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PART 22 MEASUREMENT REPORT

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

Date of Testing:
5/23/2024 - 6/13/2024
Test Report Issue Date:
7/22/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2405140039-02.A3L

FCC ID:	**A3LSMX828U**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-X828U
EUT Type:	Portable Tablet
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part:	22
Test Procedure(s):	ANSI C63.26-2015

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

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

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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PART 22 MEASUREMENT REPORT

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.146	21.64	0.239	23.79	4M18F9W
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.194	22.89	0.319	25.04	13M5G7D
		16QAM	831.5 - 841.5	0.165	22.17	0.270	24.32	13M5W7D
	10 MHz	QPSK	829.0 - 844.0	0.195	22.90	0.320	25.05	9M05G7D
		16QAM	829.0 - 844.0	0.171	22.34	0.281	24.49	8M97W7D
	5 MHz	QPSK	826.5 - 846.5	0.194	22.87	0.318	25.02	4M52G7D
		16QAM	826.5 - 846.5	0.175	22.43	0.287	24.58	4M49W7D
	3 MHz	QPSK	825.5 - 847.5	0.199	22.98	0.326	25.13	2M70G7D
		16QAM	825.5 - 847.5	0.168	22.25	0.275	24.40	2M72W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.197	22.95	0.324	25.10	1M09G7D
		16QAM	824.7 - 848.3	0.165	22.16	0.270	24.31	1M10W7D
NR Band n26/5	20 MHz	π/2 BPSK	834.0 - 839.0	0.154	21.87	0.253	24.02	18M0G7D
		QPSK	834.0 - 839.0	0.156	21.93	0.256	24.08	19M1G7D
		16QAM	834.0 - 839.0	0.123	20.90	0.202	23.05	19M1W7D
	15 MHz	π/2 BPSK	831.5 - 841.5	0.153	21.86	0.252	24.01	13M5G7D
		QPSK	831.5 - 841.5	0.160	22.04	0.262	24.19	14M2G7D
		16QAM	831.5 - 841.5	0.126	20.99	0.206	23.14	14M2W7D
	10 MHz	π/2 BPSK	829.0 - 844.0	0.158	21.98	0.259	24.13	9M01G7D
		QPSK	829.0 - 844.0	0.156	21.93	0.256	24.08	9M34G7D
		16QAM	829.0 - 844.0	0.126	21.02	0.207	23.17	9M34W7D
	5 MHz	π/2 BPSK	826.5 - 846.5	0.154	21.89	0.253	24.04	4M49G7D
		QPSK	826.5 - 846.5	0.154	21.86	0.252	24.01	4M49G7D
		16QAM	826.5 - 846.5	0.119	20.76	0.195	22.91	4M50W7D

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

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

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

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

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

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Electronics Co., Ltd. Portable Tablet FCC ID: A3LSMX828U**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 22.

Test Device Serial No.: 18066, 38346, 18207, 18181, 18074

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1 and FR2), 802.11b/g/n/ac/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" 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 C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version X828USQU0AXFE installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from Measurement Procedure……..None

3.2 Radiated Power and Radiated Spurious Emissions

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

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$E_{[dB\mu V/m]}$ = Measured amplitude level$_{[dBm]}$ + 107 + Cable Loss$_{[dB]}$ + Antenna Factor$_{[dB/m]}$
And
$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8$; where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

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

4.0 MEASUREMENT UNCERTAINTY

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

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

5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	AP2
-	LTx2	Licensed Transmitter Cable Set	4/2/2024	Annual	4/2/2025	LTx2
-	LTx3	LIcensed Transmitter Cable Set	4/2/2024	Annual	4/2/2025	LTx3
-	LTx5	LIcensed Transmitter Cable Set	4/2/2024	Annual	4/2/2025	LTx5
Agilent	N9030A	50GHz PXA Signal Analyzer	4/23/2024	Annual	4/23/2025	US51350301
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201381794
Com-Power	AL-130R	Active Loop Antenna	2/22/2024	Biennial	2/22/2026	121085
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/5/2023	Triennial	7/5/2025	9203-2178
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/22/2024	Biennial	2/22/2026	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/29/2023	Biennial	3/29/2025	128337
ETS Lindgren	3164-10	Quad Ridge Horn 400MHz - 10000MHz	7/13/2023	Biennial	7/13/2025	166283
ETS Lindgren	3816/2NM	LISN	8/11/2022	Biennial	8/11/2024	114451
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/29/2023	Annual	8/29/2024	MY49430494
Keysight Technologies	N9030A	PXA Signal Analyzer	8/7/2023	Annual	8/7/2024	MY54490576
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	3/8/2024	Annual	3/8/2025	103187
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 5-1. Test Equipment

Notes:

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

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

6.0 SAMPLE CALCULATIONS

WCDMA Emission Designator

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

QPSK Modulation

Emission Designator = 8M62G7D
LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D
LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMX828U

FCC Classification: PCS Licensed Transmitter (PCB)

Mode(s): WCDMA/LTE/NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Frequency Stability	2.1055, 22.355	The carrier frequency of the transmitter must be maintained within the 2.5ppm	PASS	Section 7.8
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 22.917(a)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v2.3.0.

7.2 Conducted Power Output Data

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

Test Settings

1. Detector = RMS
2. Trace mode = trace average for continuous emissions, max hold for pulse emissions
3. Sweep time = auto couple
4. The trace was allowed to stabilize
5. Please see test notes below for RBW and VBW settings

Test Setup

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

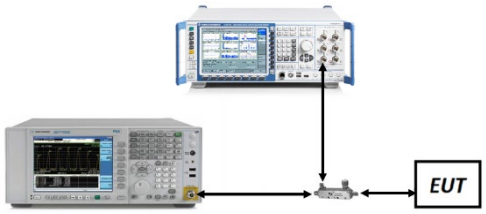


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Conducted power measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

2. All other conducted power measurements are contained in the RF exposure report for this filing.

3. Conducted power was found to reduce for the higher order QAM modulations when compared to 16QAM. Due to this trend, only the worst-case QAM (16QAM) powers are included in this section.

Mode	Channel	Frequency [MHz]	Conducted Power [dBm]
WCDMA 850	4132	826.4	23.29
	4183	836.6	23.43
	4233	846.6	23.70

Table 7-2. Max Conducted Powers – WCDMA 850

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
15MHz (Band 26 only)	QPSK	26865	831.5	1 / 74	24.02
		26915	836.5	1 / 37	24.04
		26965	841.5	1 / 37	24.02
	16QAM	26865	831.5	1 / 74	23.27
10 MHz	QPSK	26840	829.0	1 / 49	24.04
		26915	836.5	1 / 49	24.10
		26990	844.0	1 / 49	24.19
	16QAM	26915	836.5	1 / 49	23.51
5 MHz	QPSK	26815	826.5	1 / 0	24.01
		26915	836.5	1 / 24	24.15
		27015	846.5	1 / 0	24.21
	16QAM	26815	826.5	1 / 0	23.53
3 MHz	QPSK	26805	825.5	1 / 7	24.11
		26915	836.5	1 / 7	24.10
		27025	847.5	1 / 7	24.21
	16QAM	26805	825.5	1 / 7	23.35
1.4 MHz	QPSK	26797	824.7	1 / 3	24.08
		26915	836.5	1 / 3	24.18
		27033	848.3	1 / 3	24.07
	16QAM	26797	824.7	1 / 3	23.26

Table 7-3. Max Conducted Powers – LTE Band 26/5

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	π/2 BPSK	166800	834.0	1 / 104	24.14
		167300	836.5	1 / 53	24.23
		167800	839.0	1 / 53	24.18
	QPSK	166800	834.0	1 / 104	24.07
		167300	836.5	1 / 53	24.10
		167800	839.0	1 / 53	24.10
	16-QAM	167300	836.5	1 / 53	22.84
15 MHz	π/2 BPSK	166300	831.5	1 / 77	24.13
		167300	836.5	1 / 39	24.21
		168300	841.5	1 / 39	24.26
	QPSK	166300	831.5	1 / 77	24.06
		167300	836.5	1 / 39	24.20
		168300	841.5	1 / 39	24.13
	16-QAM	168300	841.5	1 / 39	23.02
10 MHz	π/2 BPSK	165800	829.0	1 / 26	24.03
		167300	836.5	1 / 26	24.33
		168800	844.0	1 / 26	24.31
	QPSK	165800	829.0	1 / 26	24.10
		167300	836.5	1 / 26	24.10
		168800	844.0	1 / 50	23.98
	16-QAM	167300	836.5	1 / 26	22.95
5 MHz	π/2 BPSK	165300	826.5	1 / 1	24.08
		167300	836.5	1 / 23	24.24
		169300	846.5	1 / 1	24.10
	QPSK	165300	826.5	1 / 1	24.06
		167300	836.5	1 / 23	24.00
		169300	846.5	1 / 1	24.09
	16-QAM	167300	836.5	1 / 23	22.69

Table 7-4. Max Conducted Powers – NR Band n26/5

7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.4

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

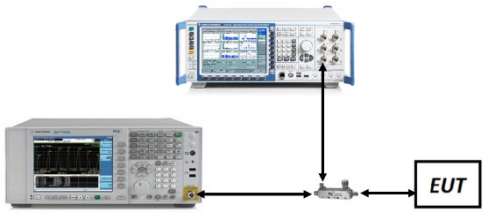


Figure 7-2. Test Instrument & Measurement Setup

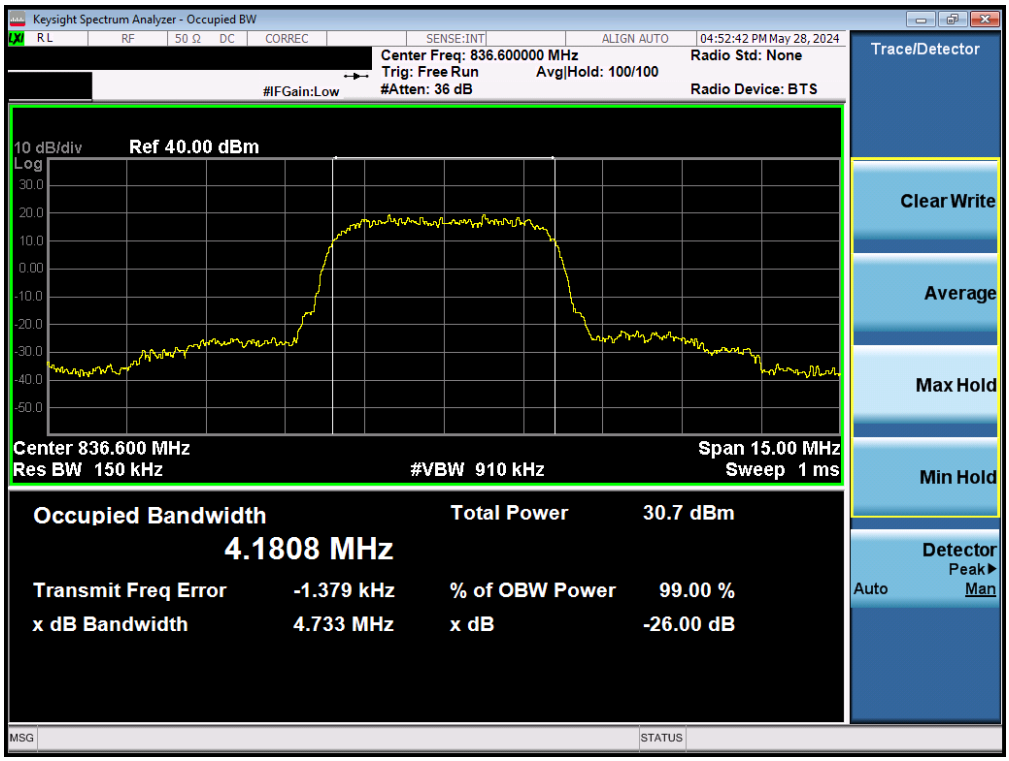
Test Notes

None.

Mode	Bandwidth	Modulation	OBW [MHz]
WCDMA-Cell	N/A	Spread Spectrum	4.18
LTE-B26-5	15MHz	QPSK	13.50
		16QAM	13.51
	10MHz	QPSK	9.05
		16QAM	8.97
	5 MHz	QPSK	4.52
		16QAM	4.49
	3 MHz	QPSK	2.70
		16QAM	2.72
	1.4 MHz	QPSK	1.09
		16QAM	1.10
NR-n26-5	20 MHz	π/2 BPSK	17.98
		QPSK	19.07
		16QAM	19.06
	15 MHz	π/2 BPSK	13.47
		QPSK	14.17
		16QAM	14.18
	10 MHz	π/2 BPSK	9.01
		QPSK	9.34
		16QAM	9.34
	5 MHz	π/2 BPSK	4.49
		QPSK	4.49
		16QAM	4.50

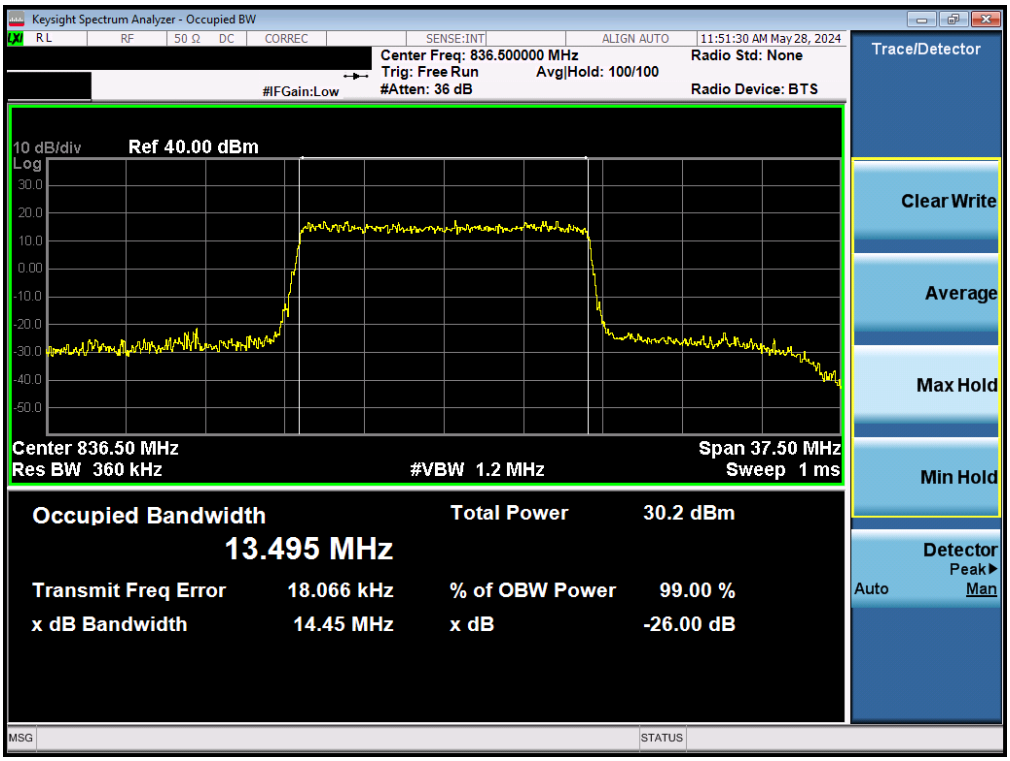
Table 7-5. Occupied Bandwidth Test Results

