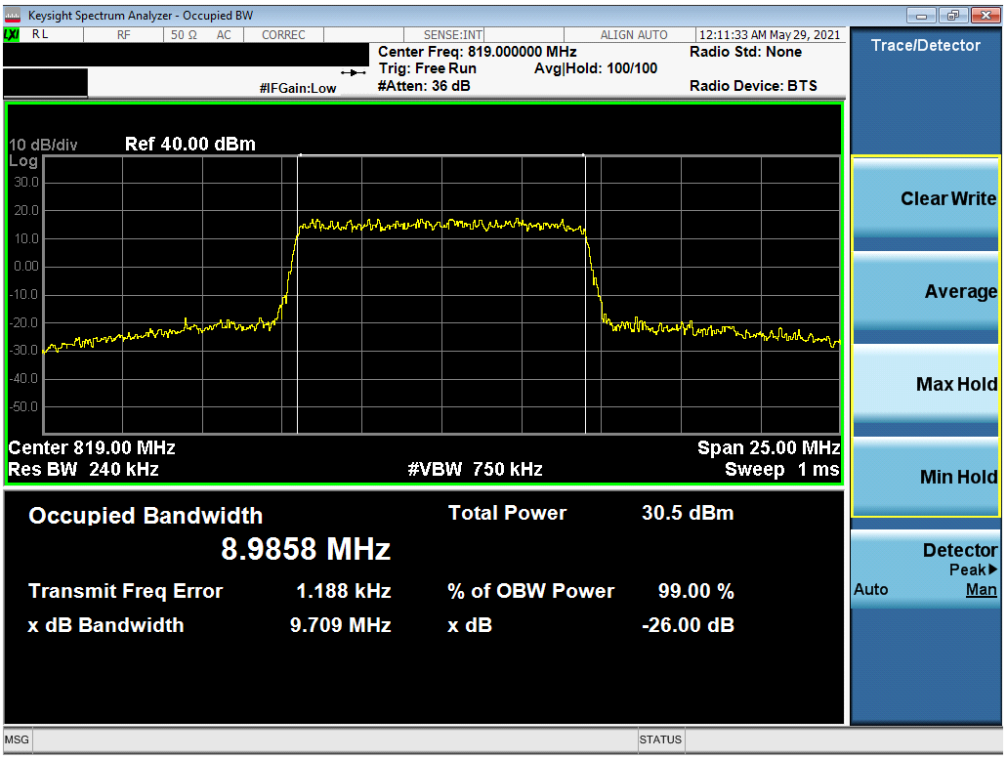
Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)



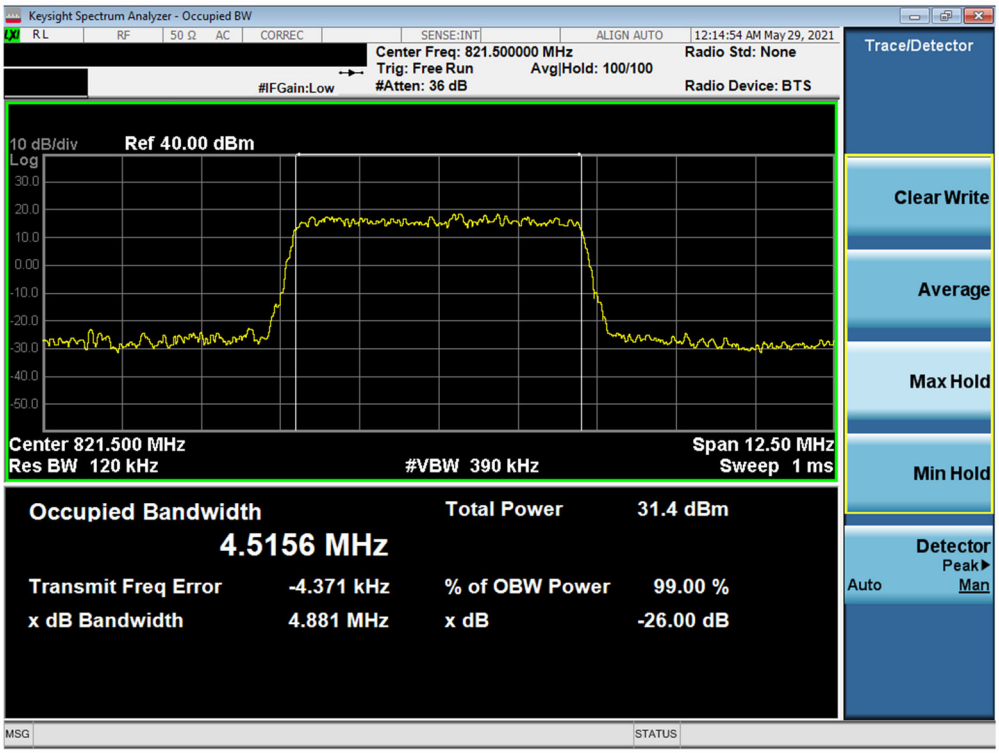
Plot 7-6. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)



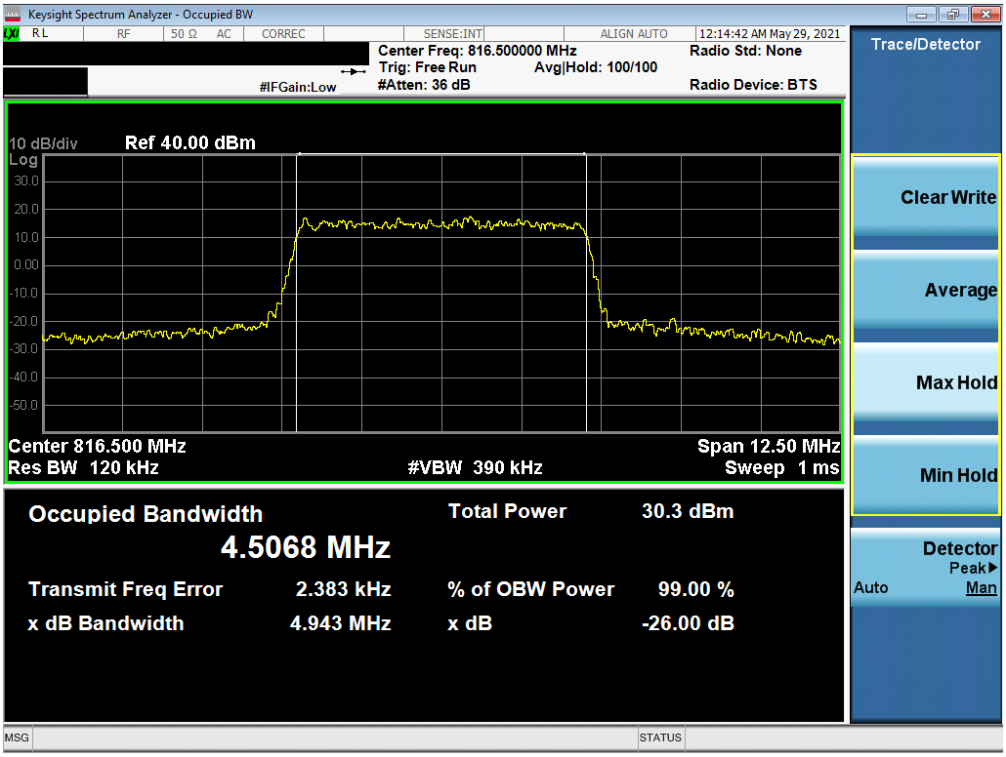
Plot 7-7. Occupied Bandwidth Plot (LTE Band 26 - 10MHz QPSK – Full RB)



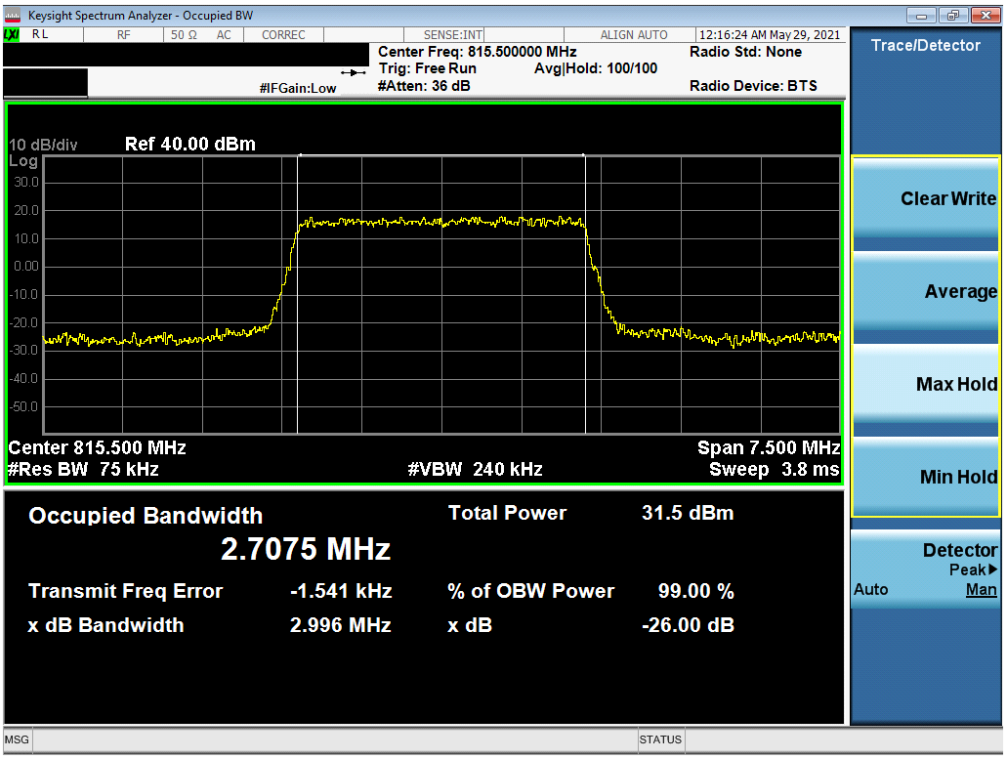
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB)



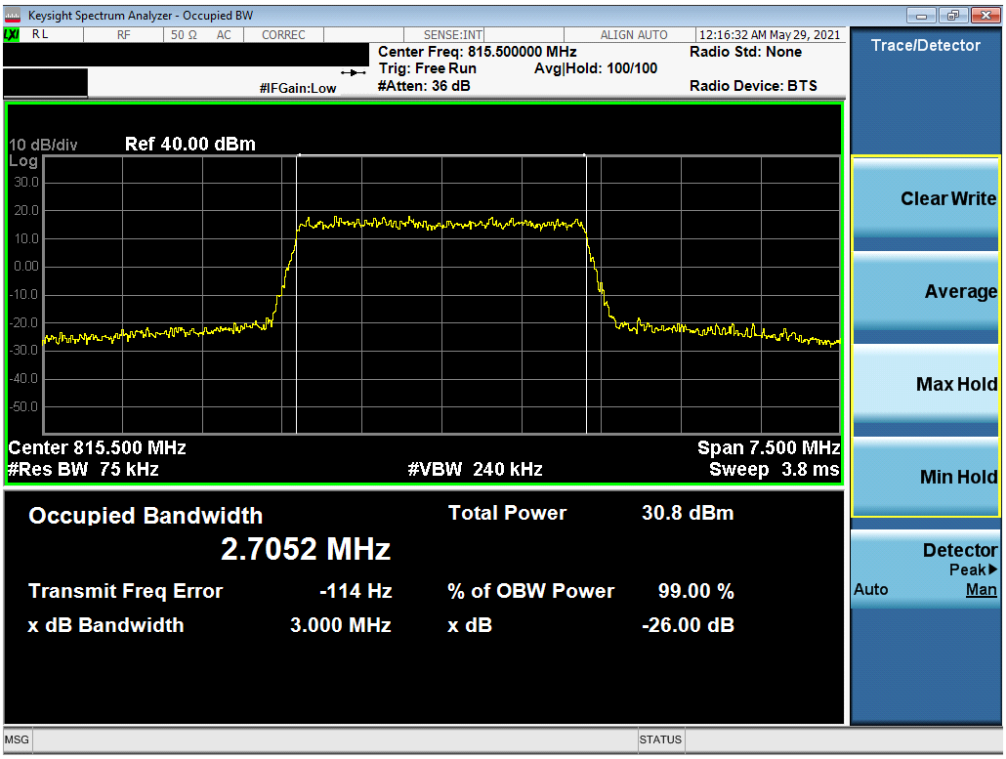
Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 5MHz QPSK - Full RB)