WCDMA Cell

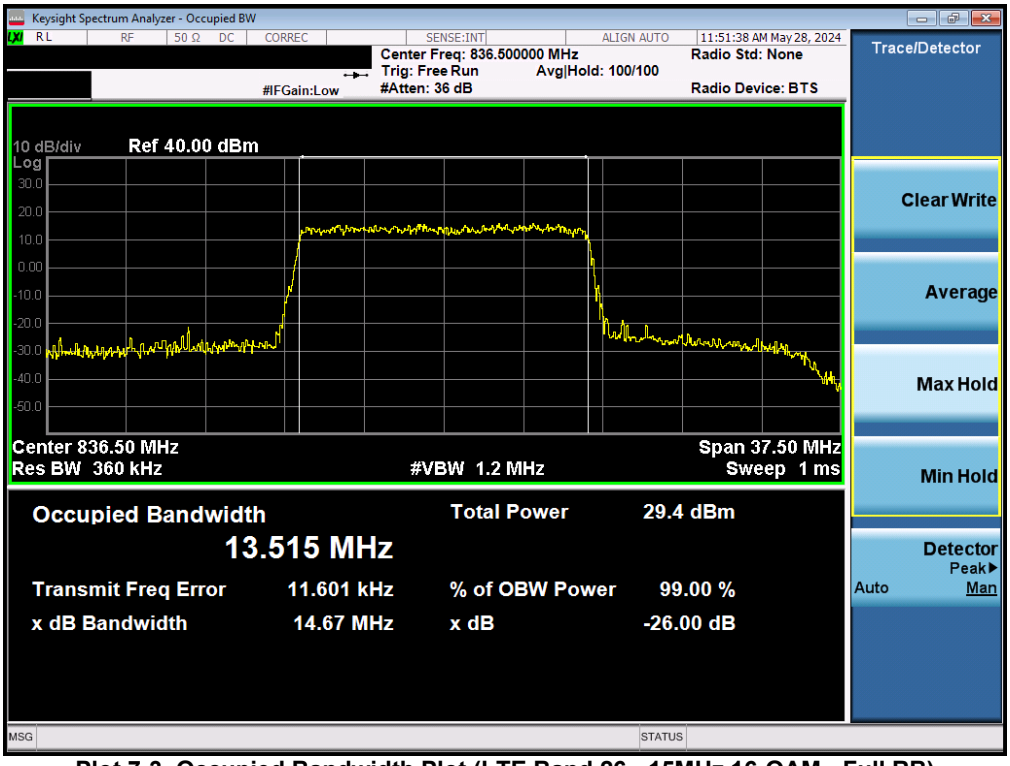


Plot 7-1. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

LTE Band 26/5

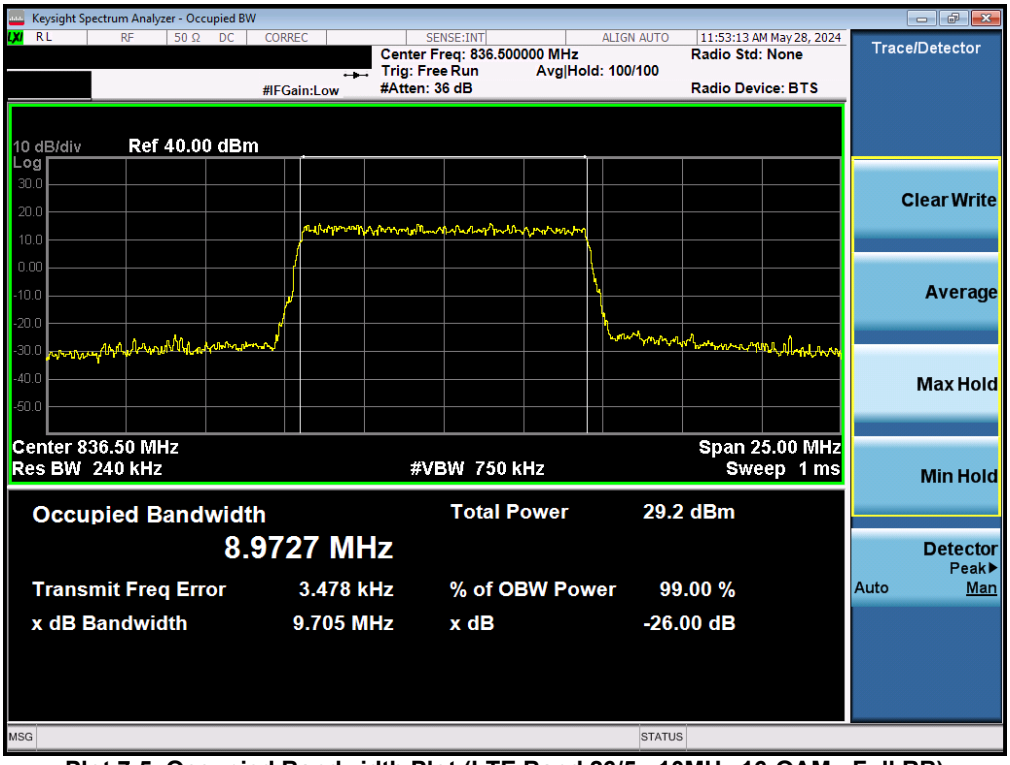


Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)

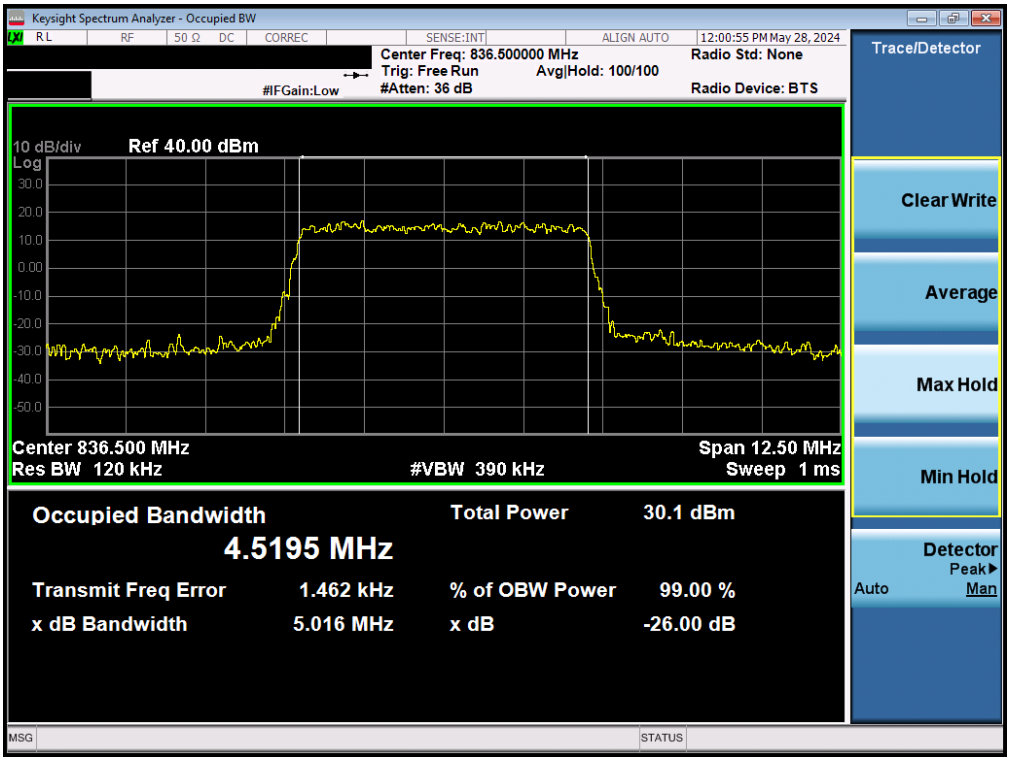


Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

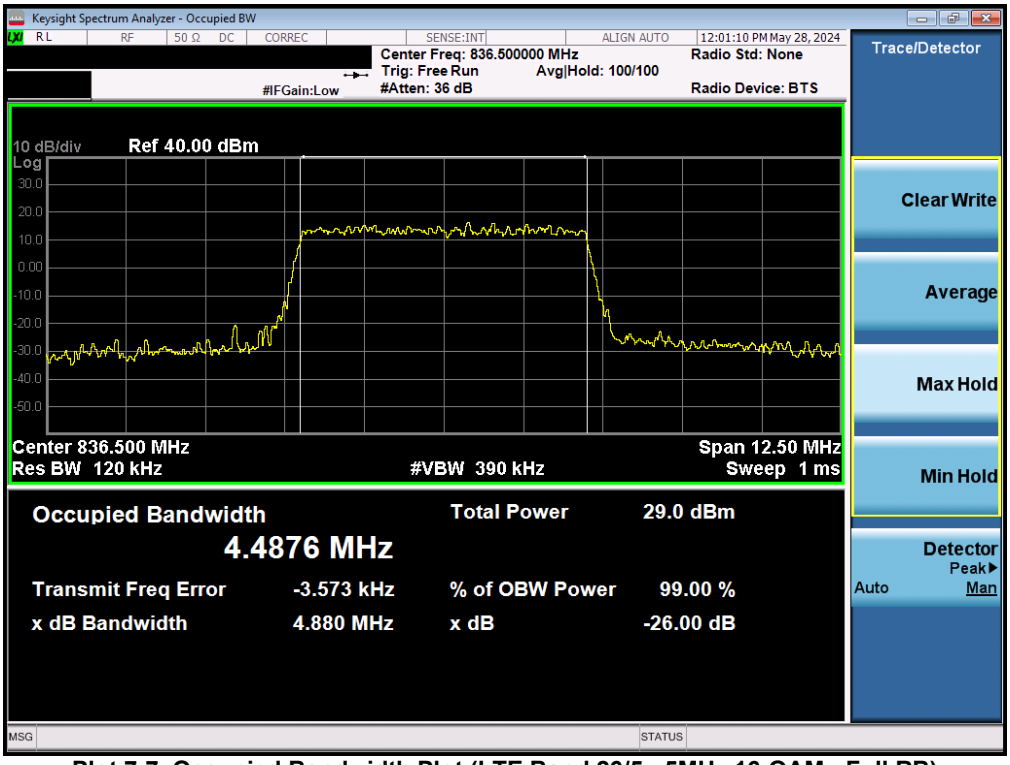
Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB)



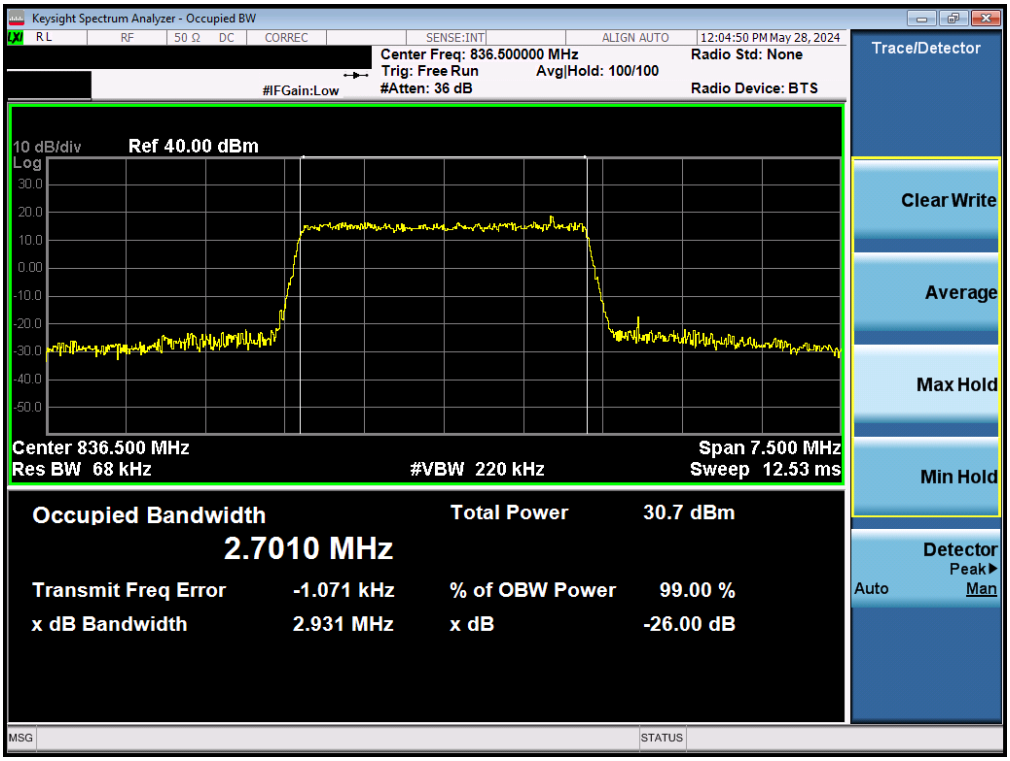
Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB)



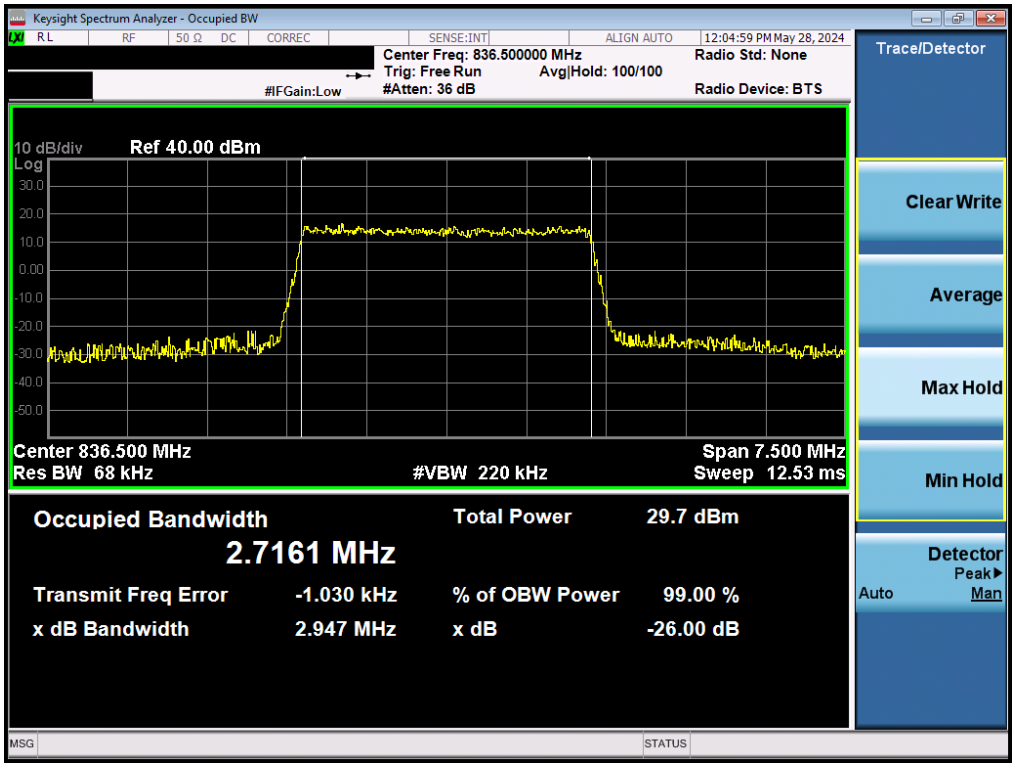
Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB)



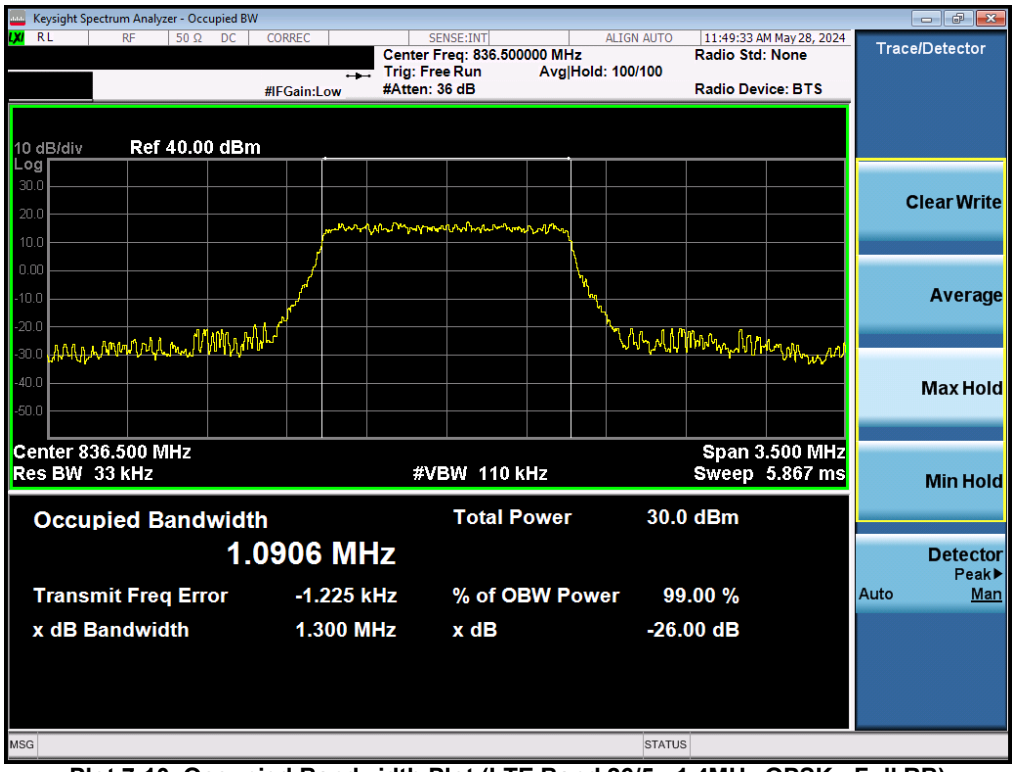
Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB)



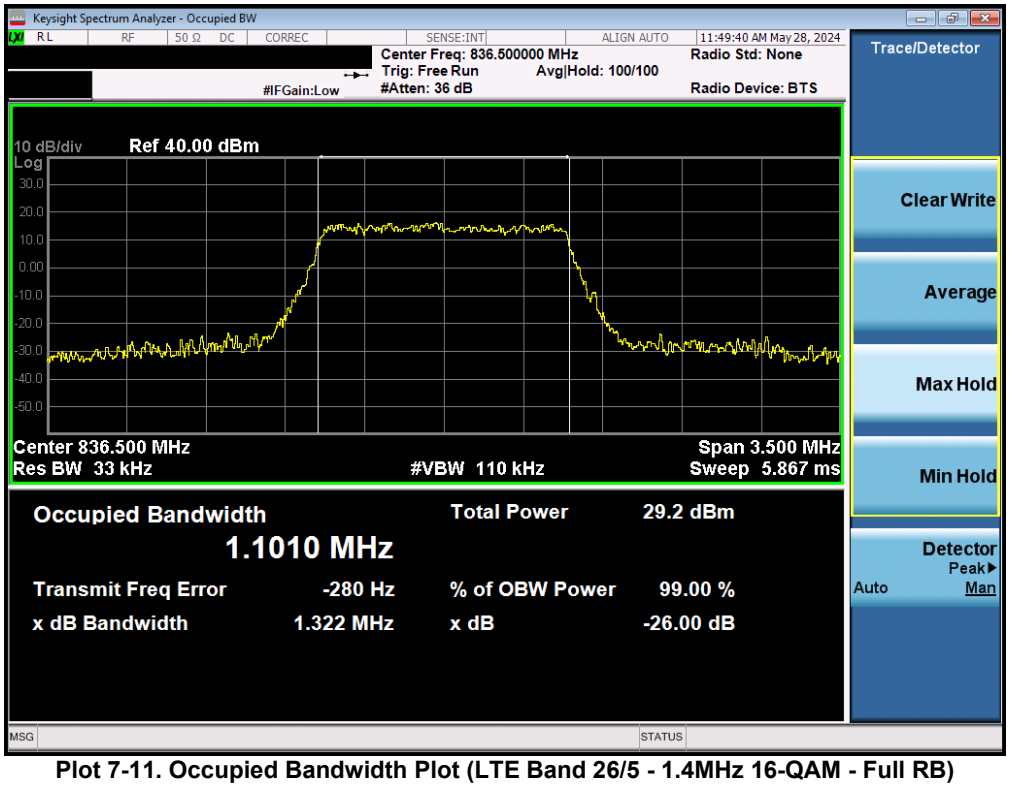
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB)



Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB)

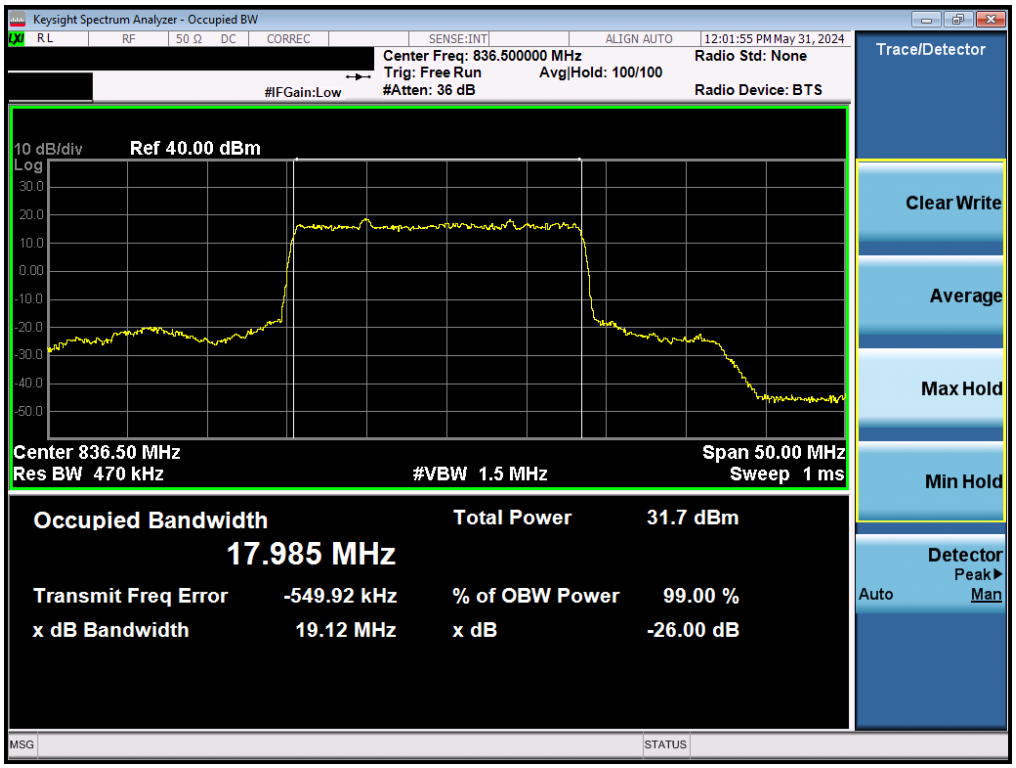


Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB)

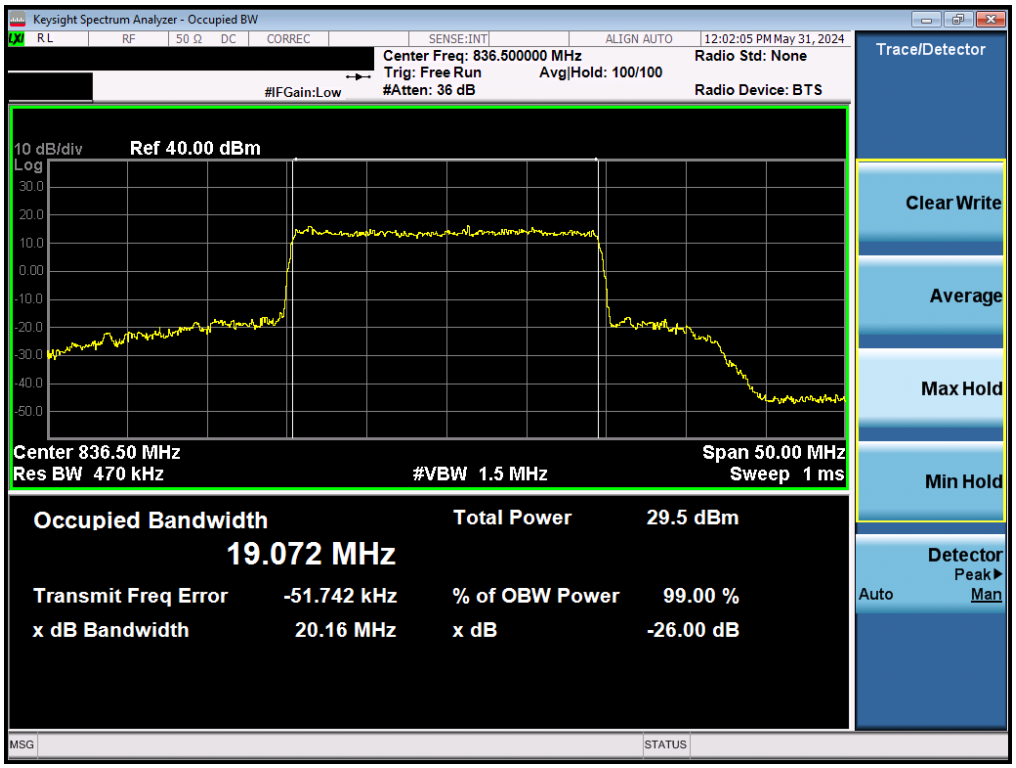


Plot 7-11. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB)

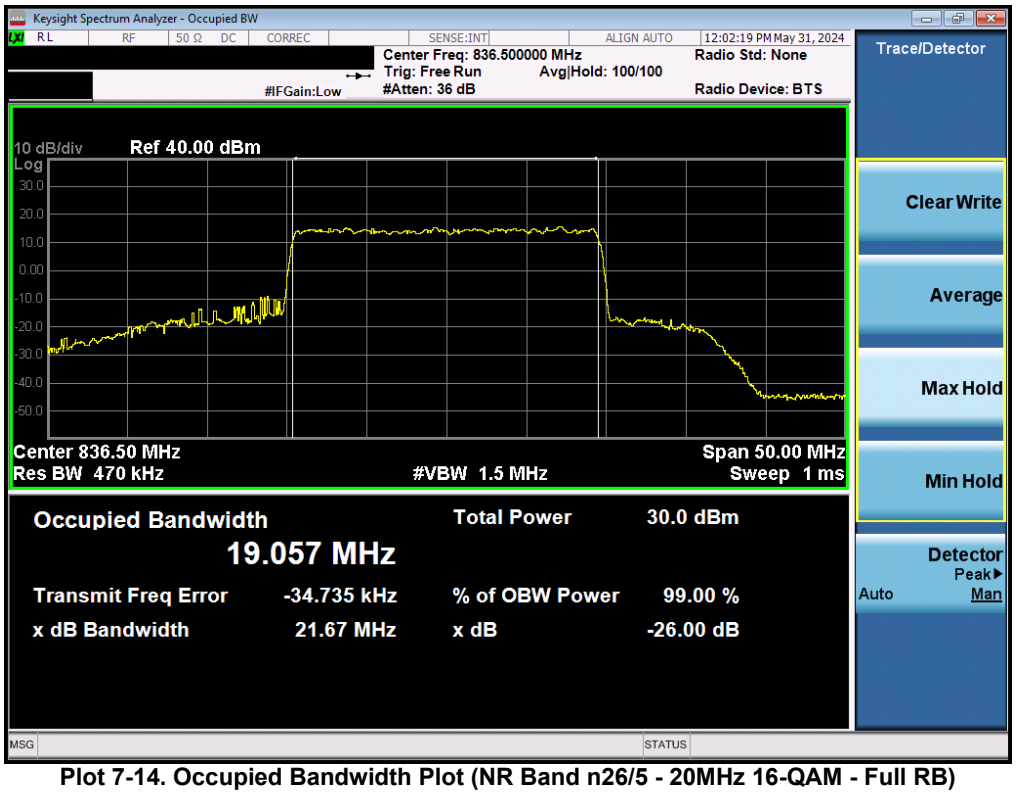
NR Band n26/5



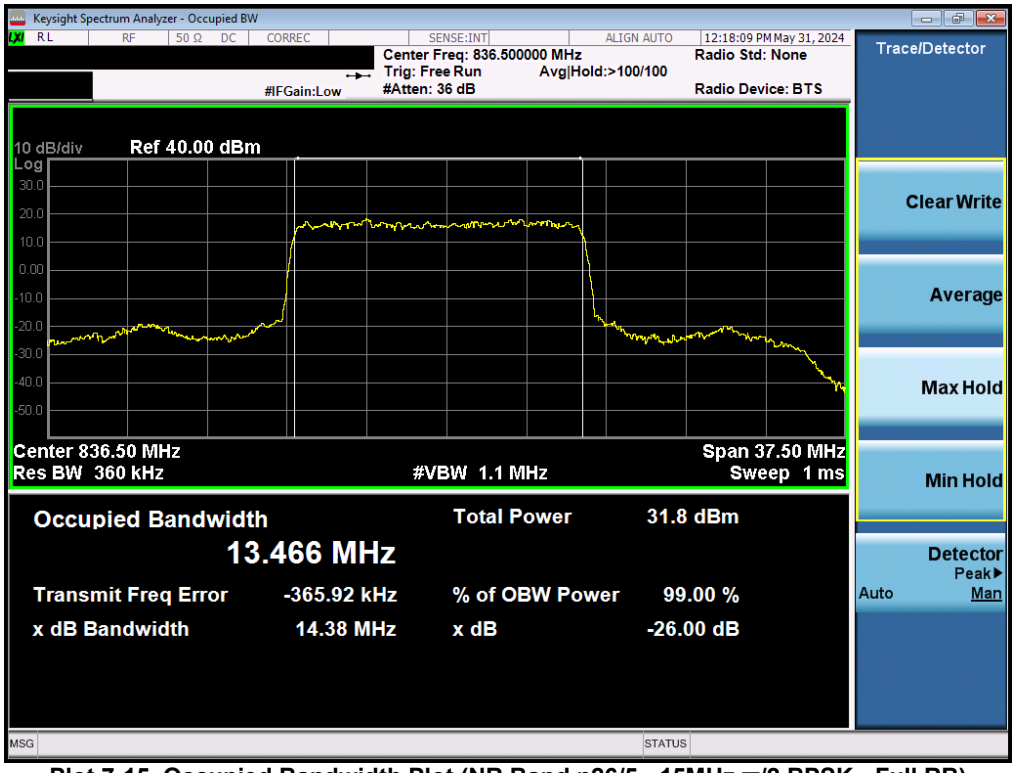
Plot 7-12. Occupied Bandwidth Plot (NR Band n26/5 - 20MHz π/2 BPSK - Full RB)



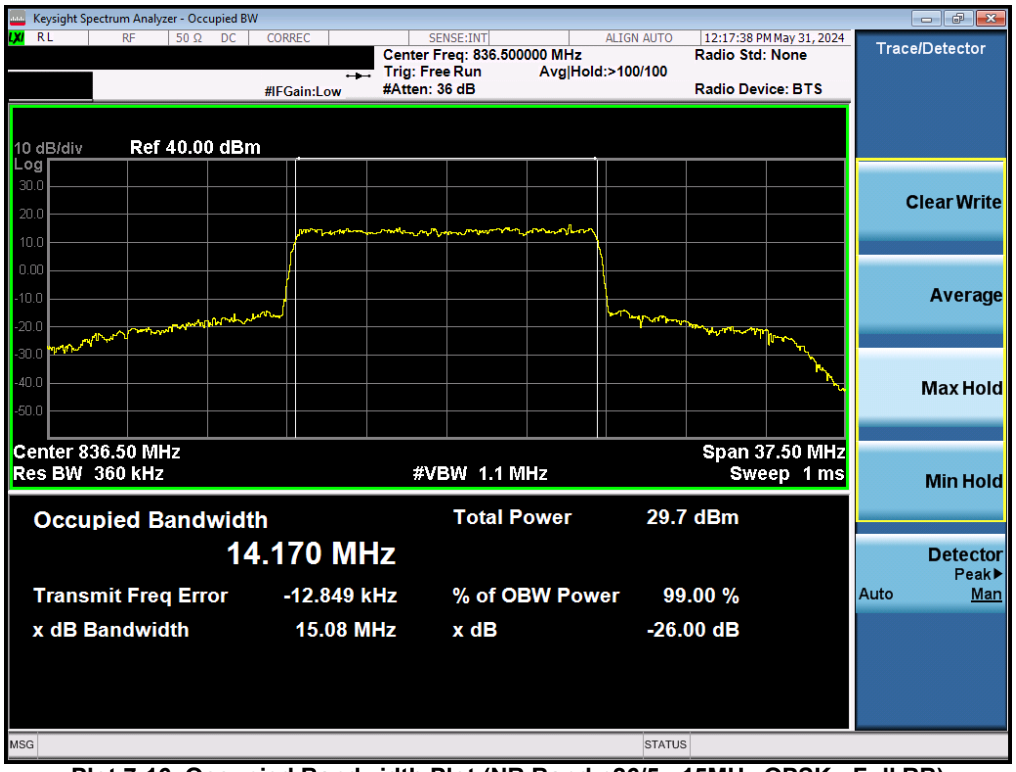
Plot 7-13. Occupied Bandwidth Plot (NR Band n26/5 - 20MHz QPSK - Full RB)