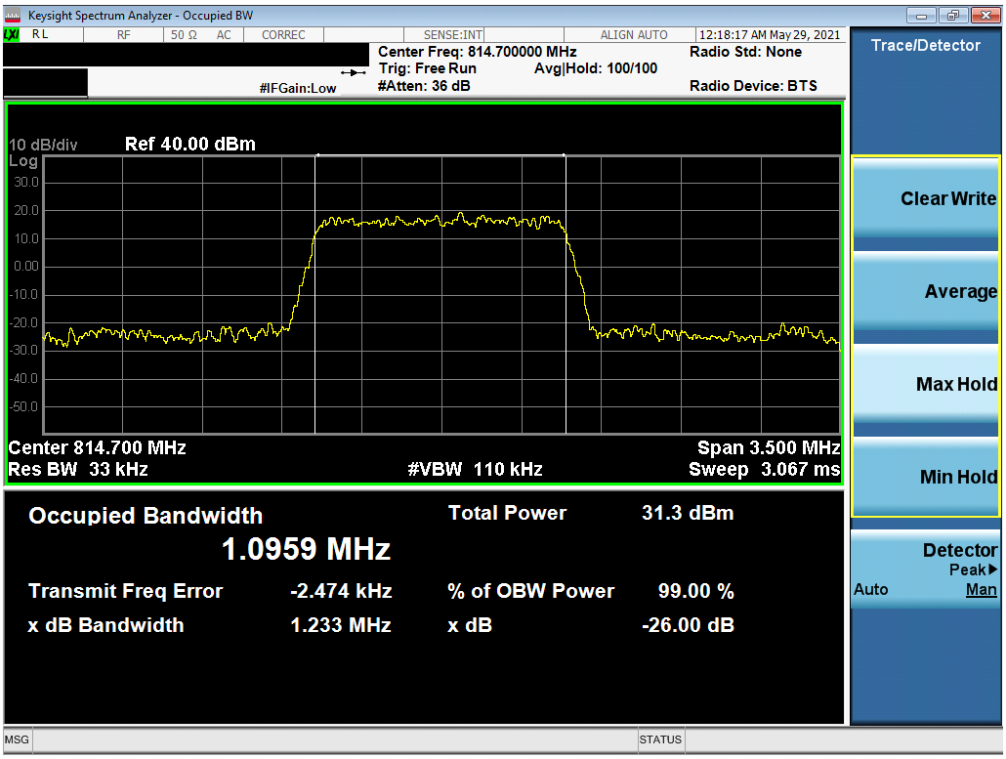
Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 16-QAM - Full RB)



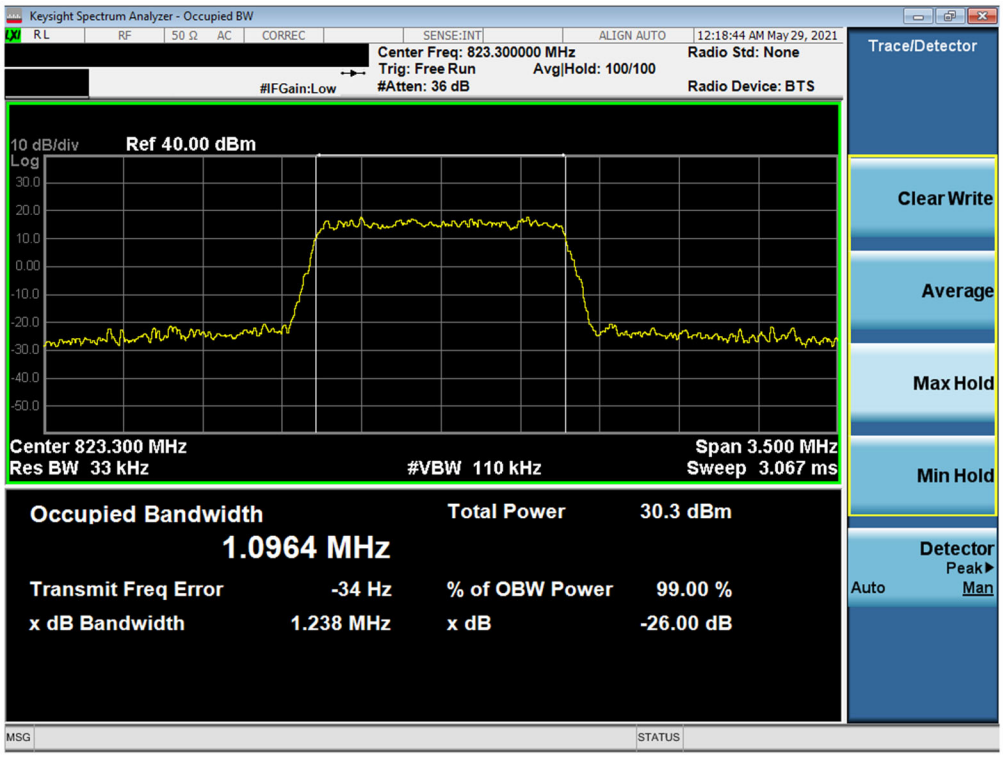
Plot 7-11. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB)



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



Plot 7-13. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB)

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. 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.

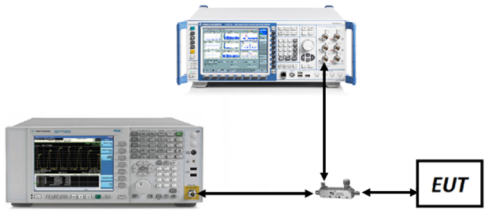
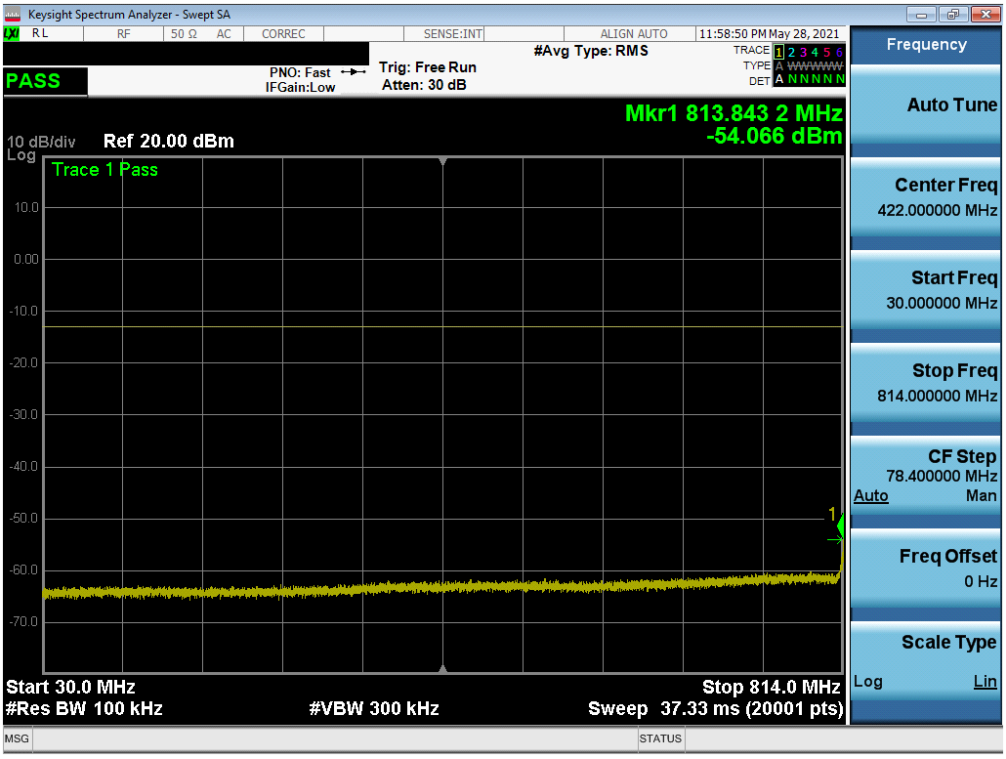
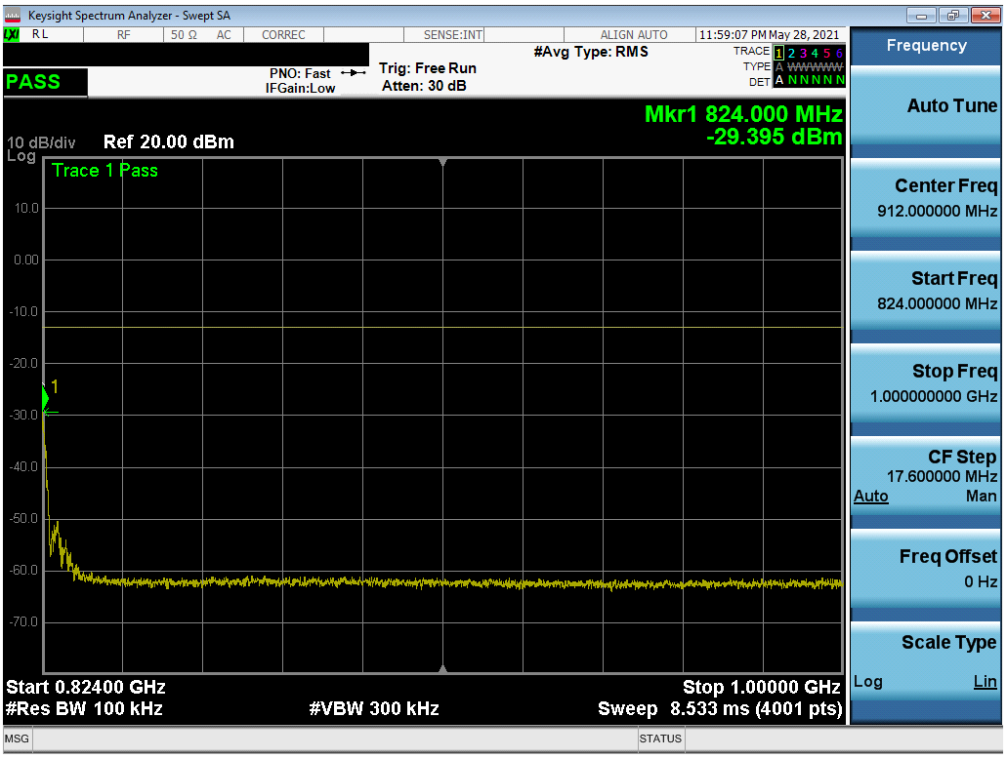


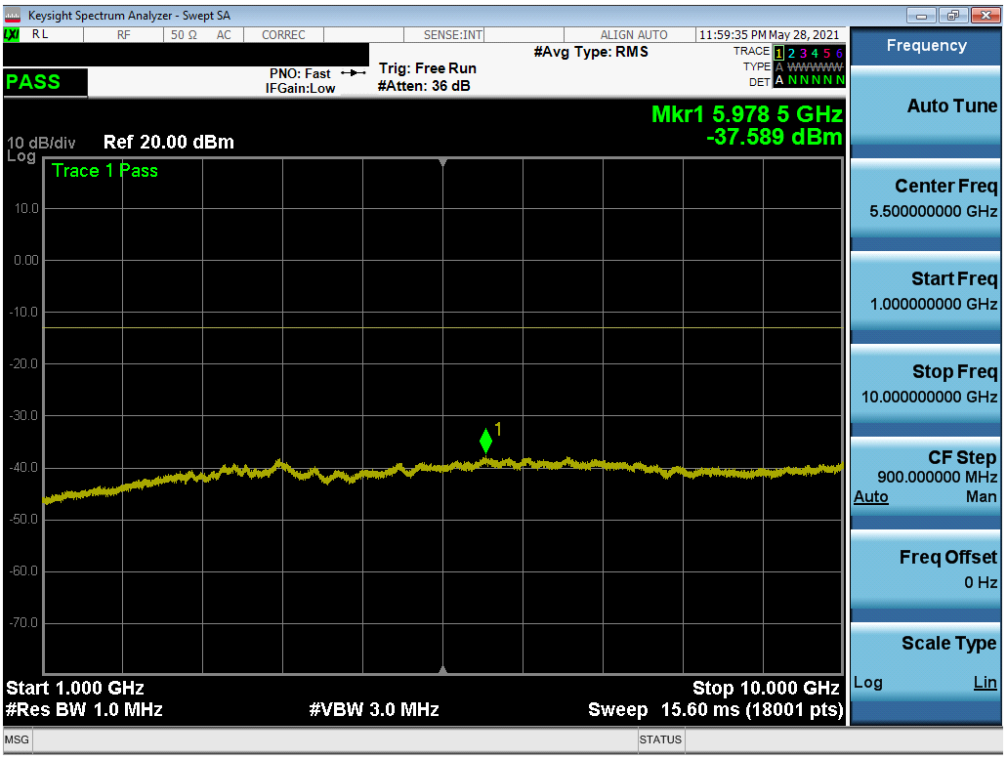
Figure 7-2. Test Instrument & Measurement Setup