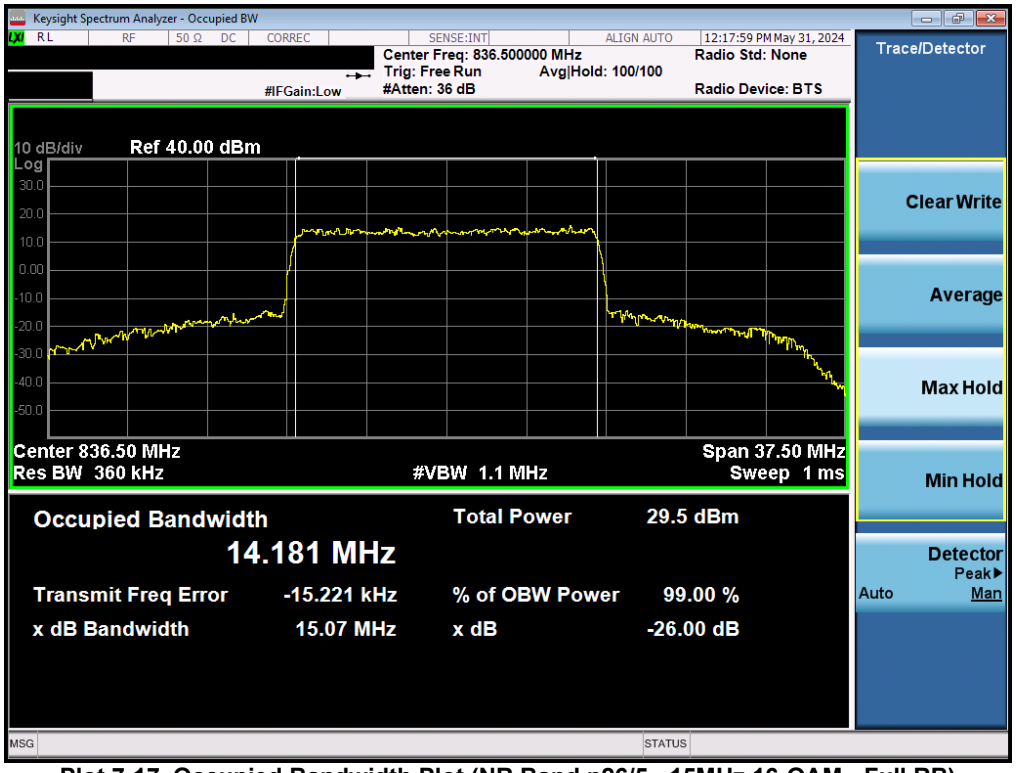
Plot 7-14. Occupied Bandwidth Plot (NR Band n26/5 - 20MHz 16-QAM - Full RB)



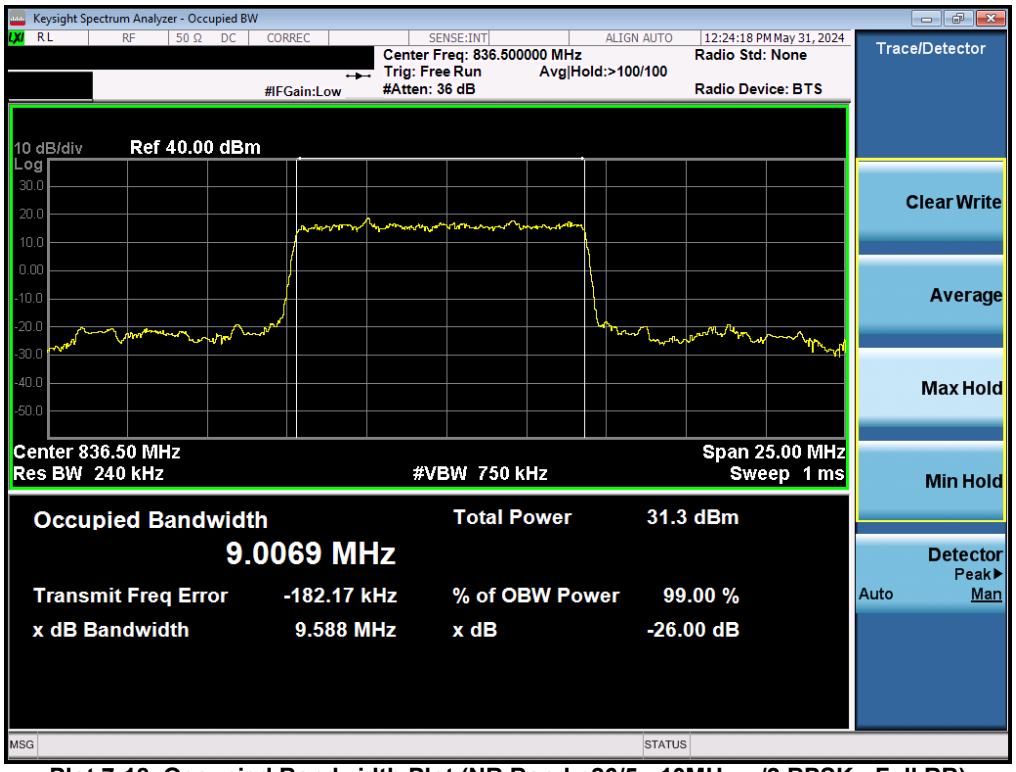
Plot 7-15. Occupied Bandwidth Plot (NR Band n26/5 - 15MHz π/2 BPSK - Full RB)



Plot 7-16. Occupied Bandwidth Plot (NR Band n26/5 - 15MHz QPSK - Full RB)



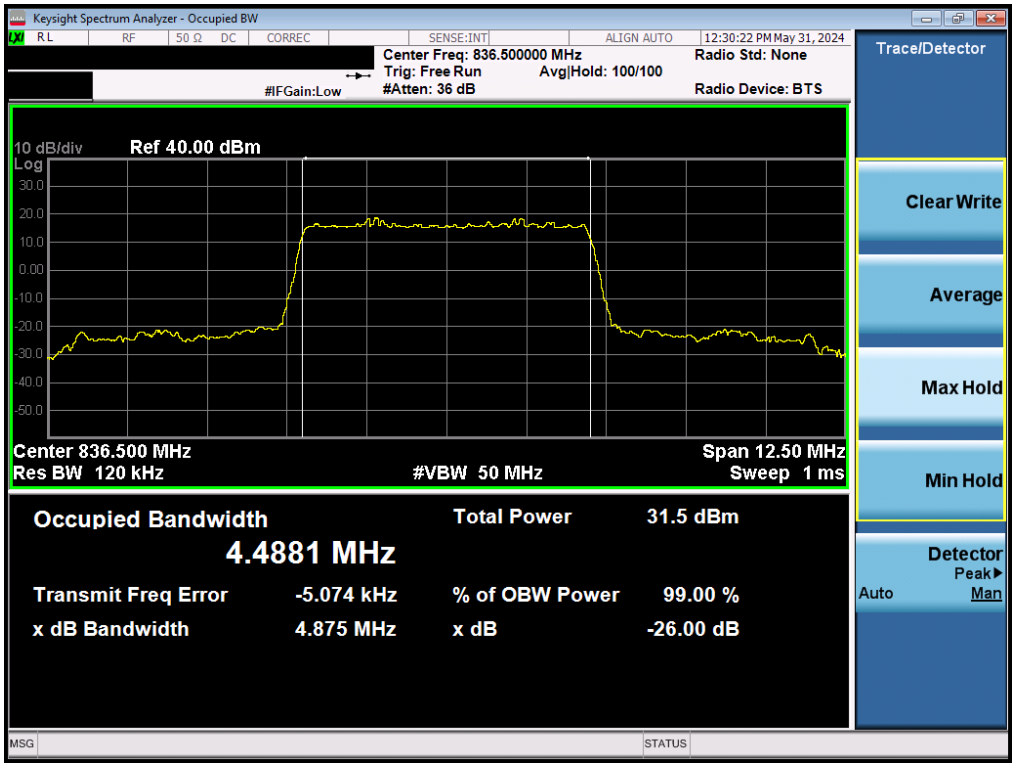
Plot 7-17. Occupied Bandwidth Plot (NR Band n26/5 - 15MHz 16-QAM - Full RB)



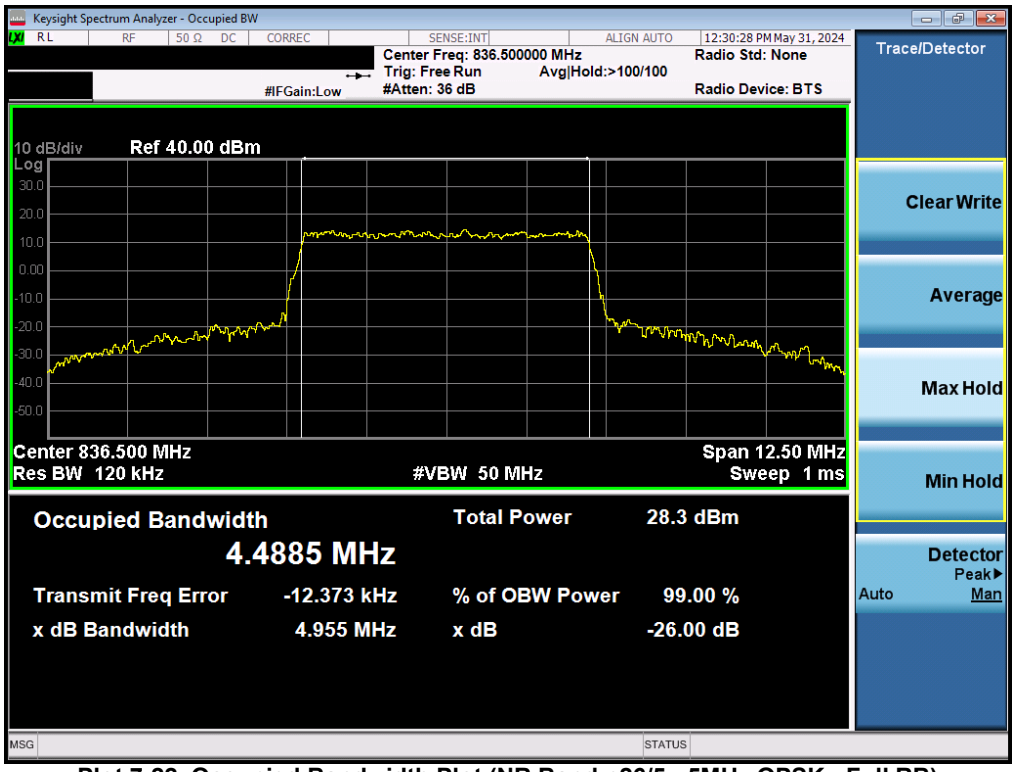
Plot 7-18. Occupied Bandwidth Plot (NR Band n26/5 - 10MHz π/2 BPSK - Full RB)

Plot 7-19. Occupied Bandwidth Plot (NR Band n26/5 - 10MHz QPSK - Full RB)

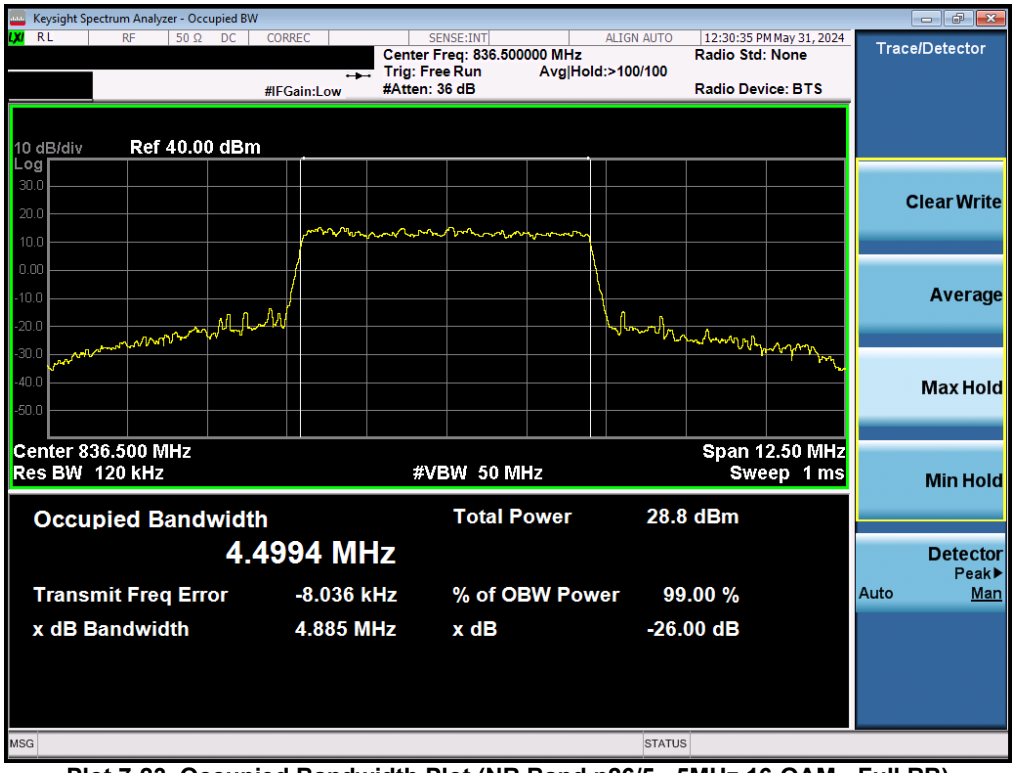
Plot 7-20. Occupied Bandwidth Plot (NR Band n26/5 - 10MHz 16-QAM - Full RB)



Plot 7-21. Occupied Bandwidth Plot (NR Band n26/5 - 5MHz π/2 BPSK - Full RB)



Plot 7-22. Occupied Bandwidth Plot (NR Band n26/5 - 5MHz QPSK - Full RB)



Plot 7-23. Occupied Bandwidth Plot (NR Band n26/5 - 5MHz 16-QAM - Full RB)

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

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

Test Setup

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

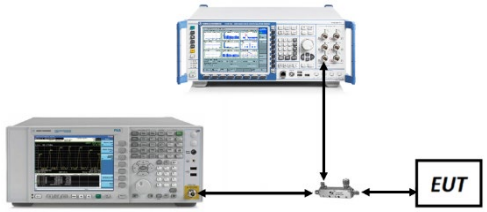


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

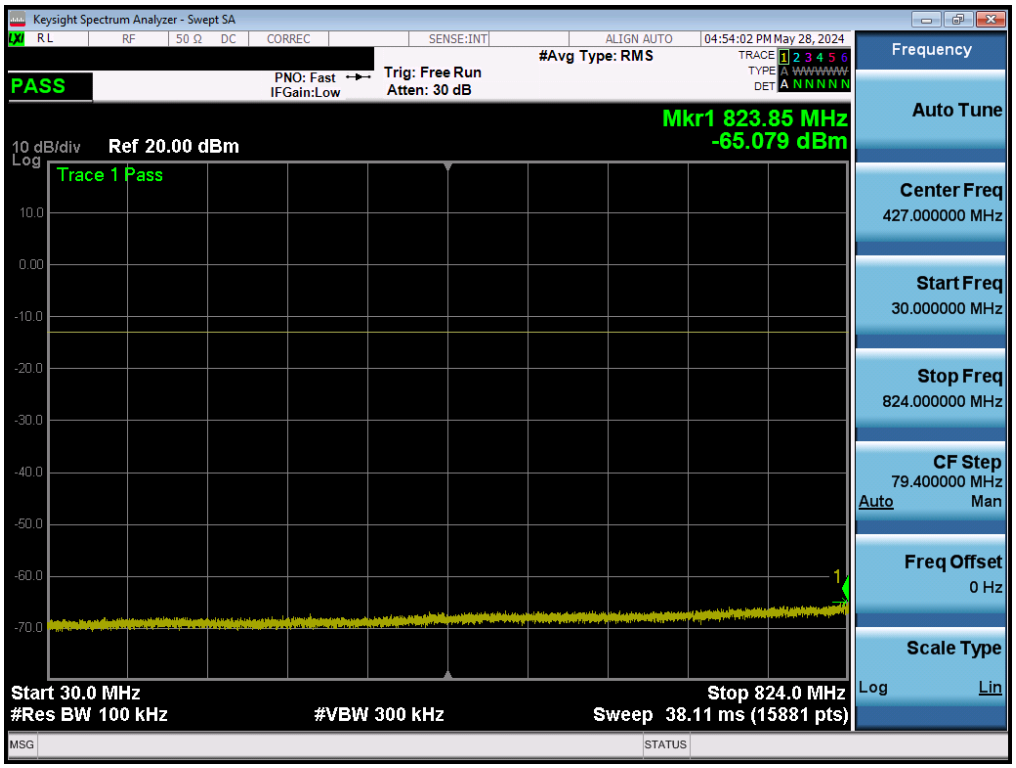
1. Per Part 22, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least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

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

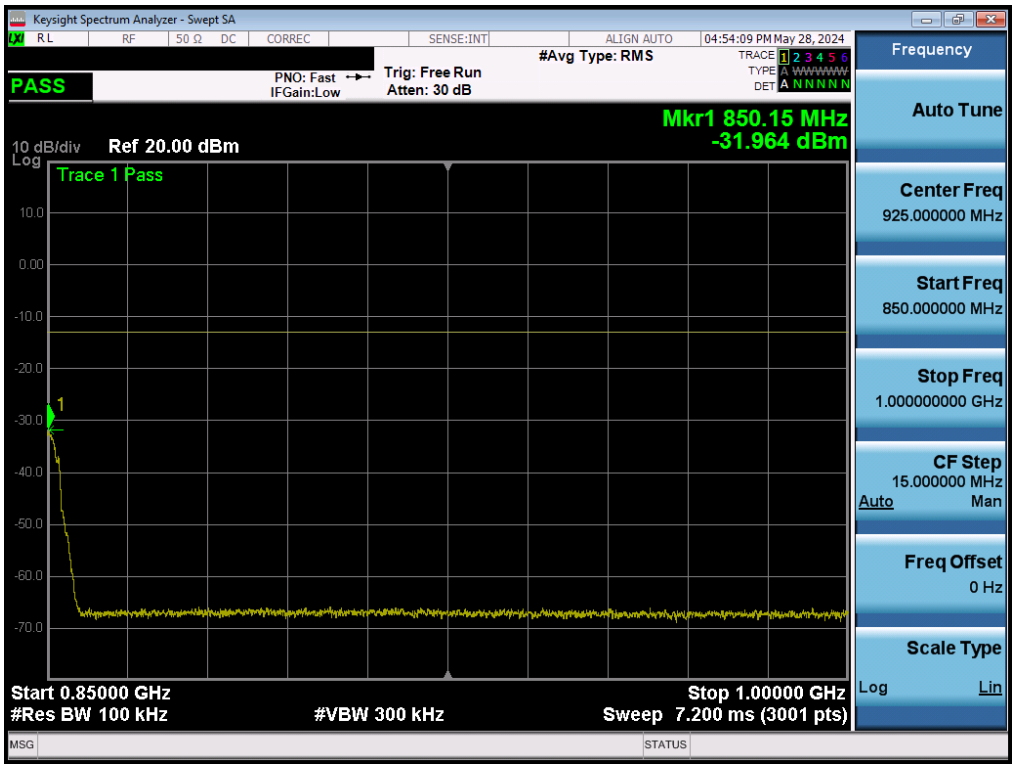
Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
WCDMA-Cell	5MHz	Low	30.0 - 823.0	-35.85	-13.0	-22.85
		Low	849.0 - 1000.0	-65.87	-13.0	-52.87
		Low	1000.0 - 10000.0	-47.18	-13.0	-34.18
		Mid	30.0 - 824.0	-57.48	-13.0	-44.48
		Mid	849.0 - 1000.0	-58.51	-13.0	-45.51
		Mid	1000.0 - 10000.0	-46.84	-13.0	-33.84
		High	30.0 - 824.0	-65.08	-13.0	-52.08
		High	850.0 - 1000.0	-31.96	-13.0	-18.96
		High	1000.0 - 10000.0	-46.95	-13.0	-33.94
LTE-B26-5	10MHz	Low	30.0 - 823.0	-56.46	-13.0	-43.46
		Low	849.0 - 1000.0	-60.70	-13.0	-47.70
		Low	1000.0 - 10000.0	-46.91	-13.0	-33.91
		Mid	30.0 - 824.0	-58.04	-13.0	-45.04
		Mid	849.0 - 1000.0	-58.87	-13.0	-45.87
		Mid	1000.0 - 10000.0	-47.00	-13.0	-34.00
		High	30.0 - 824.0	-59.41	-13.0	-46.41
		High	850.0 - 1000.0	-57.28	-13.0	-44.28
		High	1000.0 - 10000.0	-47.11	-13.0	-34.11
NR-n26-5	20MHz	Low	30.0 - 824.0	-53.33	-13.0	-40.33
		Low	849.0 - 1000.0	-55.58	-13.0	-42.58
		Low	1000.0 - 10000.0	-46.87	-13.0	-33.87
		Mid	30.0 - 824.0	-53.19	-13.0	-40.19
		Mid	849.0 - 1000.0	-56.19	-13.0	-43.19
		Mid	1000.0 - 10000.0	-46.59	-13.0	-33.59
		High	30.0 - 824.0	-54.83	-13.0	-41.83
		High	849.0 - 1000.0	-54.34	-13.0	-41.34
		High	1000.0 - 10000.0	-46.71	-13.0	-33.71

Table 7-6. Conducted Spurious Emissions Test Results

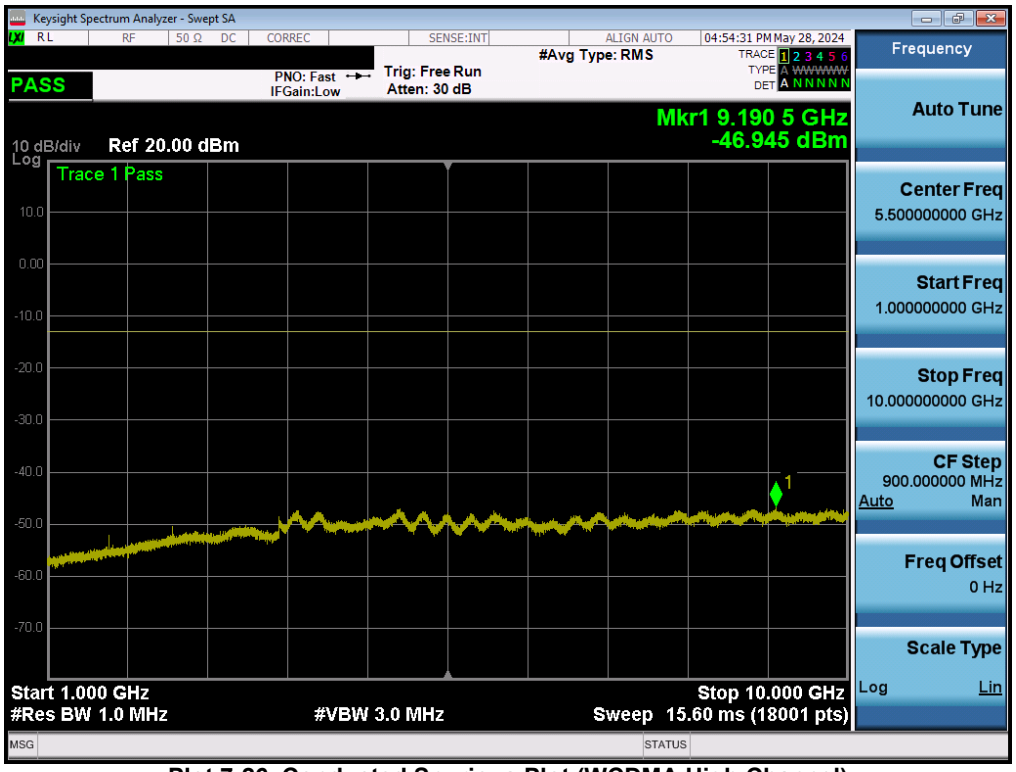
WCDMA Cell



Plot 7-24. Conducted Spurious Plot (WCDMA High Channel)

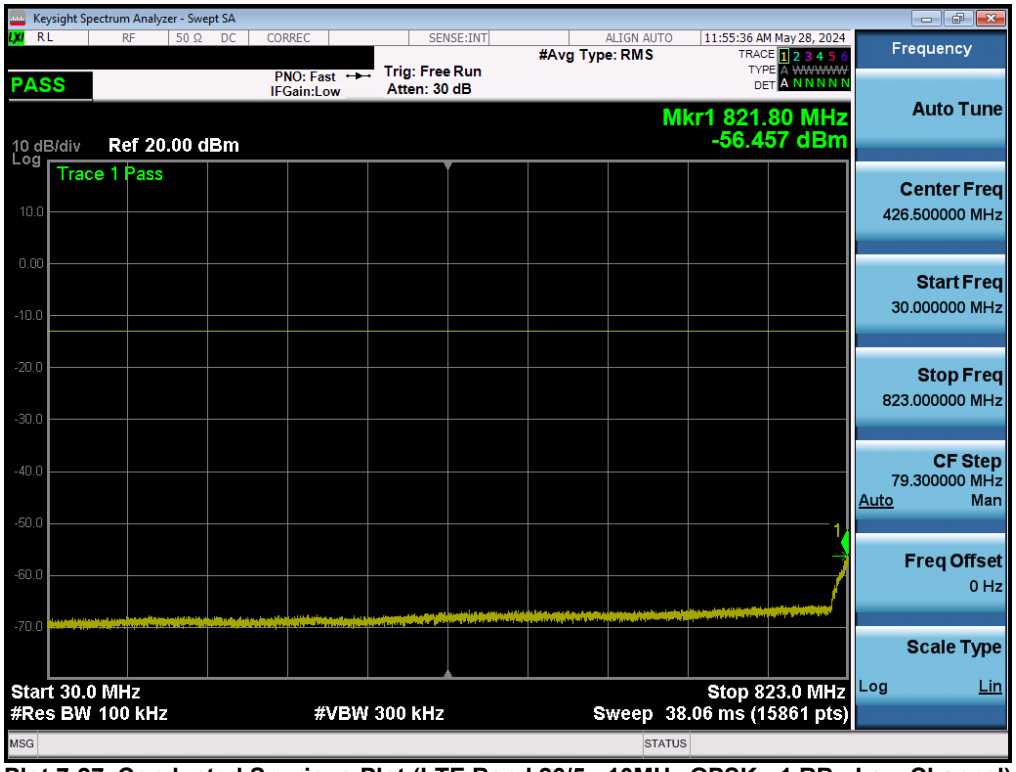


Plot 7-25. Conducted Spurious Plot (WCDMA High Channel)

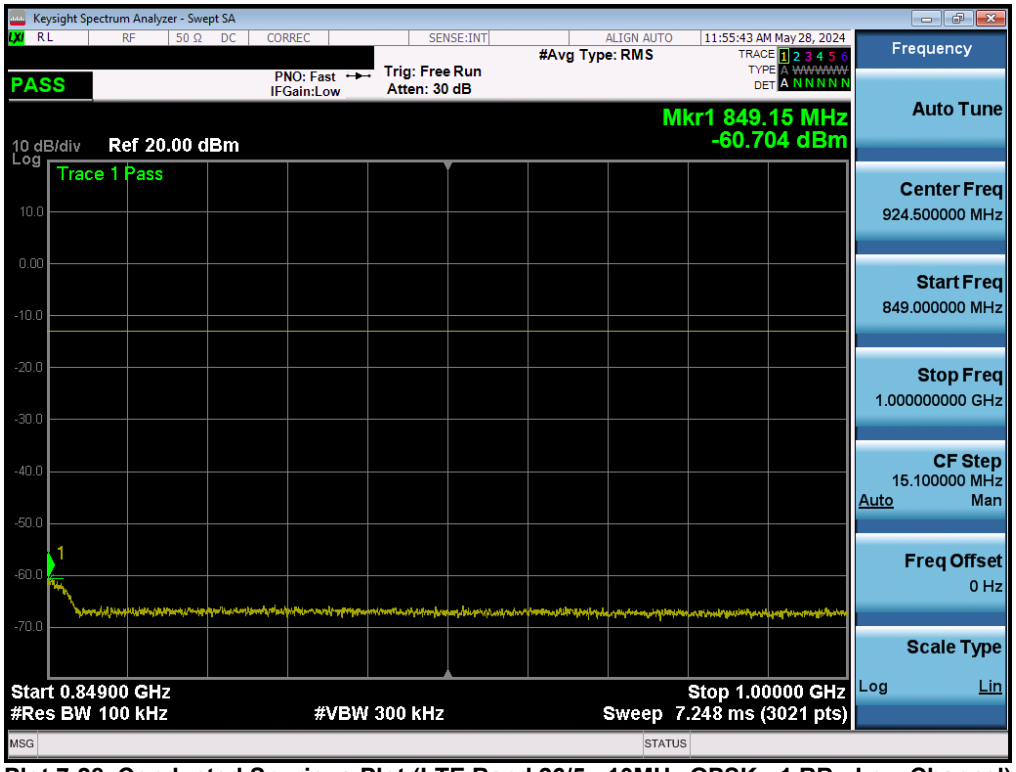


Plot 7-26. Conducted Spurious Plot (WCDMA High Channel)