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

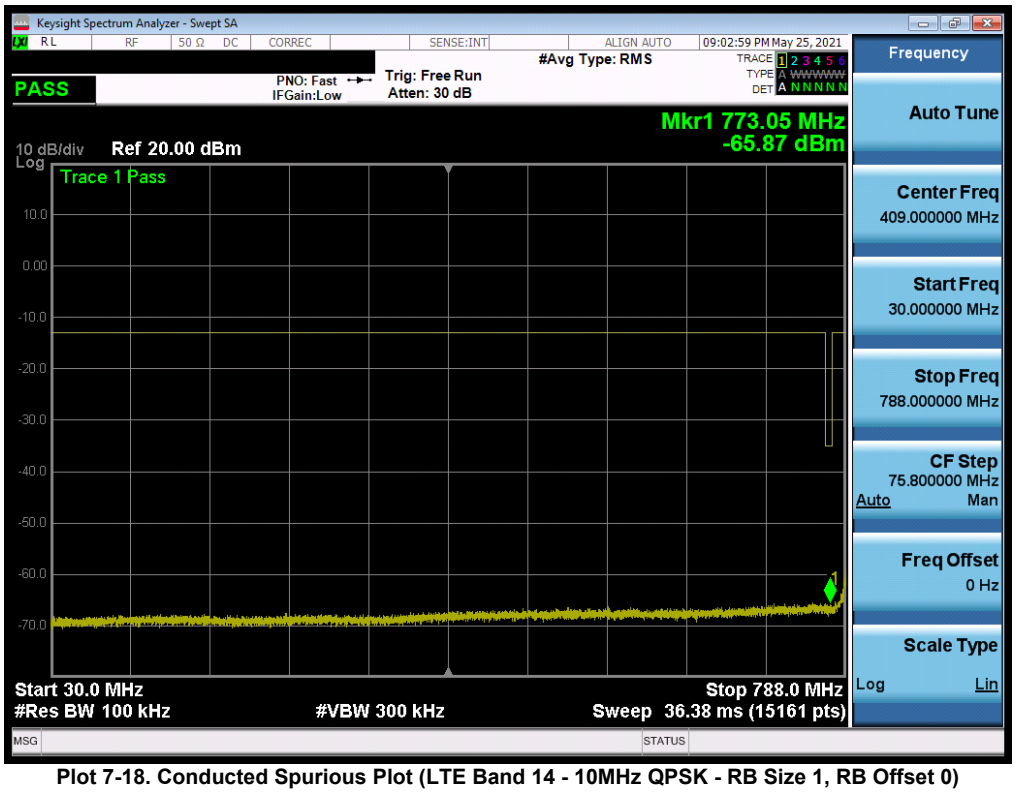


Plot 7-16. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

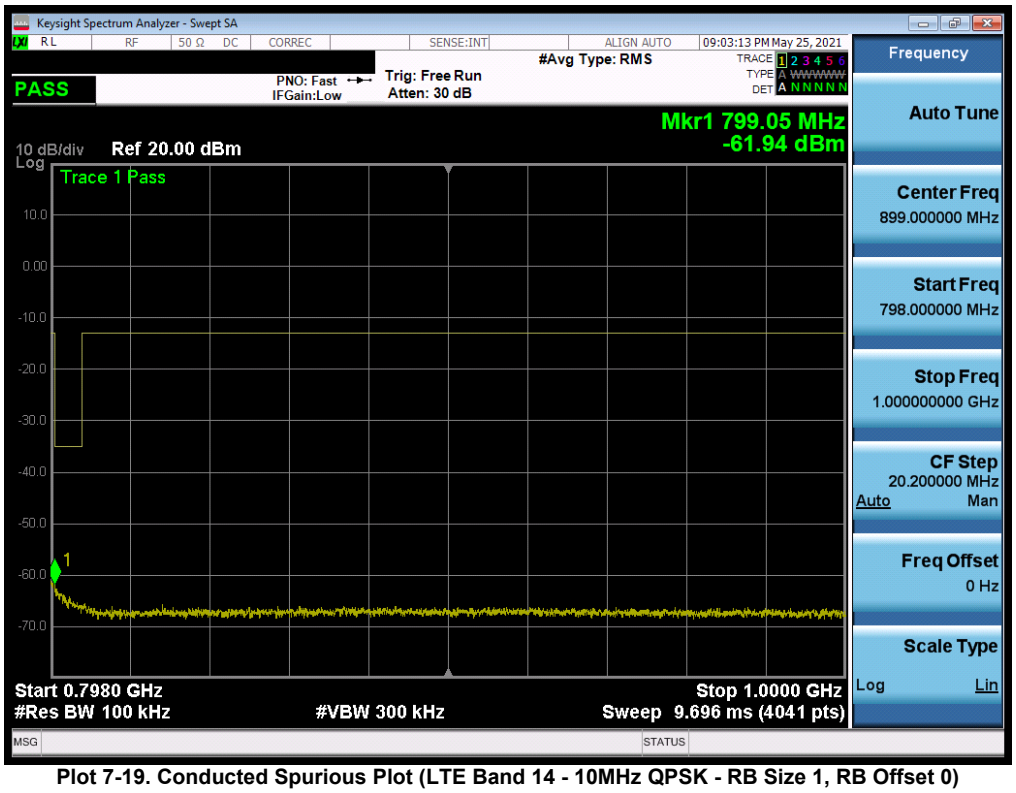


Plot 7-17. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

LTE Band 14



Plot 7-18. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)



Plot 7-19. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

Plot 7-20. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

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.

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.

For LTE B14 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 100kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Additionally, for LTE B14 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 + 10log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

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.

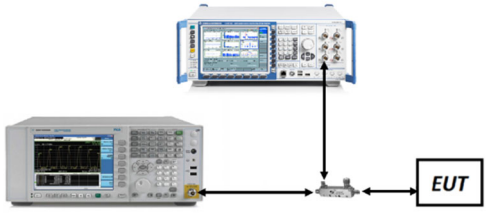


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

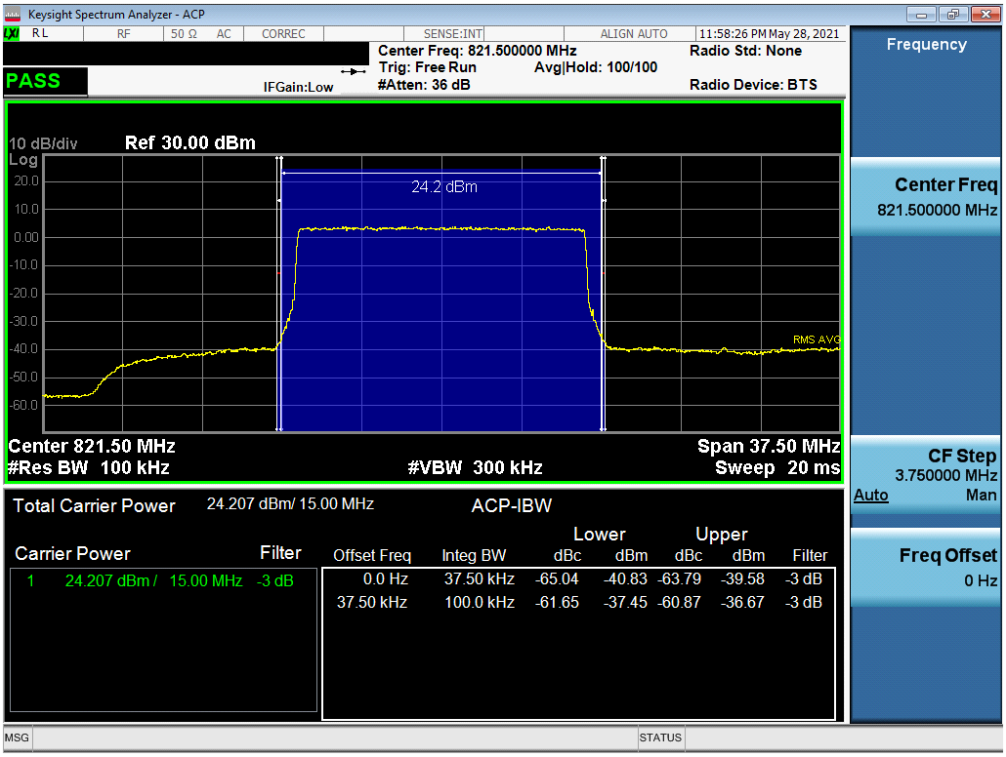
1) For channel edge emission, the signal analyzer's "ACP" measurement capability is used.

2) Per 90.543(e)(5) for B14 operations, in the 100kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30kHz may be employed.

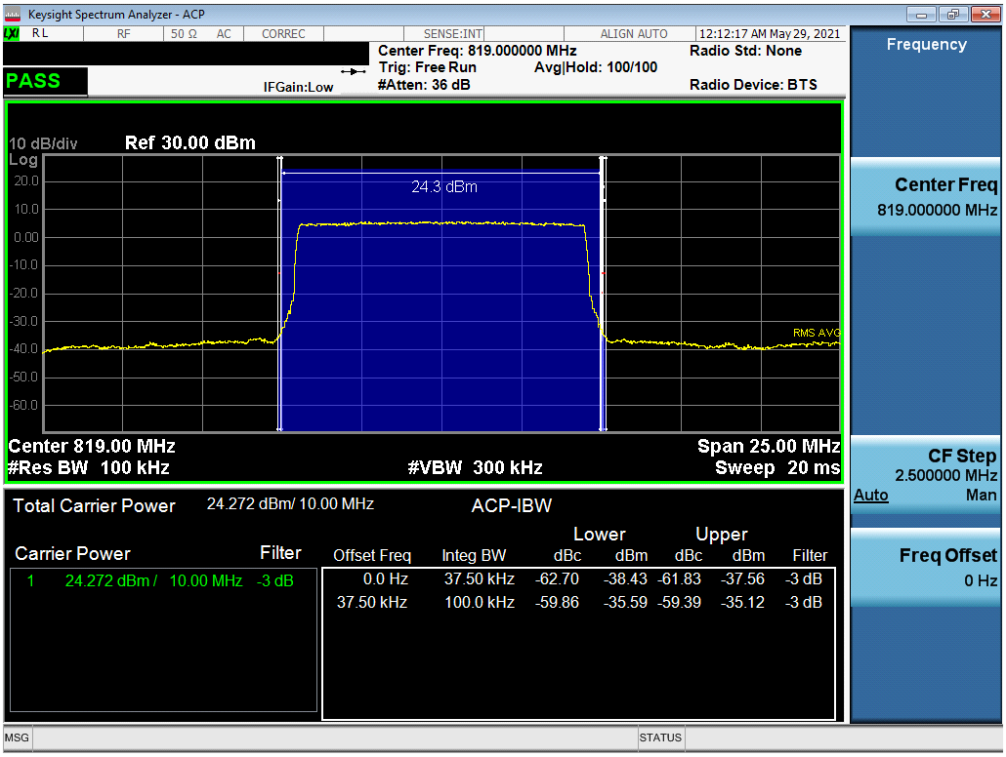
3) For LTE Band 14 operation under Part 90.543, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

4) 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.