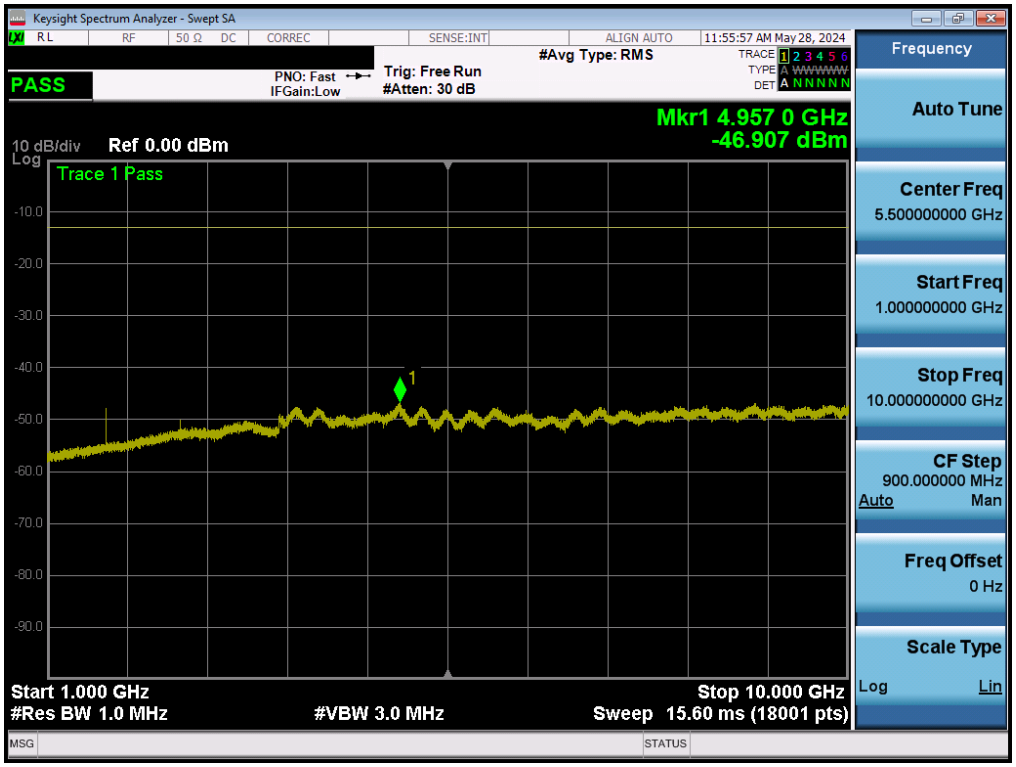
LTE Band 26/5



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

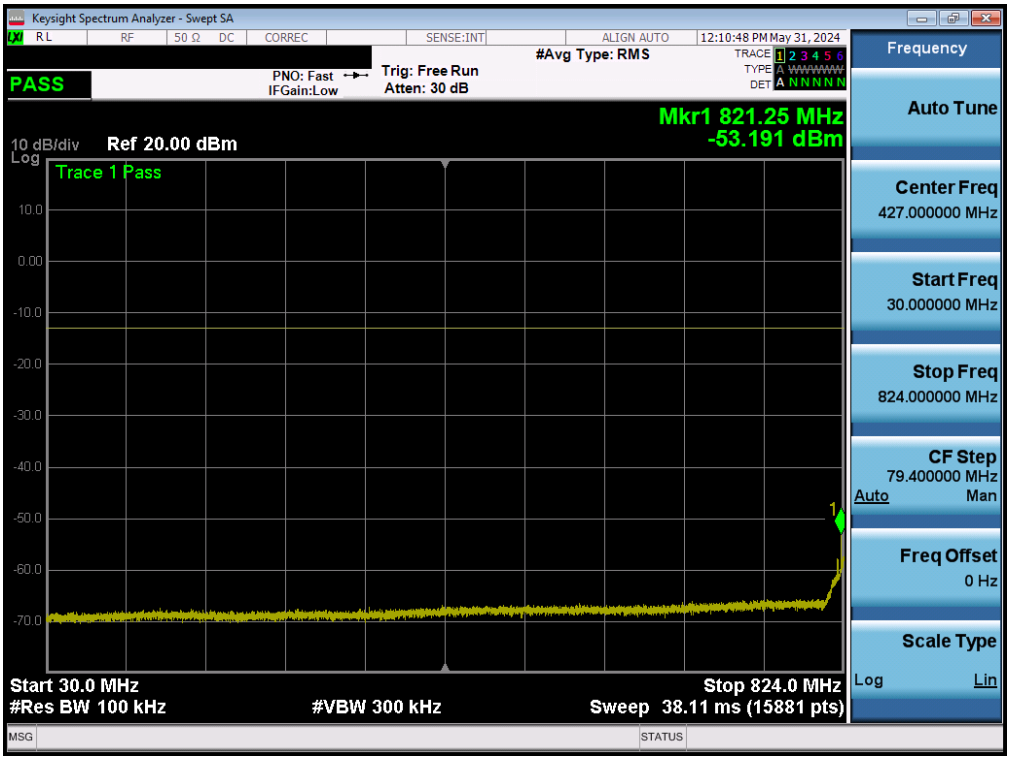


Plot 7-28. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

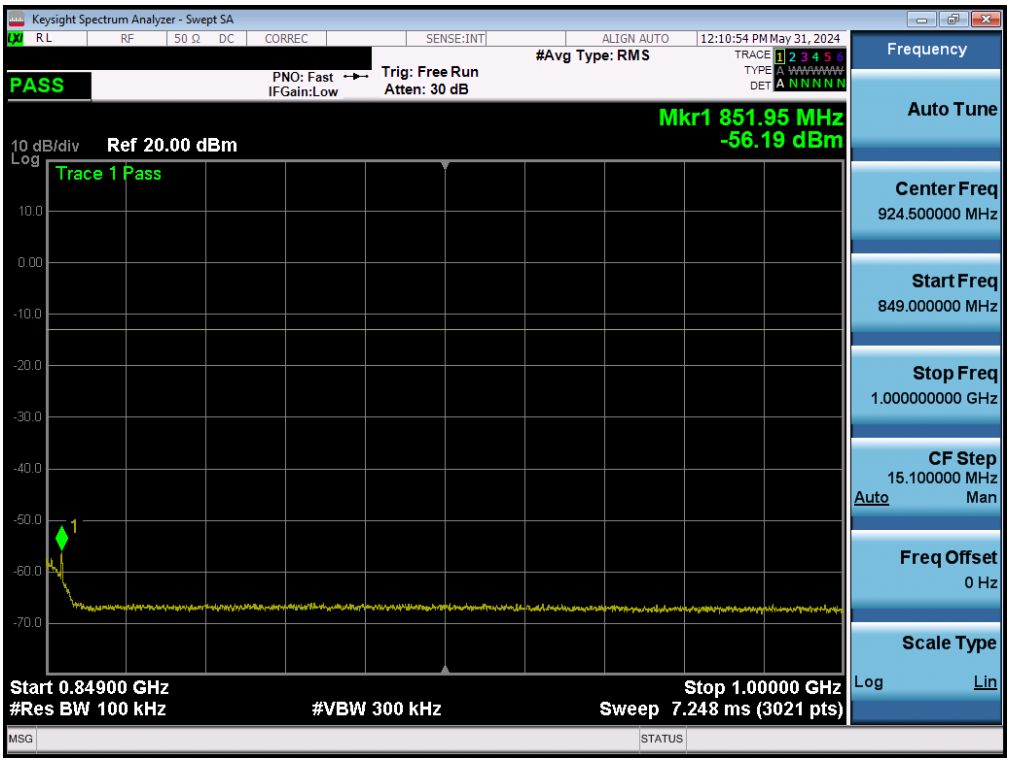


Plot 7-29. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

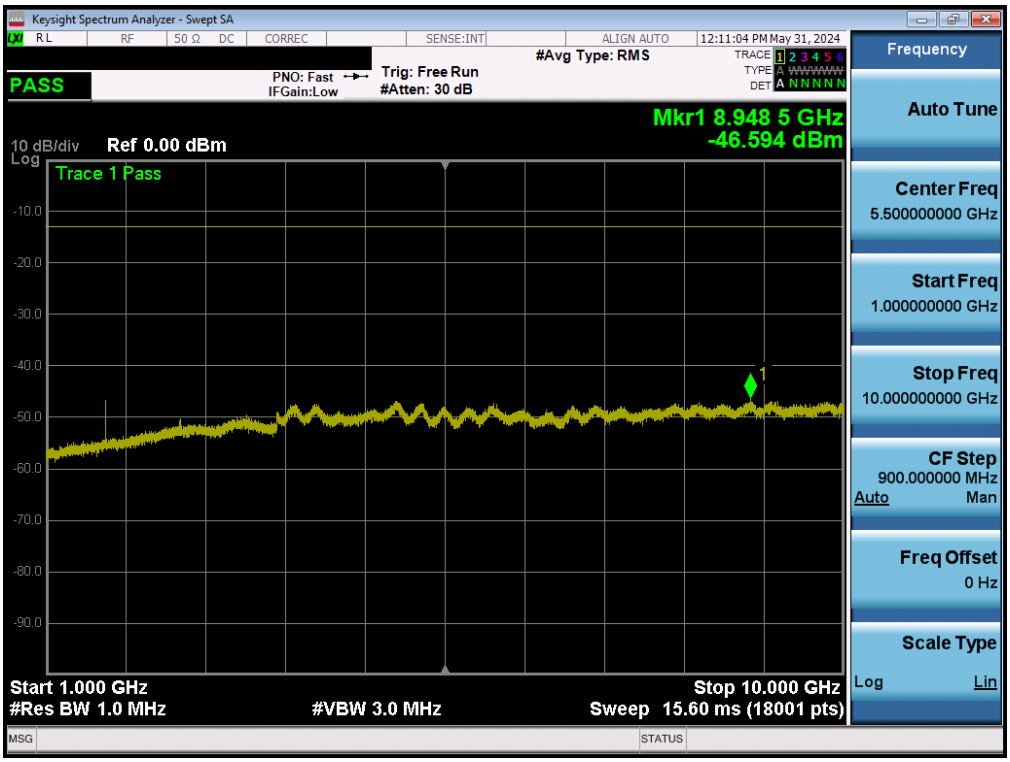
NR Band n26/5



Plot 7-30. Conducted Spurious Plot (NR Band n26/5 - 20.0MHz - 1 RB - Mid Channel)



Plot 7-31. Conducted Spurious Plot (NR Band n26/5 - 20.0MHz - 1 RB - Mid Channel)



Plot 7-32. Conducted Spurious Plot (NR Band n26/5 - 20.0MHz - 1 RB - Mid Channel)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

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

Test Setup

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

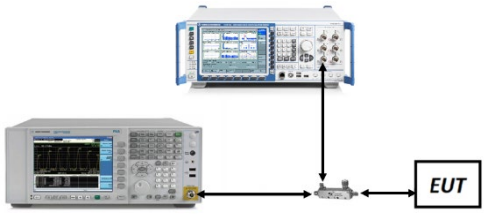


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

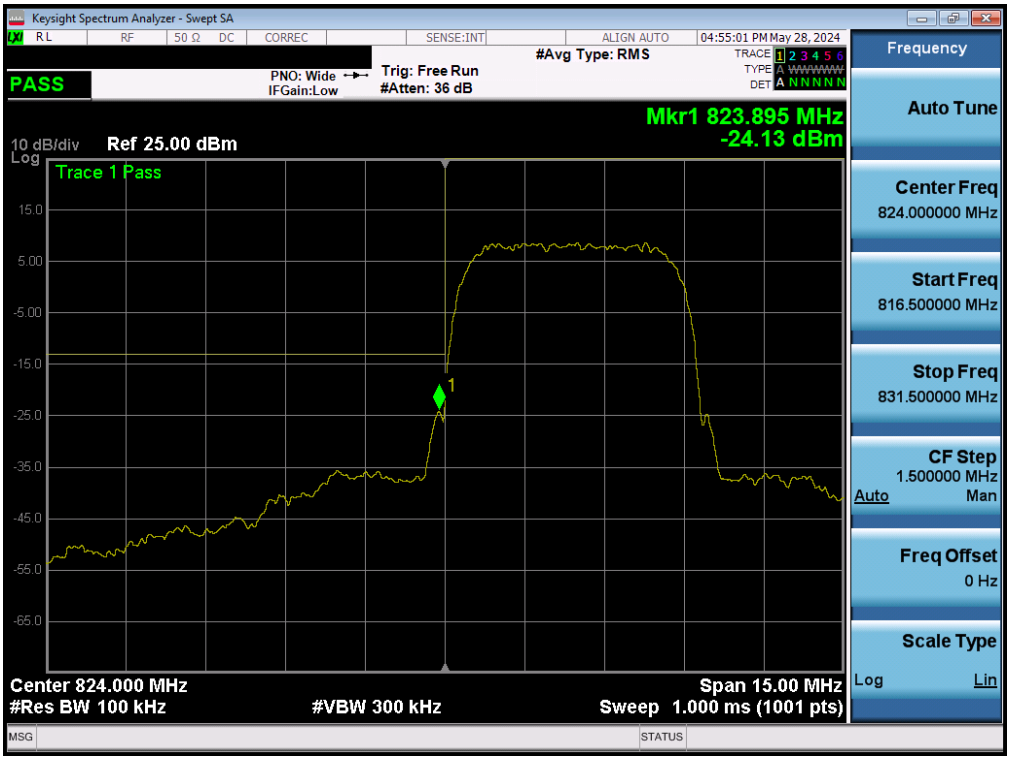
1. Per 22.917(b), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission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

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

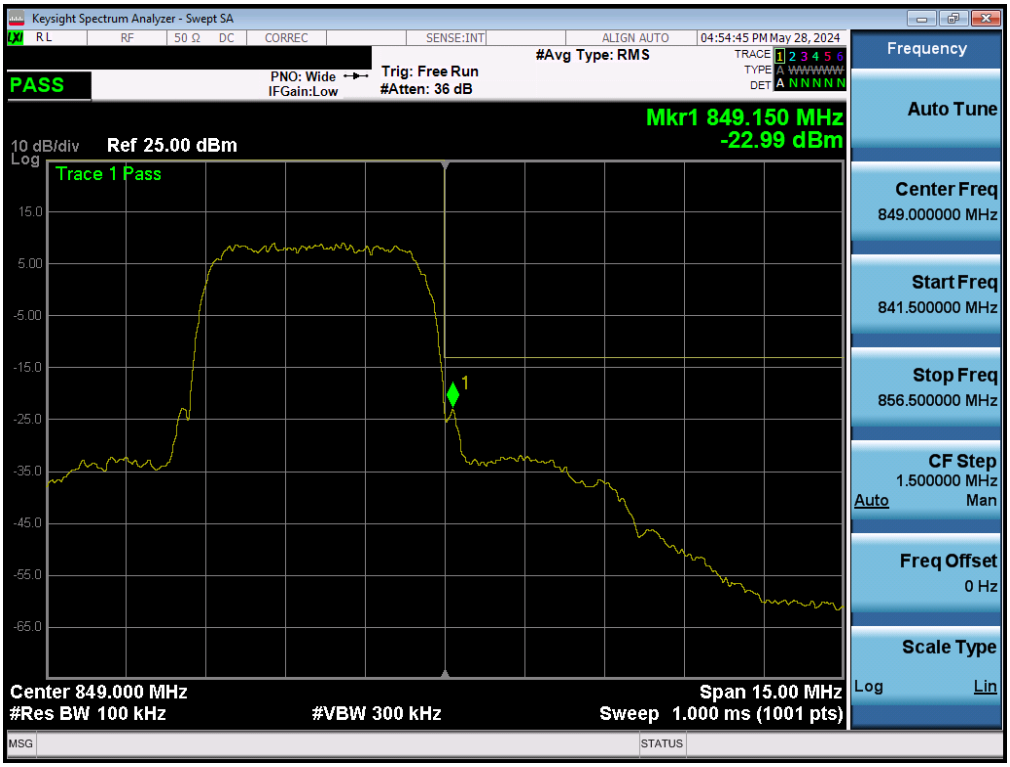
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
WCDMA-Cell	5MHz	Low	Band Edge	-24.13	-13	-11.13
		High	Band Edge	-22.99	-13	-9.99
LTE-B26-5	15 MHz	Low	Band Edge	-37.18	-13	-24.18
		High	Band Edge	-31.67	-13	-18.67
	10 MHz	Low	Band Edge	-37.72	-13	-24.72
		High	Band Edge	-34.57	-13	-21.57
	5 MHz	Low	Band Edge	-30.98	-13	-17.98
		High	Band Edge	-27.70	-13	-14.70
	3 MHz	Low	Band Edge	-24.96	-13	-11.96
		High	Band Edge	-23.76	-13	-10.76
	1.4 MHz	Low	Band Edge	-18.97	-13	-5.97
		High	Band Edge	-20.20	-13	-7.20
NR-n26-5	20 MHz	Low	Band Edge	-27.91	-13	-14.91
		High	Band Edge	-32.90	-13	-19.90
	15 MHz	Low	Band Edge	-27.20	-13	-14.20
		High	Band Edge	-31.90	-13	-18.90
	10 MHz	Low	Band Edge	-28.77	-13	-15.77
		High	Band Edge	-33.30	-13	-20.30
	5 MHz	Low	Band Edge	-26.79	-13	-13.79
		High	Band Edge	-25.82	-13	-12.82

Table 7-7. Conducted Band Edge Test Results

WCDMA Cell

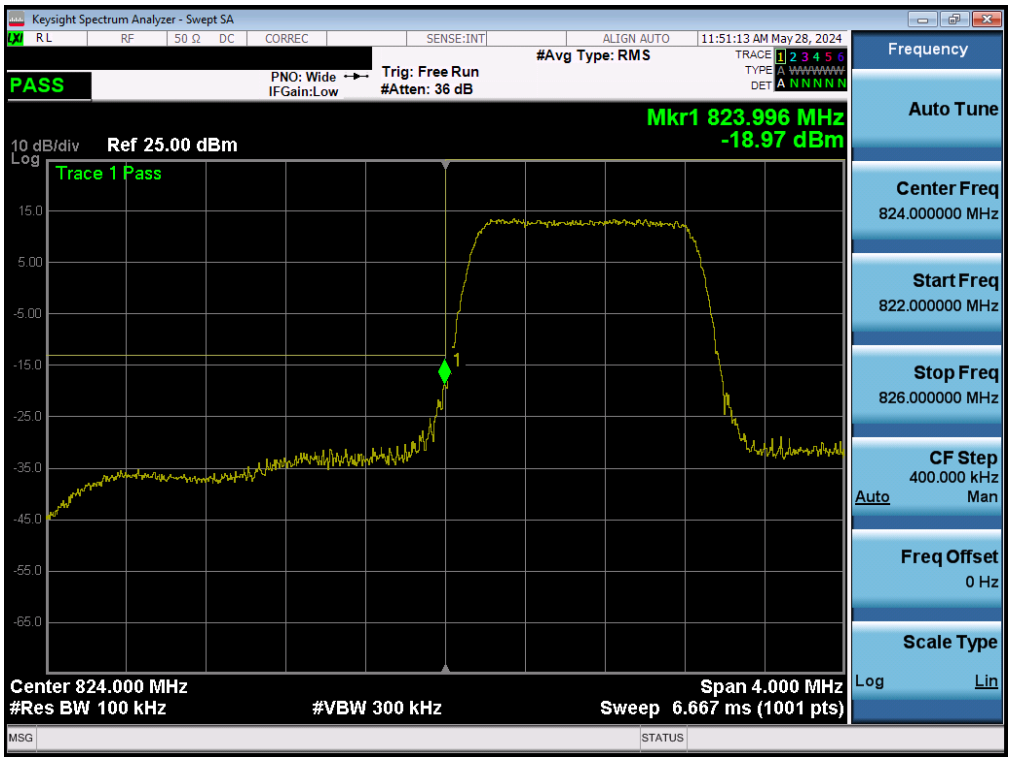


Plot 7-33. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)

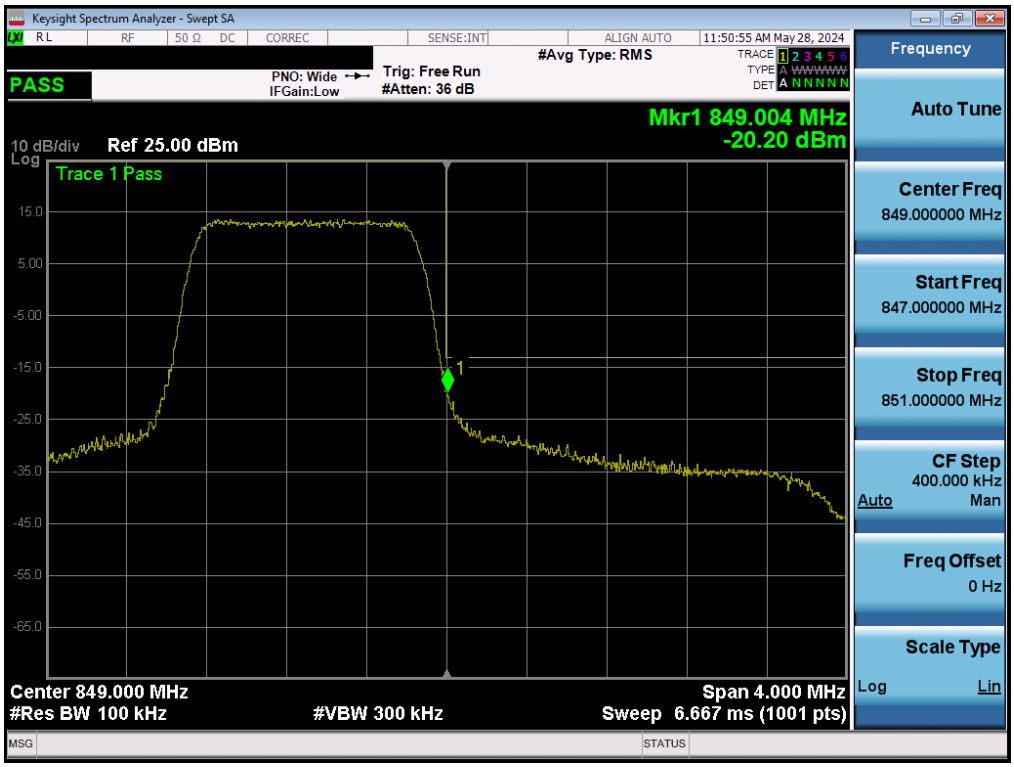


Plot 7-34. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

LTE Band 26/5

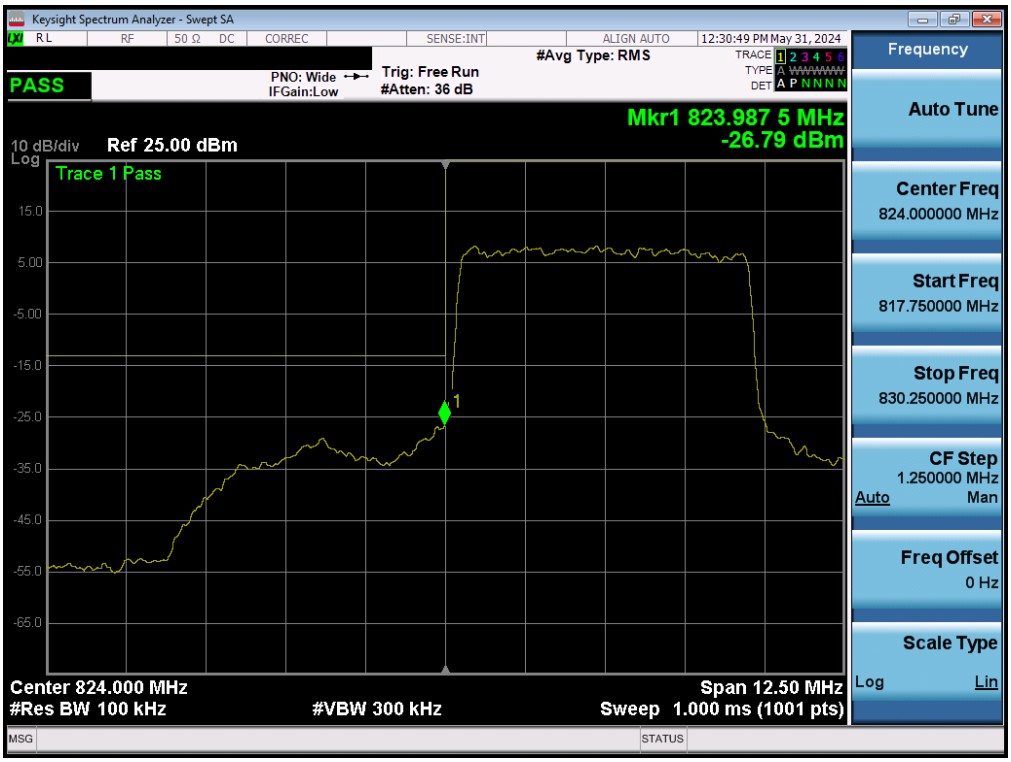


Plot 7-35. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)



Plot 7-36. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

NR Band n26/5



Plot 7-37. Lower Band Edge Plot (NR Band n26/5 – 5.0MHz - Full RB)

Plot 7-38. Upper Band Edge Plot (NR Band n26/5 – 5.0MHz - Full RB)

7.6 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements 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

ANSI C63.26-2015 – Section 5.2.4.4

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

Test Setup

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

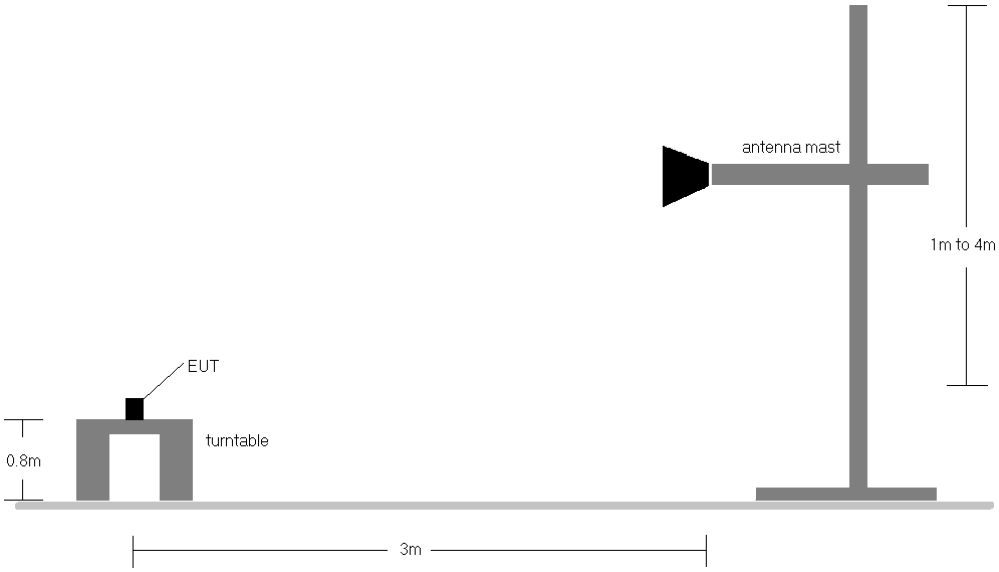


Figure 7-5. Radiated Test Setup < 1GHz

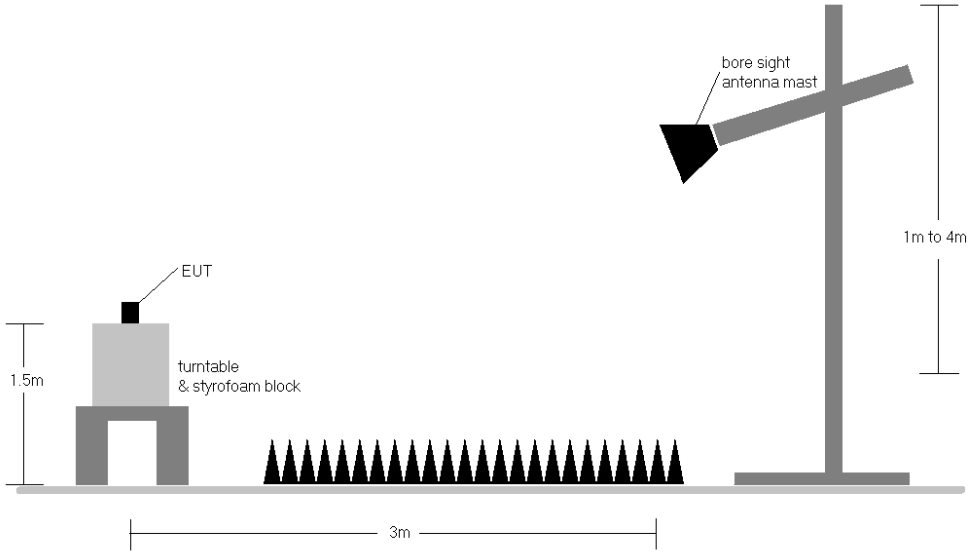


Figure 7-6. Radiated Test Setup > 1GHz

Test Notes

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

2) 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.

3) This unit was tested with its standard battery.

4) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.50	V	148	135	1.25	1 / 37	23.79	**22.89**	0.194	38.45	-15.56
	QPSK	836.50	V	146	138	1.35	1 / 0	23.53	22.73	0.188	38.45	-15.72
	QPSK	841.50	V	144	141	1.46	1 / 0	23.38	22.69	0.186	38.45	-15.76
	16-QAM	831.50	V	148	135	1.25	1 / 37	23.07	22.17	0.165	38.45	-16.28
10 MHz	QPSK	829.00	V	148	135	1.20	1 / 49	23.86	**22.90**	0.195	38.45	-15.55
	QPSK	836.50	V	146	138	1.35	1 / 49	23.59	22.79	0.190	38.45	-15.66
	QPSK	844.00	V	144	141	1.51	1 / 49	23.50	22.86	0.193	38.45	-15.59
	16-QAM	836.50	V	146	138	1.35	1 / 49	23.13	22.34	0.171	38.45	-16.11
5 MHz	QPSK	826.50	V	148	135	1.14	1 / 0	23.88	**22.87**	0.194	38.45	-15.58
	QPSK	836.50	V	146	138	1.35	1 / 24	23.64	22.85	0.193	38.45	-15.60
	QPSK	846.50	V	144	141	1.56	1 / 0	23.46	22.87	0.194	38.45	-15.58
	16-QAM	826.50	V	148	135	1.14	1 / 0	23.44	22.43	0.175	38.45	-16.02
3 MHz	QPSK	825.50	V	148	135	1.12	1 / 7	24.01	**22.98**	0.199	38.45	-15.47
	QPSK	836.50	V	146	138	1.35	1 / 7	23.60	22.80	0.191	38.45	-15.65
	QPSK	847.50	V	144	141	1.58	1 / 7	23.44	22.87	0.194	38.45	-15.58
	16-QAM	825.50	V	148	135	1.12	1 / 7	23.28	22.25	0.168	38.45	-16.20
1.4 MHz	QPSK	824.70	V	148	135	1.11	1 / 3	24.00	**22.95**	0.197	38.45	-15.50
	QPSK	836.50	V	146	138	1.35	1 / 3	23.68	22.88	0.194	38.45	-15.57
	QPSK	848.30	V	144	141	1.60	1 / 3	23.29	22.74	0.188	38.45	-15.71
	16-QAM	824.70	V	148	135	1.11	1 / 3	23.21	22.16	0.165	38.45	-16.29
Hz (Band 26	QPSK (Opposite Pol.)	831.50	H	199	7	1.46	0.00	22.44	21.75	0.150	38.45	-16.70

Table 7-8. ERP Data (LTE Band 26/5)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
20 MHz	π/2 BPSK	834.00	V	133	53	1.30	1 / 1	22.66	21.81	0.152	38.45	-16.64
	π/2 BPSK	836.50	V	133	51	1.35	1 / 1	22.67	21.87	0.154	38.45	-16.58
	π/2 BPSK	839.00	V	137	45	1.41	1 / 1	22.52	21.78	0.150	38.45	-16.68
	QPSK	834.00	V	133	53	1.30	1 / 1	22.73	21.88	0.154	38.45	-16.57
	QPSK	836.50	V	133	51	1.35	1 / 1	22.73	**21.93**	0.156	38.45	-16.52
	QPSK	839.00	V	137	45	1.41	1 / 1	22.61	21.87	0.154	38.45	-16.59
	16-QAM	836.50	V	133	51	1.35	1 / 1	21.70	20.90	0.123	38.45	-17.55
15 MHz	π/2 BPSK	831.50	V	133	53	1.25	1 / 77	22.70	21.80	0.151	38.45	-16.65
	π/2 BPSK	836.50	V	133	51	1.35	1 / 39	22.65	21.86	0.153	38.45	-16.60
	π/2 BPSK	841.50	V	137	45	1.46	1 / 39	22.55	21.85	0.153	38.45	-16.60
	QPSK	831.50	V	133	53	1.25	1 / 77	22.77	21.87	0.154	38.45	-16.58
	QPSK	836.50	V	133	51	1.35	1 / 39	22.84	**22.04**	0.160	38.45	-16.41
	QPSK	841.50	V	137	45	1.46	1 / 39	22.59	21.89	0.155	38.45	-16.56
	16-QAM	841.50	V	137	45	1.46	1 / 39	21.68	20.99	0.126	38.45	-17.46
10 MHz	π/2 BPSK	829.00	V	133	53	1.20	1 / 26	22.66	21.70	0.148	38.45	-16.75
	π/2 BPSK	836.50	V	133	51	1.35	1 / 26	22.77	**21.98**	0.158	38.45	-16.47
	π/2 BPSK	844.00	V	137	45	1.51	1 / 26	22.55	21.91	0.155	38.45	-16.55
	QPSK	829.00	V	133	53	1.20	1 / 26	22.86	21.91	0.155	38.45	-16.54
	QPSK	836.50	V	133	51	1.35	1 / 26	22.73	21.93	0.156	38.45	-16.52
	QPSK	844.00	V	137	45	1.51	1 / 50	22.39	21.75	0.150	38.45	-16.70
	16-QAM	836.50	V	133	51	1.35	1 / 26	21.81	21.02	0.126	38.45	-17.43
5 MHz	π/2 BPSK	829.00	V	133	53	1.14	1 / 1	22.76	21.75	0.150	38.45	-16.70
	π/2 BPSK	836.50	V	133	51	1.35	1 / 23	22.68	**21.89**	0.154	38.45	-16.56
	π/2 BPSK	844.00	V	137	45	1.56	1 / 1	22.28	21.69	0.148	38.45	-16.76
	QPSK	829.00	V	133	53	1.14	1 / 1	22.87	21.86	0.154	38.45	-16.59
	QPSK	836.50	V	133	51	1.35	1 / 23	22.63	21.83	0.153	38.45	-16.62
	QPSK	844.00	V	137	45	1.56	1 / 1	22.44	21.85	0.153	38.45	-16.60
	16-QAM	836.50	V	133	51	1.35	1 / 23	21.56	20.76	0.119	38.45	-17.69
20 MHz	QPSK (CP-OFDM)	836.50	V	133	52	1.35	1 / 53	21.22	**20.42**	0.110	38.45	-18.03

Table 7-9. ERP Data (NR Band n26/5)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	V	136	59	22.29	1.14	21.28	0.134	38.45	-17.17	23.43	0.220	40.61	-17.18
836.60	WCDMA850	V	137	53	22.43	1.36	**21.64**	**0.146**	38.45	-16.82	**23.79**	**0.239**	40.61	-16.82
846.60	WCDMA850	V	137	58	21.96	1.56	21.37	0.137	38.45	-17.08	23.52	0.225	40.61	-17.08