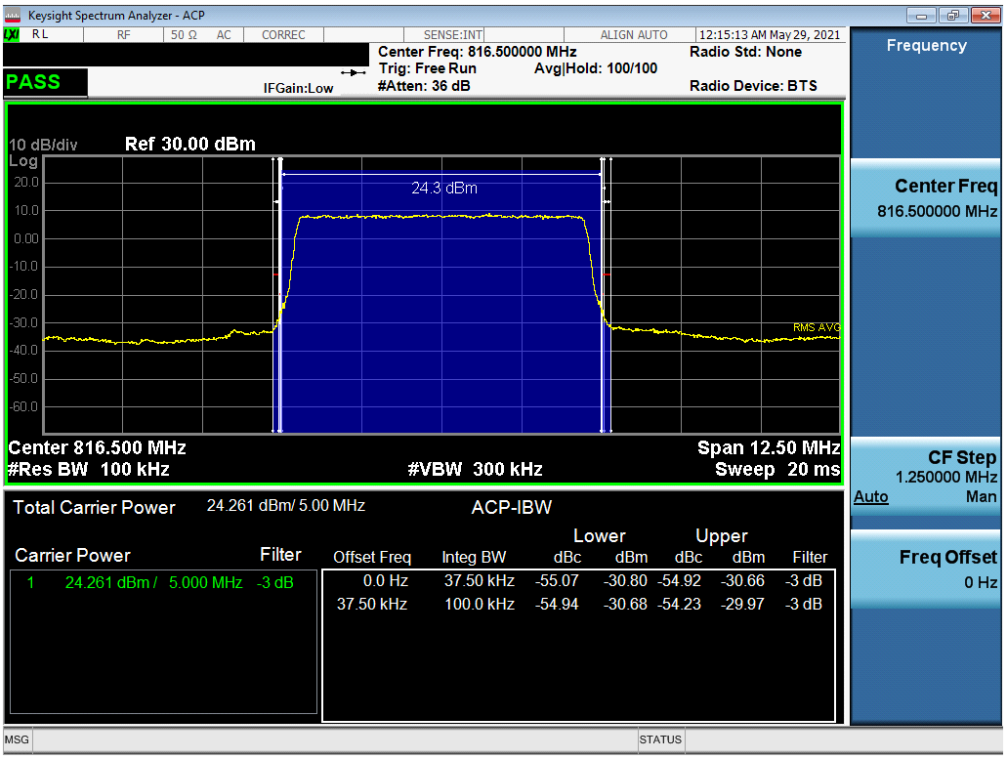
LTE Band 26



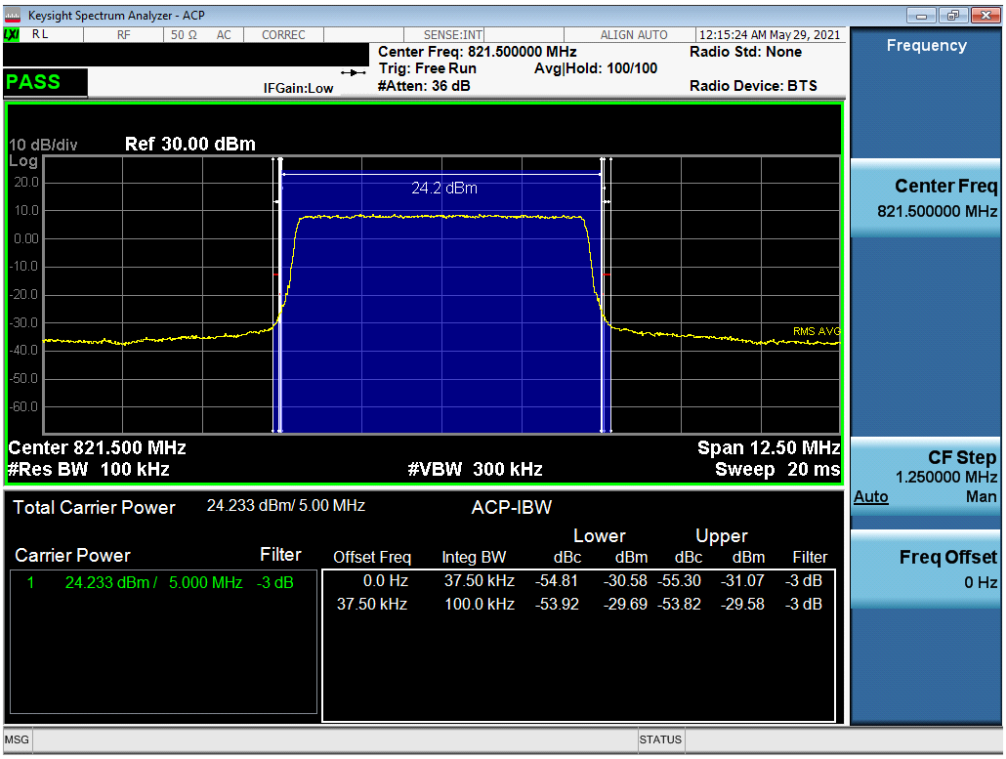
Plot 7-21. Channel Edge Plot (LTE Band 26 - 15MHz QPSK - Mid Channel)



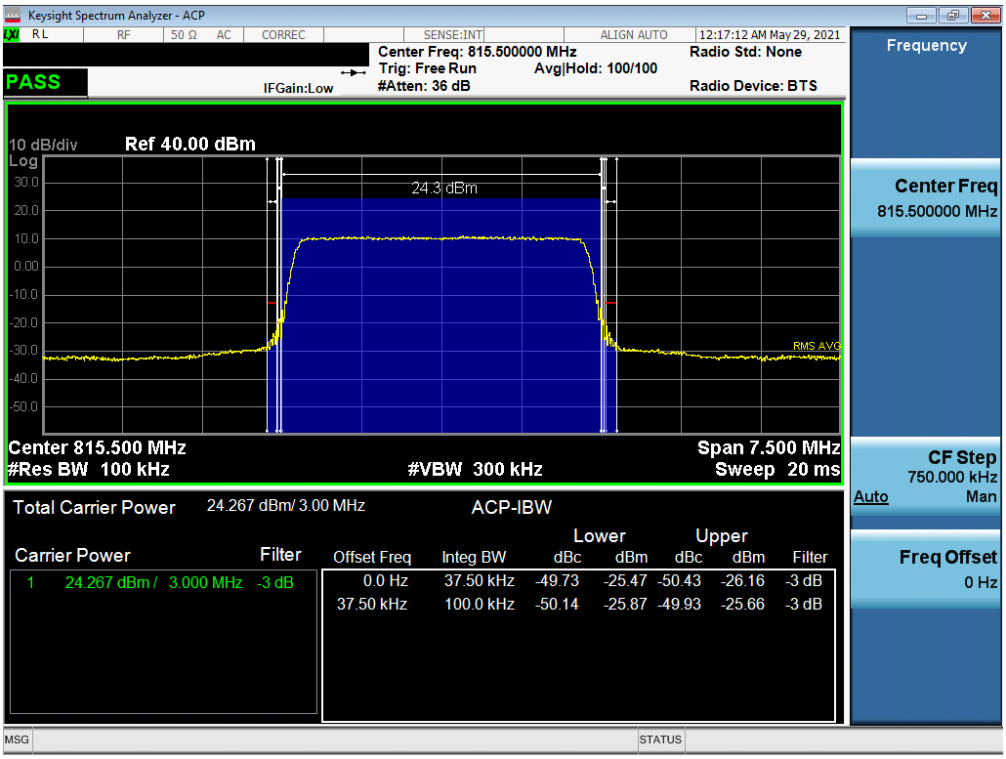
Plot 7-22. Channel Edge Plot (LTE Band 26 - 10MHz QPSK - Mid Channel)



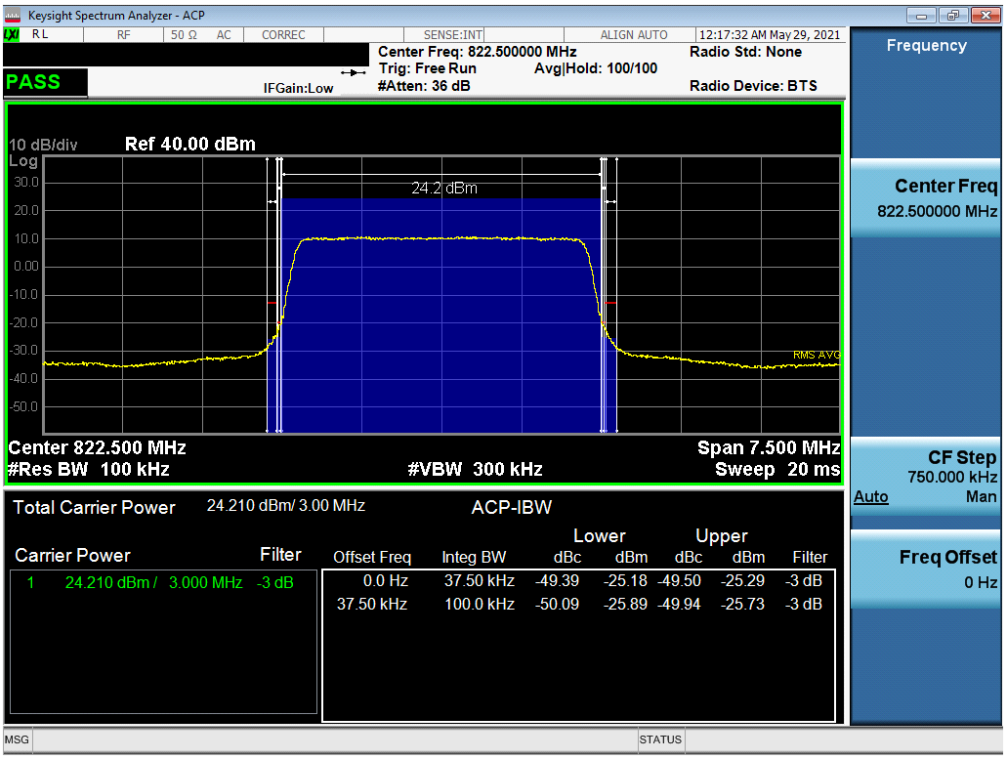
Plot 7-23. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - Low Channel)



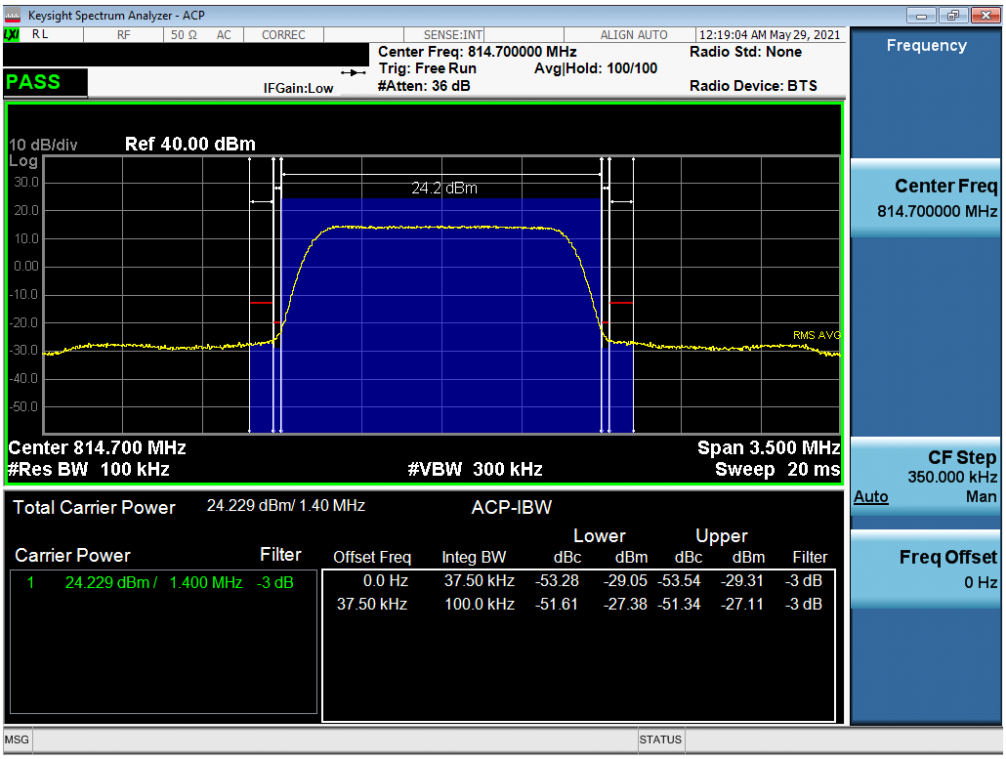
Plot 7-24. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - High Channel)



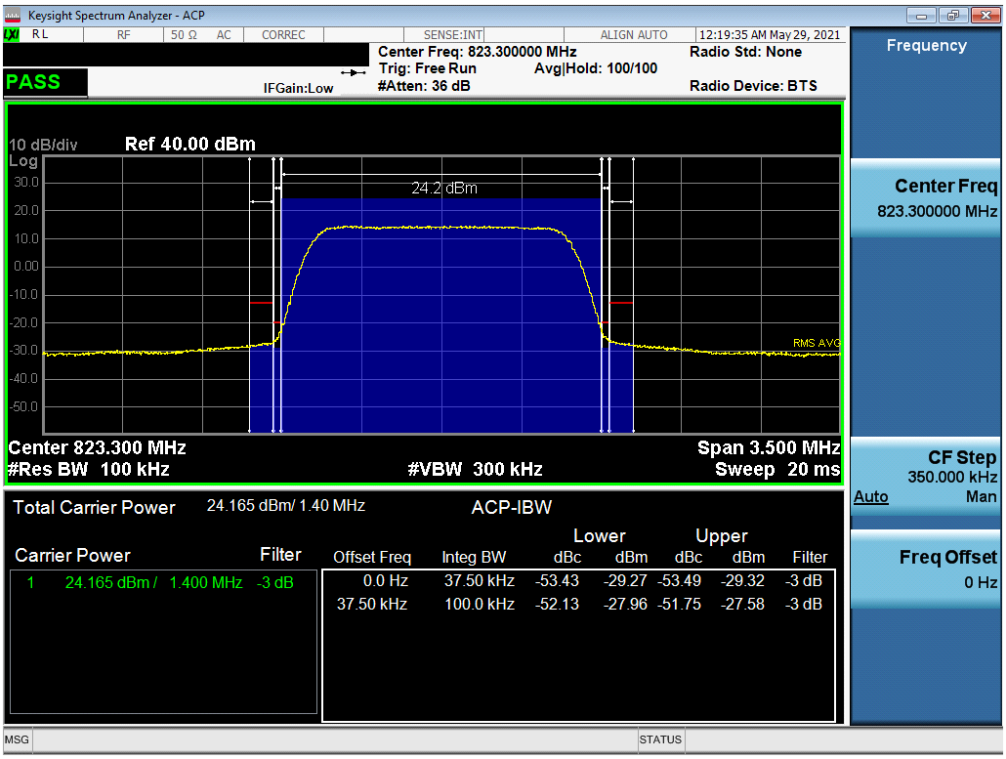
Plot 7-25. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - Low Channel)



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

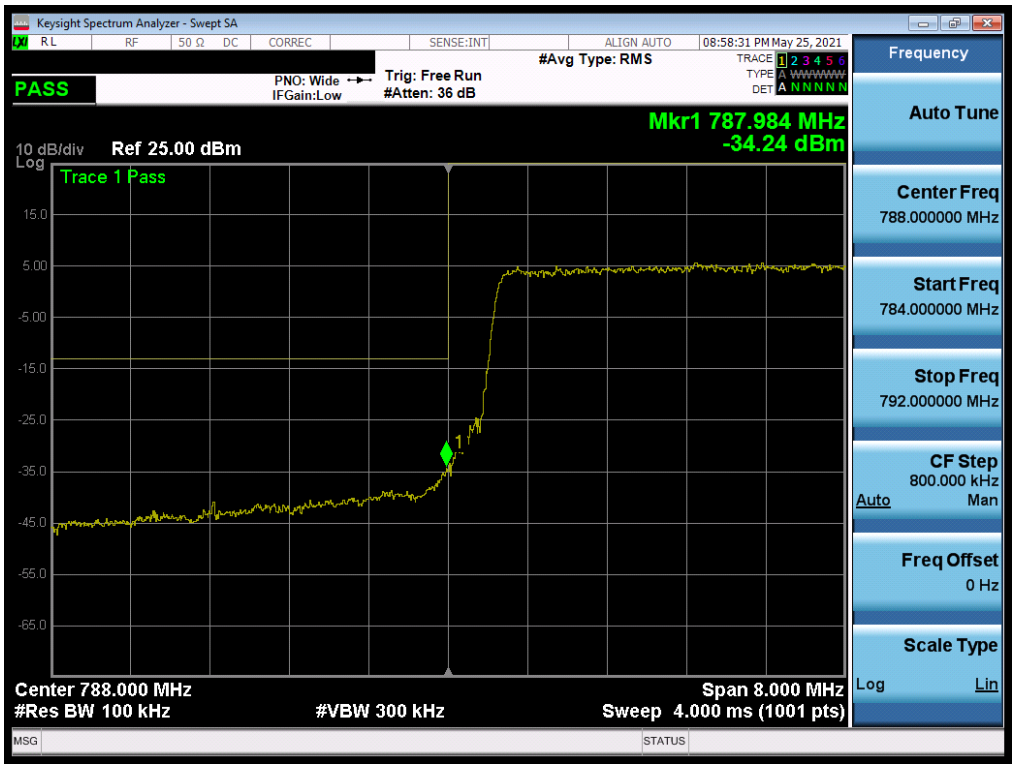


Plot 7-27. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - Low Channel)

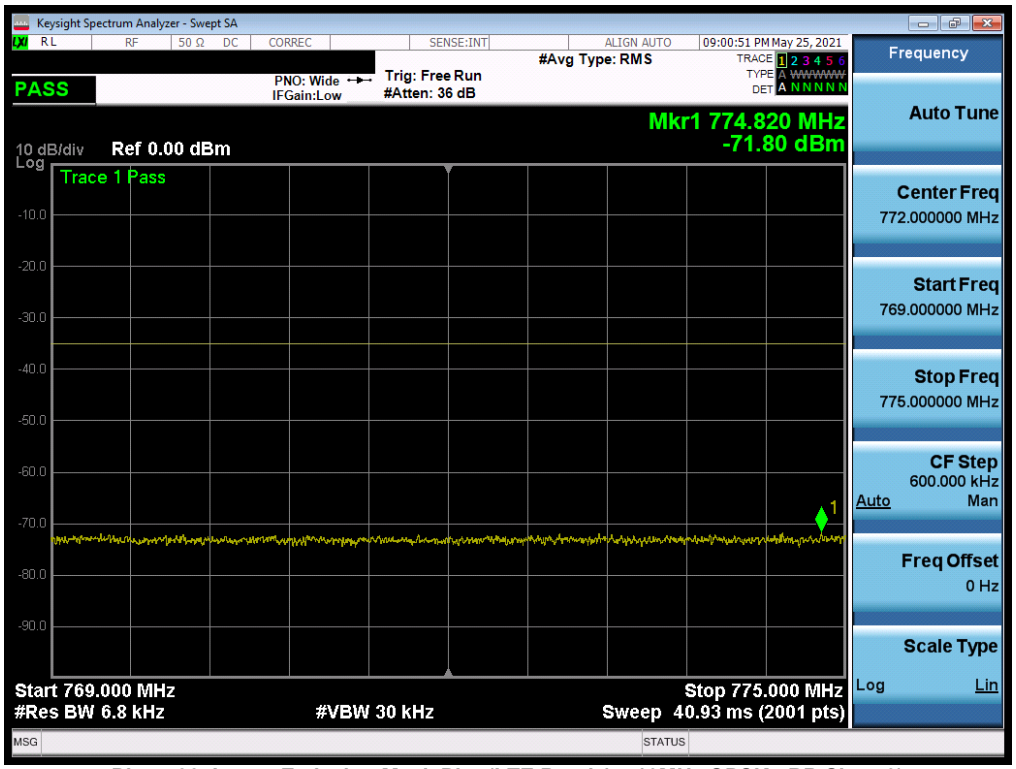


Plot 7-28. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - High Channel)

LTE Band 14

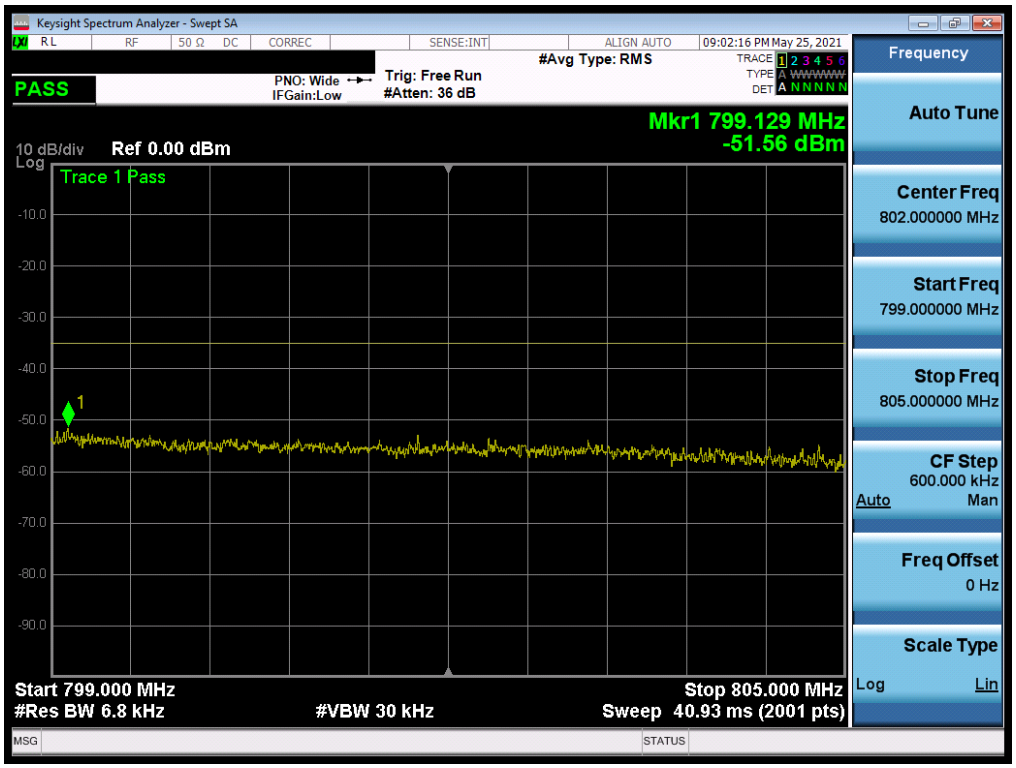


Plot 7-29. Lower Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)

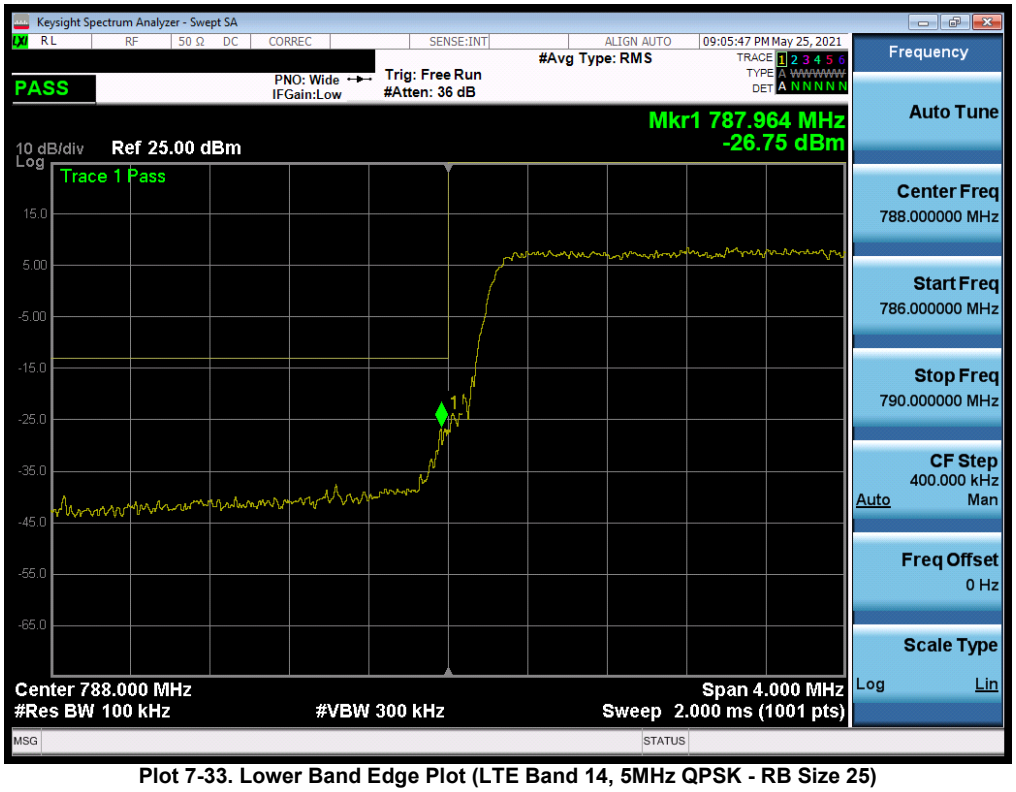


Plot 7-30. Lower Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)

Plot 7-31. Upper Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



Plot 7-32. Upper Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



Plot 7-33. Lower Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

Plot 7-34. Lower Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

Plot 7-35. Upper Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

Plot 7-36. Upper Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

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 / 0	25.18	0.330	50.00	-24.82
	16-QAM	26765	821.5	1 / 0	24.51	0.282	50.00	-25.49
10 MHz	QPSK	26740	819.0	1 / 25	25.27	0.336	50.00	-24.73
	16-QAM	26740	819.0	1 / 0	24.44	0.278	50.00	-25.56
5 MHz	QPSK	26715	816.5	1 / 12	25.29	0.338	50.00	-24.71
		26765	821.5	1 / 12	25.27	0.336	50.00	-24.73
	16-QAM	26715	816.5	1 / 12	24.70	0.295	50.00	-25.30
		26765	821.5	1 / 0	24.55	0.285	50.00	-25.45
3 MHz	QPSK	26705	815.5	1 / 7	25.30	0.339	50.00	-24.70
		26775	822.5	1 / 7	25.30	0.339	50.00	-24.70
	16-QAM	26705	815.5	1 / 7	24.54	0.285	50.00	-25.46
		26775	822.5	1 / 14	24.43	0.277	50.00	-25.57
1.4 MHz	QPSK	26697	814.7	1 / 3	25.28	0.337	50.00	-24.72
		26783	823.3	1 / 3	25.24	0.334	50.00	-24.76
	16-QAM	26697	814.7	1 / 3	24.45	0.279	50.00	-25.55
		26783	823.3	1 / 3	24.57	0.286	50.00	-25.43

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

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 / 37	23.90	0.245	50.00	-26.10
	16-QAM	26765	821.5	1 / 37	23.80	0.240	50.00	-26.20
10 MHz	QPSK	26740	819.0	1 / 0	23.87	0.244	50.00	-26.13
	16-QAM	26740	819.0	1 / 0	24.04	0.253	50.00	-25.96
5 MHz	QPSK	26715	816.5	1 / 12	23.96	0.249	50.00	-26.04
		26765	821.5	1 / 12	23.87	0.244	50.00	-26.13
	16-QAM	26715	816.5	1 / 24	24.23	0.265	50.00	-25.77
		26765	821.5	1 / 0	23.97	0.250	50.00	-26.03
3 MHz	QPSK	26705	815.5	1 / 7	24.04	0.253	50.00	-25.96
		26775	822.5	1 / 0	23.90	0.245	50.00	-26.10
	16-QAM	26705	815.5	1 / 7	24.08	0.256	50.00	-25.92
		26775	822.5	1 / 0	23.96	0.249	50.00	-26.04
1.4 MHz	QPSK	26697	814.7	1 / 3	23.98	0.250	50.00	-26.02
		26783	823.3	1 / 0	23.86	0.243	50.00	-26.14
	16-QAM	26697	814.7	1 / 0	24.03	0.253	50.00	-25.97
		26783	823.3	1 / 3	23.98	0.250	50.00	-26.02

Table 7-3. Conducted Power Output Data (LTE Band 26)

NOTES:

1. 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.

2. This unit was tested with its standard battery.

7.6 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. 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.

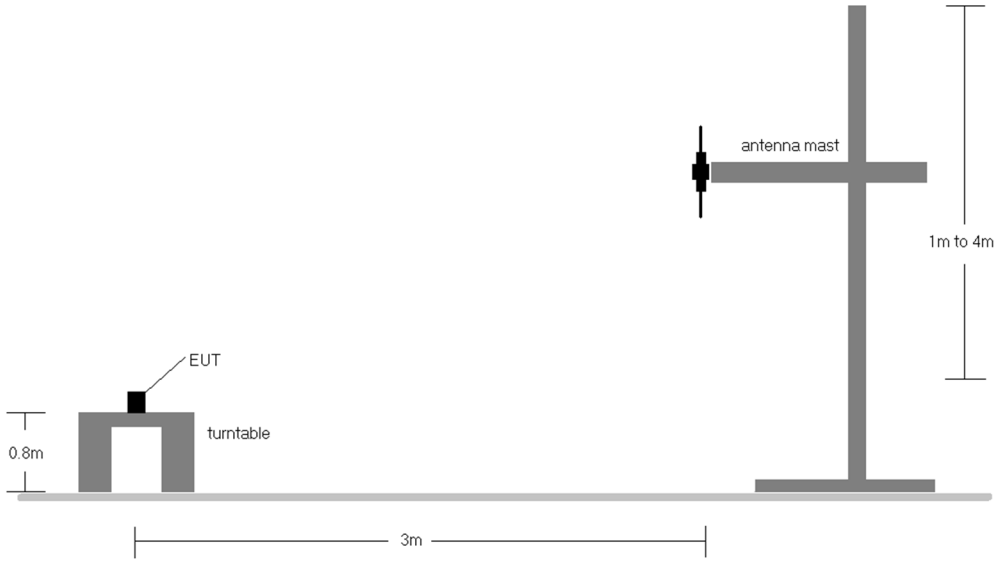


Figure 7-4. Radiated Test Setup <1GHz

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.

2) This unit was tested with its standard battery.

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	157	56	6.12	1 / 0	17.54	**21.51**	0.142	38.45	-16.94
	16-QAM	821.5	V	157	56	6.12	1 / 0	16.84	20.81	0.121	38.45	-17.64
	QPSK	821.5	H	220	106	6.62	1 / 0	16.73	21.20	0.132	38.45	-17.25
	QPSK (Half Open)	821.5	v	161	123	6.12	1 / 0	16.72	20.69	0.117	38.45	-17.76

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

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	115	72	6.12	1 / 0	16.70	**20.67**	0.117	38.45	-17.78
	16-QAM	821.5	V	115	72	6.12	1 / 0	16.20	20.17	0.104	38.45	-18.28
	QPSK	821.5	H	100	119	6.12	1 / 3	15.25	19.22	0.084	38.45	-19.23
	QPSK (Half Open)	821.5	V	116	128	6.12	1 / 3	16.08	20.05	0.101	38.45	-18.40

Table 7-5. ERP Data (LTE Band 26 – North - Open)

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	H	238	107	6.41	1 / 25	18.83	**23.09**	0.204	34.77	-11.68
	16-QAM	793.0	H	238	107	6.41	1 / 49	17.63	21.89	0.155	34.77	-12.88
5 MHz	QPSK	790.5	H	238	107	6.39	1 / 24	19.05	**23.29**	0.213	34.77	-11.49
		793.0	H	238	107	6.41	1 / 12	18.80	23.07	0.203	34.77	-11.70
		795.5	H	238	107	6.44	1 / 0	18.88	23.17	0.207	34.77	-11.60
	16-QAM	790.5	H	238	107	6.39	1 / 12	18.01	22.25	0.168	34.77	-12.52
10 MHz	QPSK	795.5	V	145	55	6.21	1 / 25	18.42	22.48	0.177	34.77	-12.29
	QPSK (Half Open)	790.5	V	144	125	6.21	1 / 49	18.93	22.99	0.199	34.77	-11.78

Table 7-6. ERP Data (LTE Band 14 – South - Open)

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	H	100	116	6.41	1 / 49	19.56	**23.82**	0.241	34.77	-10.95
	16-QAM	793.0	H	100	116	6.41	1 / 25	18.91	23.17	0.208	34.77	-11.60
5 MHz	QPSK	790.5	H	100	116	6.39	1 / 12	19.67	23.91	0.246	34.77	-10.86
		793.0	H	100	116	6.41	1 / 12	19.66	**23.93**	0.247	34.77	-10.84
		795.5	H	100	116	6.44	1 / 0	19.58	23.87	0.244	34.77	-10.90
	16-QAM	795.5	H	100	116	6.44	1 / 12	18.93	23.23	0.210	34.77	-11.54
10 MHz	QPSK	795.5	V	130	163	6.21	1 / 12	18.11	22.17	0.165	34.77	-12.60
	QPSK (Half Open)	790.5	H	100	113	6.41	1 / 12	18.80	23.06	0.203	34.77	-11.71

Table 7-7. ERP Data (LTE Band 14 – North - Open)

7.7 Radiated Spurious Emissions Measurements

Test Overview

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

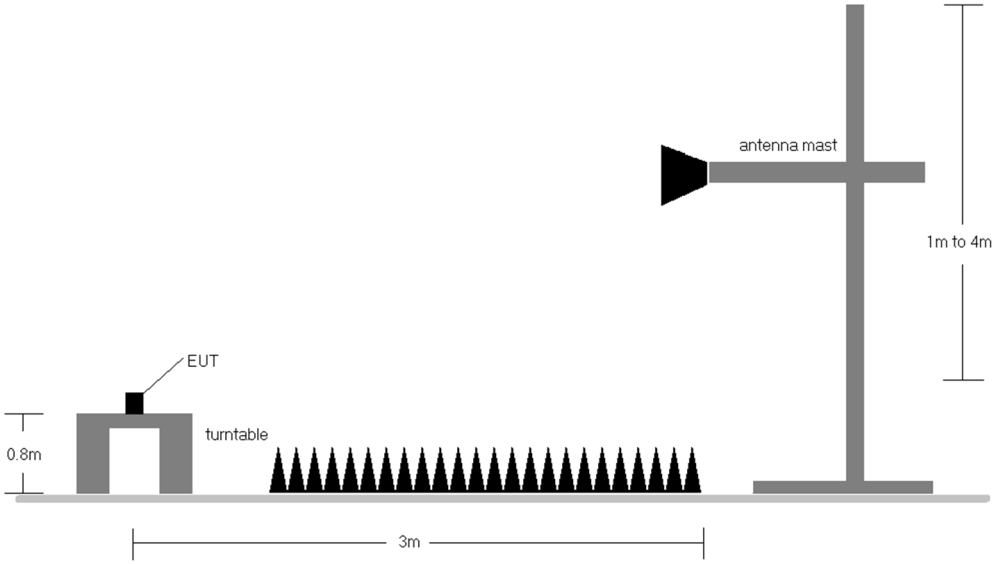


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1. For 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.

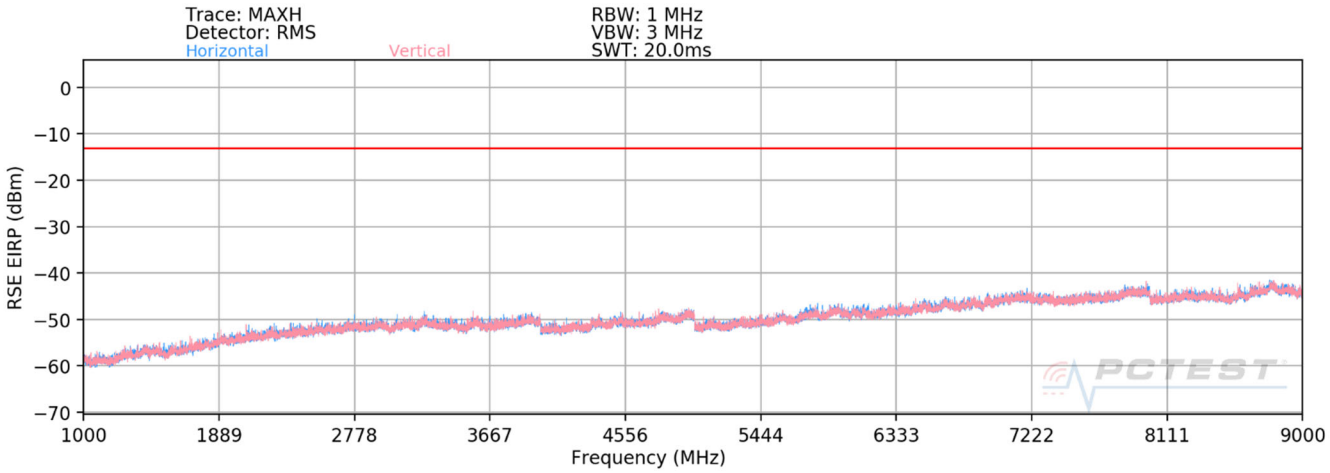
2. This unit was tested with its standard battery.

3. 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.

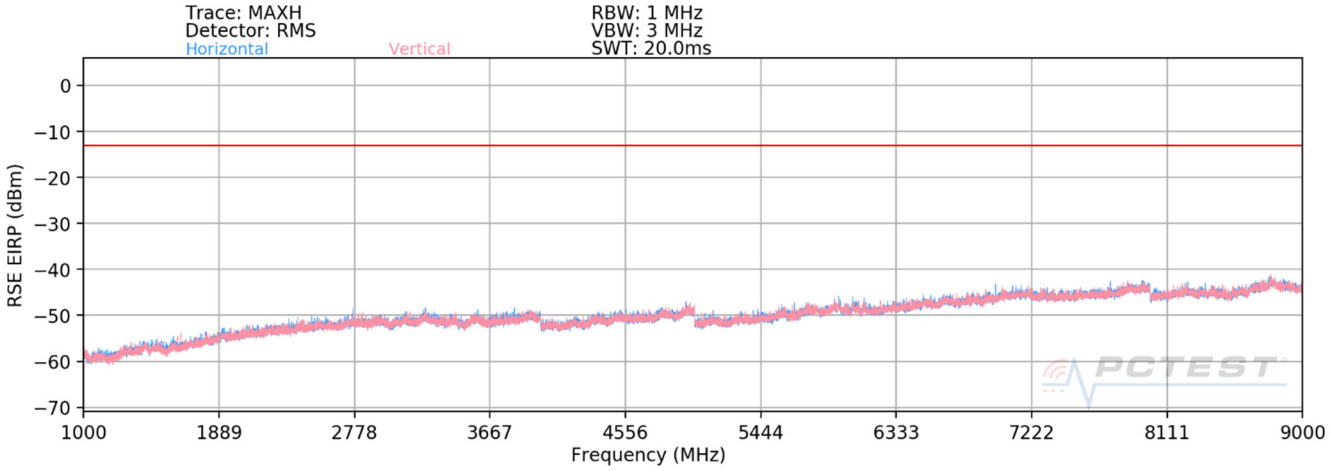
4. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

5. Per 90(R)(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 – South



Plot 7-37. Radiated Spurious Plot (LTE Band 26 – South - Closed)



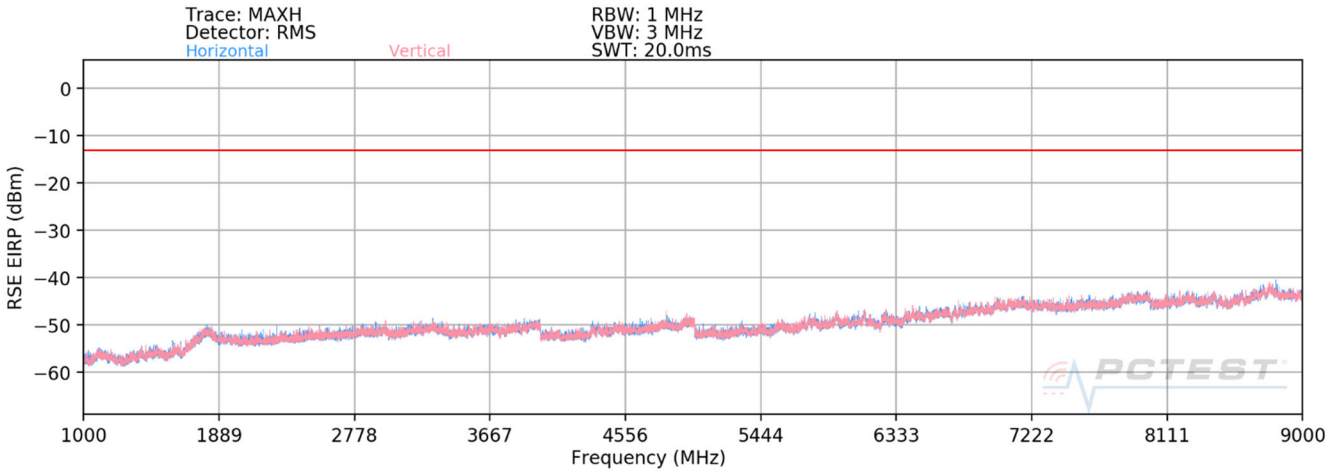
Plot 7-38. Radiated Spurious Plot (LTE Band 26 – South - Open)

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

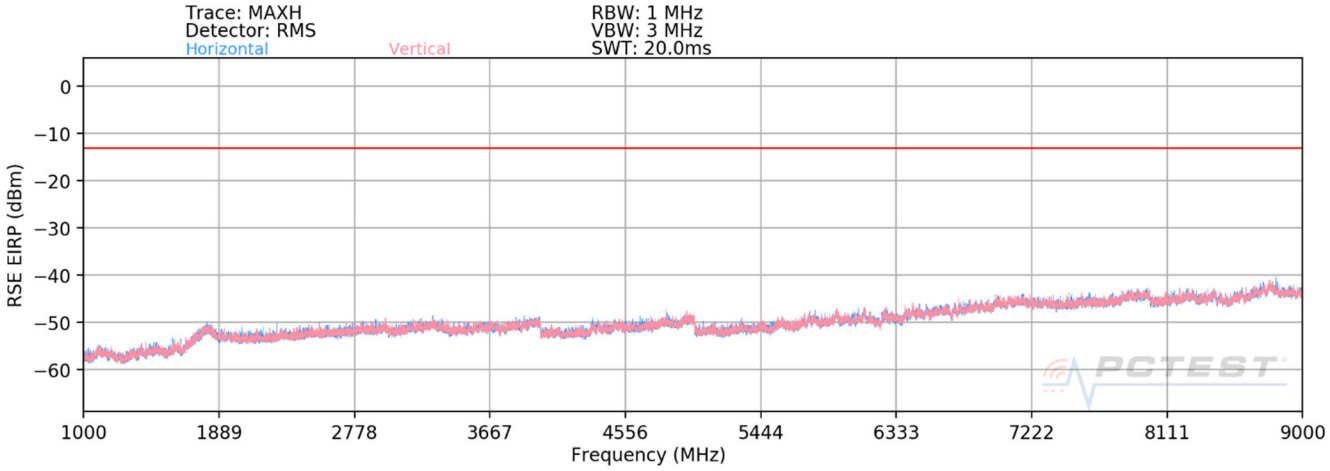
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1638.0	V	137	26	-72.67	0.75	35.08	-60.18	-13.00	-47.18
2457.0	V	-	-	-79.33	5.00	32.67	-62.59	-13.00	-49.59
3276.0	V	-	-	-80.04	7.21	34.17	-61.08	-13.00	-48.08
4095.0	V	-	-	-80.53	7.95	34.42	-60.84	-13.00	-47.84

Table 7-8. Radiated Spurious Data (LTE Band 26 – Mid Channel – South - Open)

LTE Band 26 – North



Plot 7-39. Radiated Spurious Plot (LTE Band 26 – North - Closed)



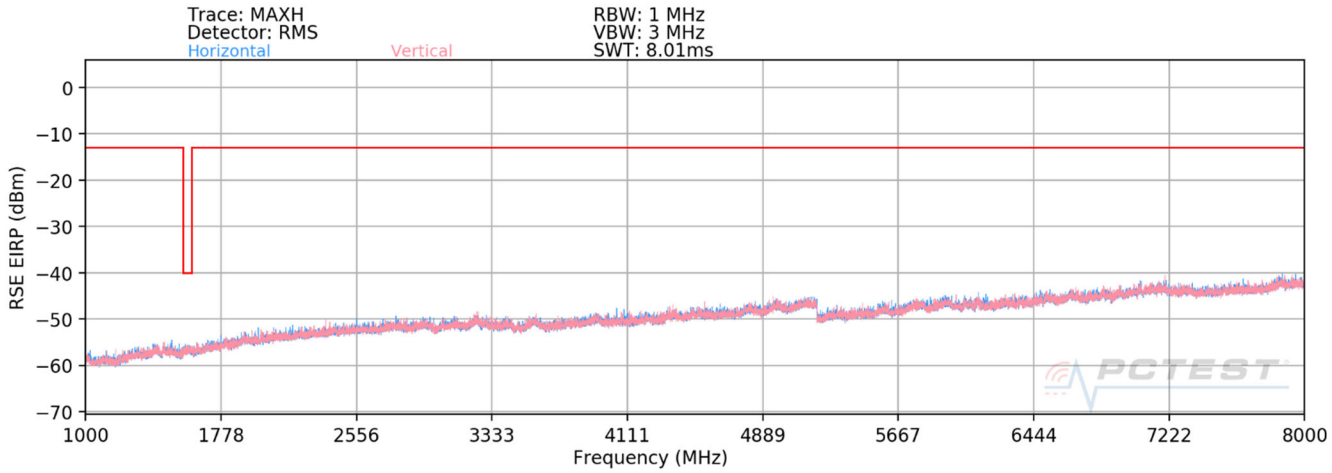
Plot 7-40. Radiated Spurious Plot (LTE Band 26 – North - Open)

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

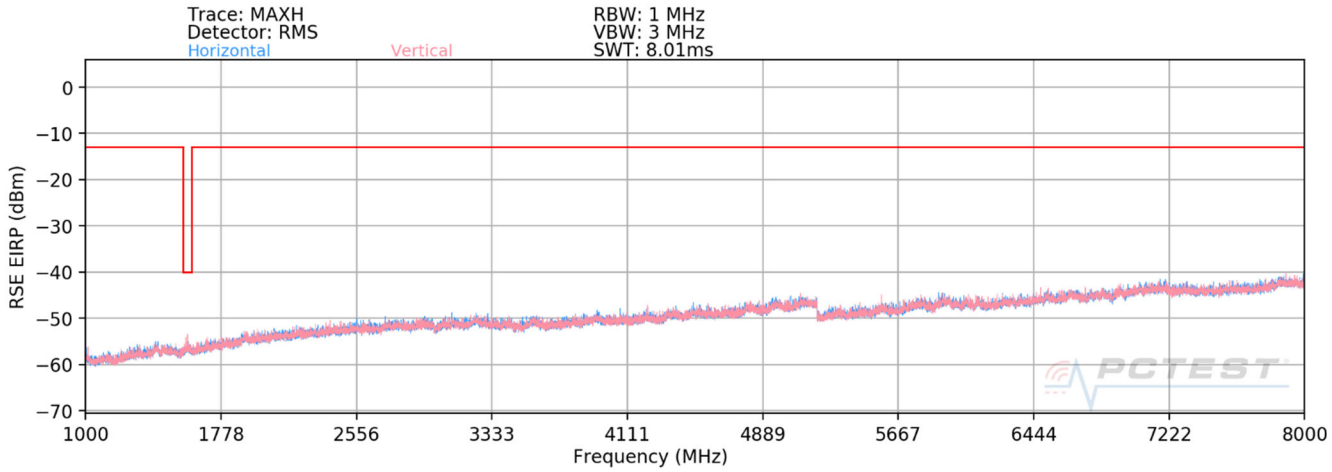
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1638.0	V	101	33	-73.24	1.50	35.26	-60.00	-13.00	-47.00
2457.0	V	-	-	-79.25	5.37	33.12	-62.14	-13.00	-49.14
3276.0	V	-	-	-80.85	7.59	33.74	-61.51	-13.00	-48.51
4095.0	V	-	-	-80.60	8.05	34.45	-60.81	-13.00	-47.81

Table 7-9. Radiated Spurious Data (LTE Band 26 – Mid Channel – North - Open)

LTE Band 14 – South



Plot 7-41. Radiated Spurious Plot (LTE Band 14 – South - Closed)



Plot 7-42. Radiated Spurious Plot (LTE Band 14 – South - Open)

Bandwidth (MHz):	5
Frequency (MHz):	790.5
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 12

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]
1581.0	V	216	13	-74.92	1.14	33.22	-62.04	-40.00	-22.04
2371.5	V	-	-	-78.98	4.81	32.83	-62.42	-13.00	-49.42
3162.0	V	-	-	-79.58	6.36	33.78	-61.47	-13.00	-48.47
3952.5	V	-	-	-81.76	8.38	33.62	-61.64	-13.00	-48.64

Table 7-10. Radiated Spurious Data (LTE Band 14 – Low Channel – South)

Bandwidth (MHz):	5
Frequency (MHz):	793.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 12

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	V	230	64	-72.73	1.26	35.53	-59.72	-40.00	-19.72
2379.0	V	-	-	-79.06	4.88	32.82	-62.44	-13.00	-49.44
3172.0	V	-	-	-79.59	6.29	33.70	-61.55	-13.00	-48.55
3965.0	V	-	-	-80.69	7.99	34.30	-60.96	-13.00	-47.96

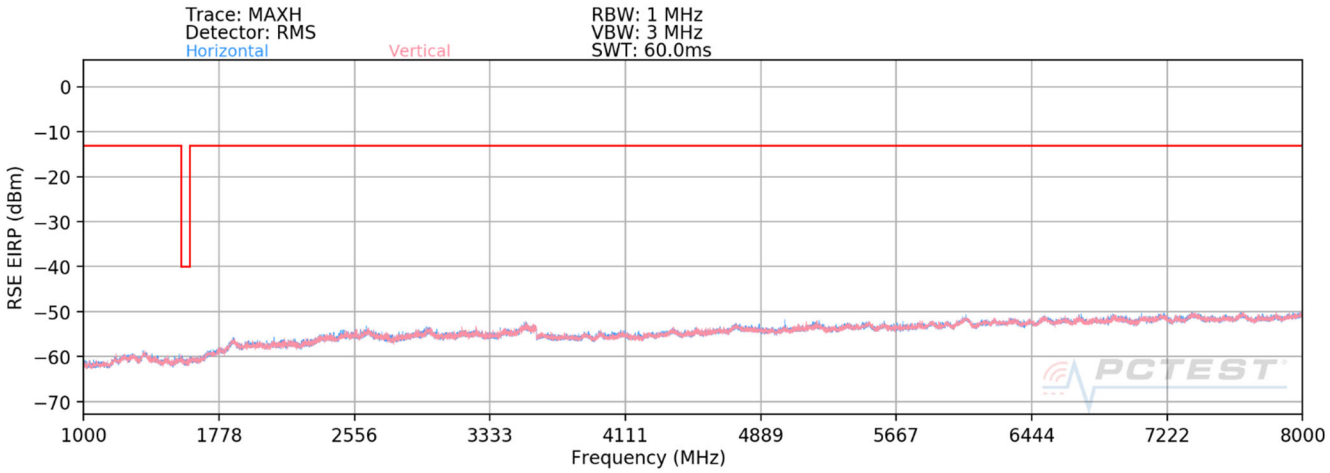
Table 7-11. Radiated Spurious Data (LTE Band 14 – Mid Channel – South - Open)

Bandwidth (MHz):	5
Frequency (MHz):	795.5
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 12

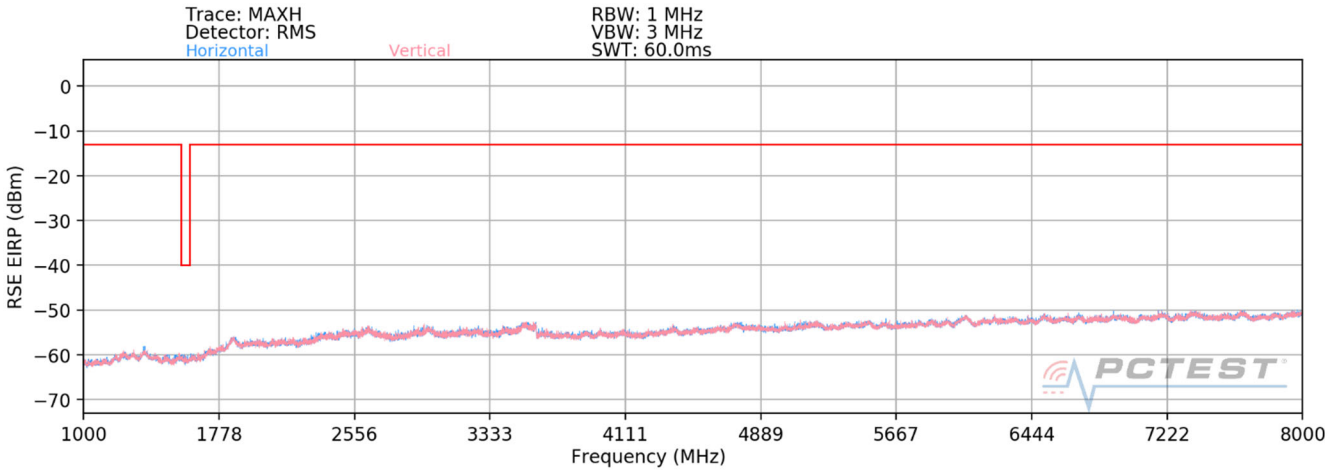
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1591.0	V	172	63	-72.92	1.39	35.47	-59.79	-40.00	-19.79
2386.5	V	-	-	-79.07	4.96	32.89	-62.37	-13.00	-49.37
3182.0	V	-	-	-79.67	6.40	33.73	-61.52	-13.00	-48.52
3977.5	V	-	-	-80.28	7.75	34.47	-60.79	-13.00	-47.79

Table 7-12. Radiated Spurious Data (LTE Band 14 – High Channel – South Ant 1 - Open)

LTE Band 14 – North



Plot 7-43. Radiated Spurious Plot (LTE Band 14 – North - Closed)



Plot 7-44. Radiated Spurious Plot (LTE Band 14 – North - Open)

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	V	115	164	-74.97	-2.95	29.08	-66.18	-40.00	-26.18
2379.0	V	-	-	-77.47	2.09	31.62	-63.64	-13.00	-50.64
3172.0	V	-	-	-77.66	2.86	32.20	-63.06	-13.00	-50.06

Table 7-13. Radiated Spurious Data (LTE Band 14 – Mid Channel – North - Open)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

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

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

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

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

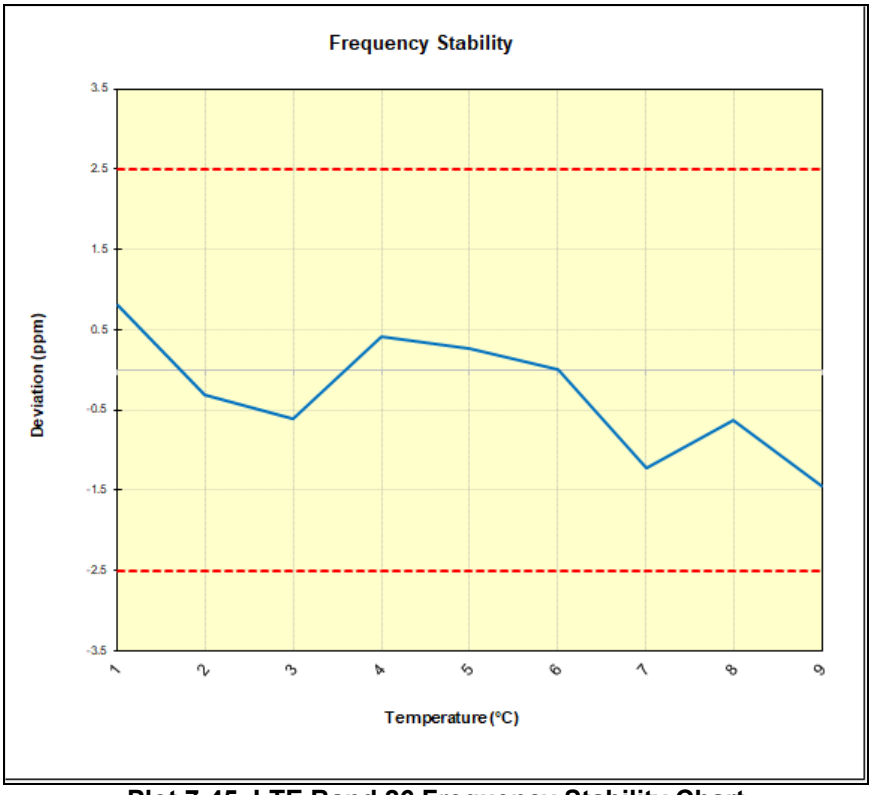
Frequency Stability / Temperature Variation

LTE Band 26

Operating Frequency (Hz):	819,000,000
Ref. Voltage (VDC):	4.24
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.24	- 30	819,003,240	658	0.0000804
		- 20	819,002,320	-262	-0.0000320
		- 10	819,002,076	-506	-0.0000617
		0	819,002,920	339	0.0000414
		+ 10	819,002,795	213	0.0000261
		+ 20 (Ref)	819,002,582	0	0.0000000
		+ 30	819,001,577	-1,005	-0.0001227
		+ 40	819,002,069	-512	-0.0000625
		+ 50	819,001,393	-1,189	-0.0001452
Battery Endpoint	3.70	+ 20	819,001,881	-701	-0.0000855

Table 7-14. LTE Band 26 Frequency Stability Data



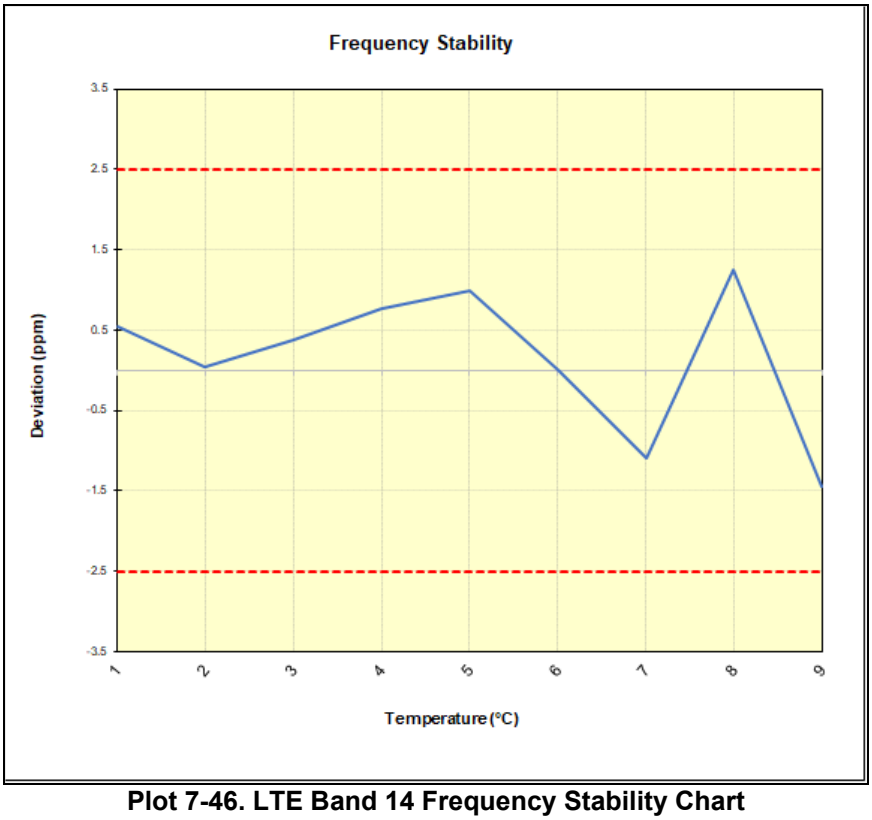
Plot 7-45. LTE Band 26 Frequency Stability Chart

Frequency Stability / Temperature Variation

LTE Band 14	
Operating Frequency (Hz):	793,000,000
Ref. Voltage (VDC):	4.24

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.24	- 30	793,000,590	424	0.0000535
		- 20	793,000,194	28	0.0000035
		- 10	793,000,461	295	0.0000372
		0	793,000,775	610	0.0000769
		+ 10	793,000,945	779	0.0000982
		+ 20 (Ref)	793,000,165	0	0.0000000
		+ 30	792,999,302	-863	-0.0001089
		+ 40	793,001,153	988	0.0001245
		+ 50	792,999,011	-1,154	-0.0001456
Battery Endpoint	3.70	+ 20	793,000,339	174	0.0000219

Table 7-15. LTE Band 14 Frequency Stability Data



Plot 7-46. LTE Band 14 Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Microsoft Corporation Portable Handset FCC ID: C3K1995** complies with all the requirements of Part 90 of the FCC rules.