Table 7-10. ERP Data (WCDMA Cell)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

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

Test Setup

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

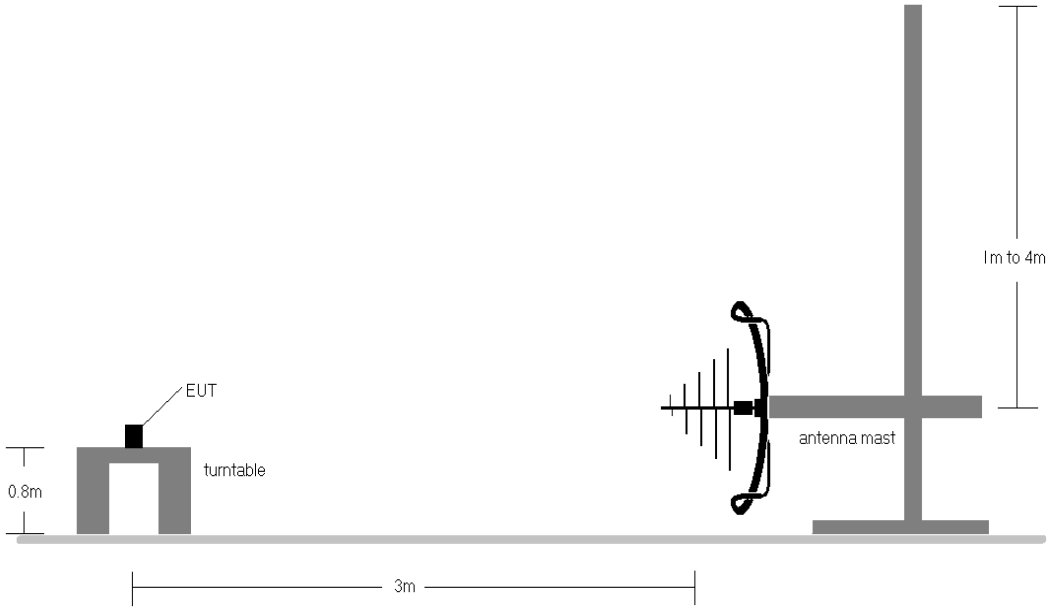


Figure 7-7. Test Instrument & Measurement Setup < 1GHz

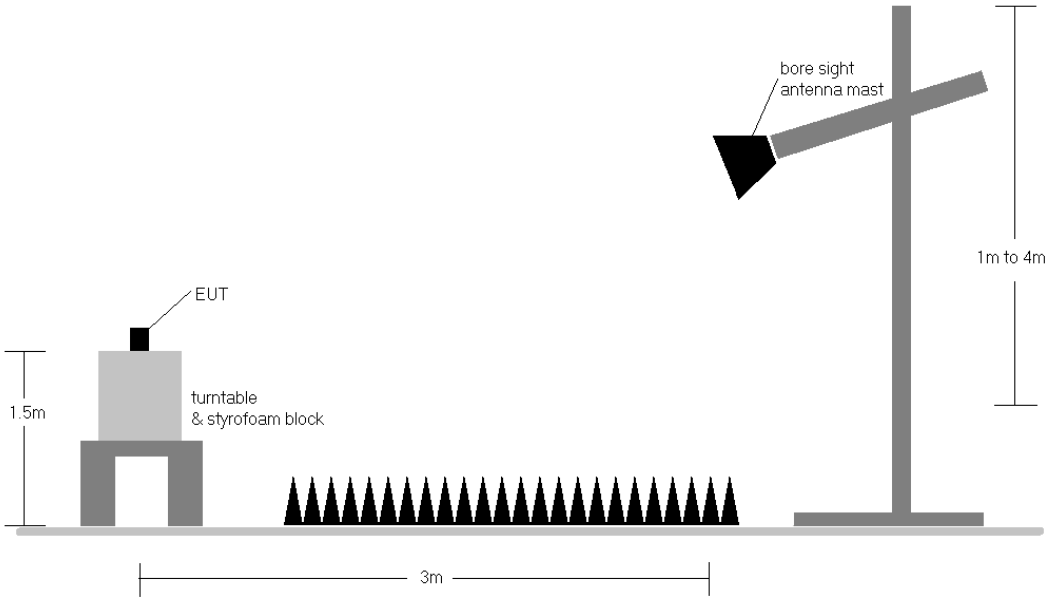


Figure 7-8. Test Instrument & Measurement Setup > 1GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

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

3) 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.

4) This unit was tested with its standard battery.

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

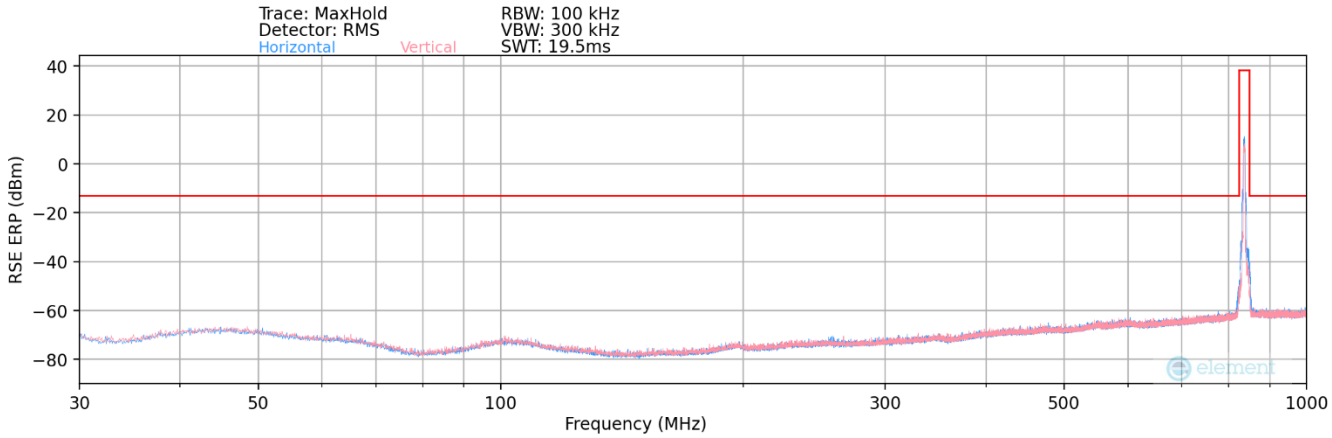
6) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.

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

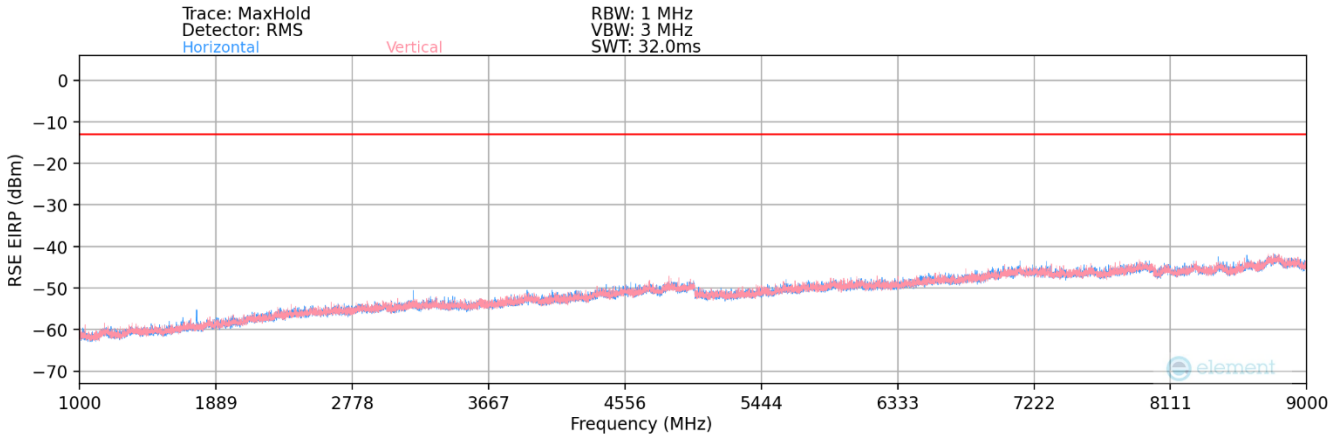
8) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

9) Spurious emission in EN-DC Operating mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor) has been checked and was found to not to be the worst case. Spurious emissions from the NR carrier device are subject to the rules under which the NR carrier operates. Spurious emissions caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates..

WCDMA Cell



Plot 7-39. Radiated Spurious Plot Below 1GHz (WCDMA Cell)



Plot 7-40. Radiated Spurious Plot Above 1GHz (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6
Detector / Trace Mode:	RMS / Average
RBW / VBW:	100kHz / 300kHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
98.77	H	-	-	-89.20	16.92	34.72	-62.69	-13.00	-49.69
192.54	H	-	-	-89.08	19.06	36.98	-60.43	-13.00	-47.43
499.30	H	-	-	-88.99	25.68	43.69	-53.71	-13.00	-40.71

Table 7-11. Radiated Spurious Data (WCDMA Cell – Low Channel)

Mode:	WCDMA RMC
Channel:	4132
Frequency (MHz):	826.4

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
1652.80	H	-	-	-76.10	-6.86	24.04	-71.22	-13.00	-58.22
2479.20	H	141	62	-74.40	-2.89	29.71	-65.55	-13.00	-52.55
3305.60	H	-	-	-77.75	0.39	29.64	-65.62	-13.00	-52.62
4132.00	H	-	-	-77.84	1.85	31.01	-64.24	-13.00	-51.24
4958.40	H	-	-	-78.21	2.68	31.47	-63.79	-13.00	-50.79

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

Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6

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
1673.20	H	-	-	-76.74	-6.39	23.87	-71.39	-13.00	-58.39
2509.80	H	159	169	-70.63	-2.71	33.66	-61.60	-13.00	-48.60
3346.40	H	-	-	-76.90	0.15	30.25	-65.01	-13.00	-52.01
4183.00	H	-	-	-77.70	1.67	30.97	-64.29	-13.00	-51.29
5019.60	H	-	-	-78.65	3.18	31.53	-63.72	-13.00	-50.72

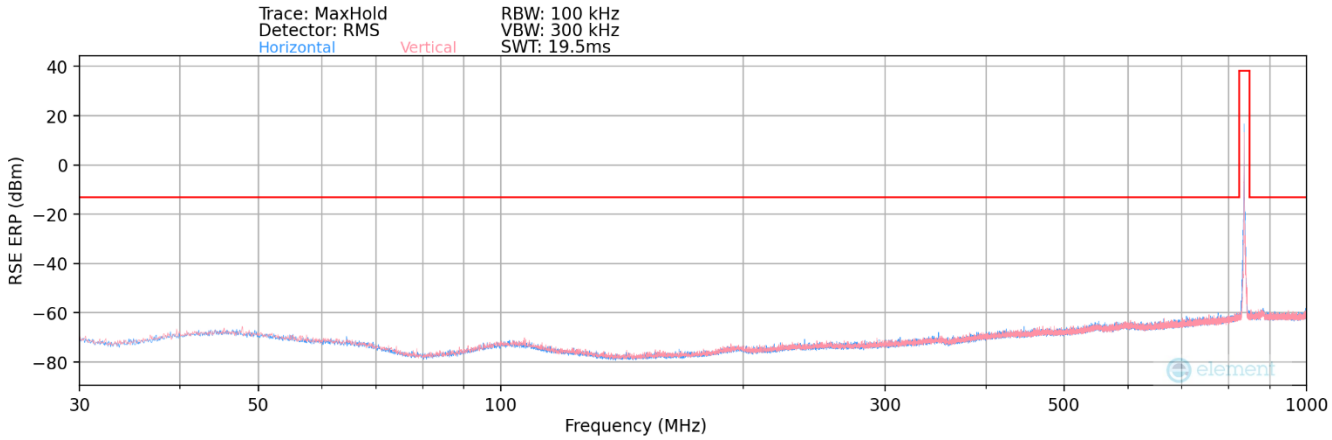
Table 7-13. Radiated Spurious Data (WCDMA Cell – Mid Channel)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6

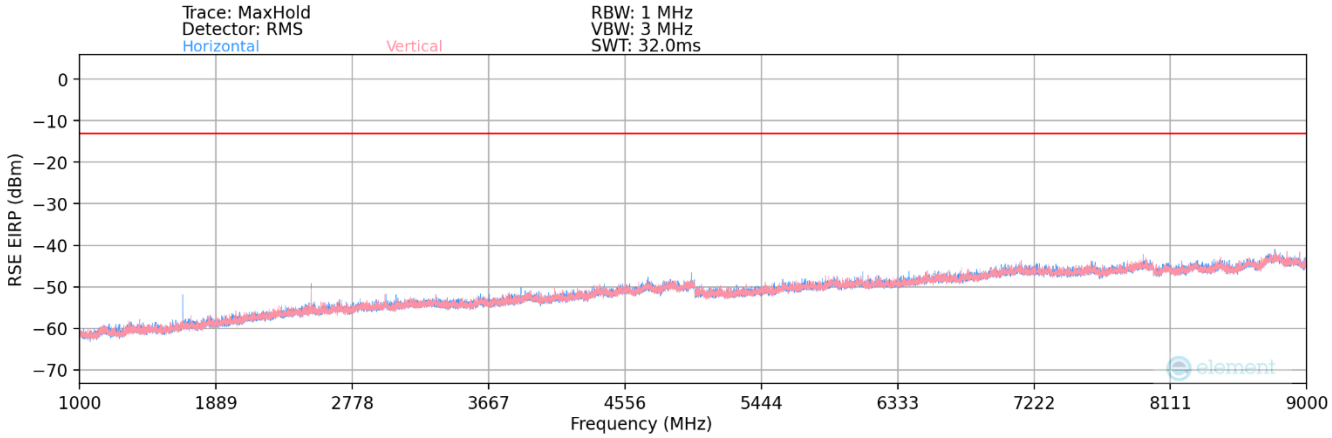
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB
1693.20	H	-	-	-76.64	-5.90	24.46	-70.80	-13.00	-57.80
2539.80	H	168	120	-69.82	-2.19	34.99	-60.27	-13.00	-47.27
3386.40	H	-	-	-77.47	0.17	29.70	-65.56	-13.00	-52.56
4233.00	H	-	-	-77.09	1.57	31.48	-63.77	-13.00	-50.77
5079.60	H	-	-	-78.55	3.62	32.07	-63.19	-13.00	-50.19

Table 7-14. Radiated Spurious Data (WCDMA Cell – High Channel)

LTE Band 26/5



Plot 7-41. Radiated Spurious Plot Below 1GHz (LTE Band 26/5)



Plot 7-42. Radiated Spurious Plot Above 1GHz (LTE Band 26/5)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25
Detector / Trace Mode:	RMS / Average
RBW / VBW:	100kHz / 300kHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
467.00	H	-	-	-96.74	25.19	35.45	-61.96	-13.00	-48.96

Table 7-15. Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	829
RB / Offset:	1 / 25
Detector / Trace Mode:	RMS / Average
RBW / VBW:	1MHz / 3MHz

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
1658.00	H	163	142	-74.32	-6.74	25.94	-69.32	-13.00	-56.32
2487.00	H	-	-	-77.04	-2.95	27.01	-68.25	-13.00	-55.25
3316.00	H	-	-	-77.36	0.29	29.93	-65.33	-13.00	-52.33
4145.00	H	-	-	-78.07	1.82	30.75	-64.51	-13.00	-51.51

Table 7-16. Radiated Spurious Data (LTE Band 26/5 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25
Detector / Trace Mode:	RMS / Average
RBW / VBW:	1MHz / 3MHz

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
1673.00	H	200	13	-76.13	-6.40	24.47	-70.79	-13.00	-57.79
2509.50	H	143	206	-74.23	-2.71	30.06	-65.20	-13.00	-52.20
3346.00	H	-	-	-77.10	0.15	30.05	-65.21	-13.00	-52.21
4182.50	H	-	-	-78.29	1.67	30.38	-64.88	-13.00	-51.88
5019.00	H	-	-	-79.41	3.18	30.77	-64.49	-13.00	-51.49

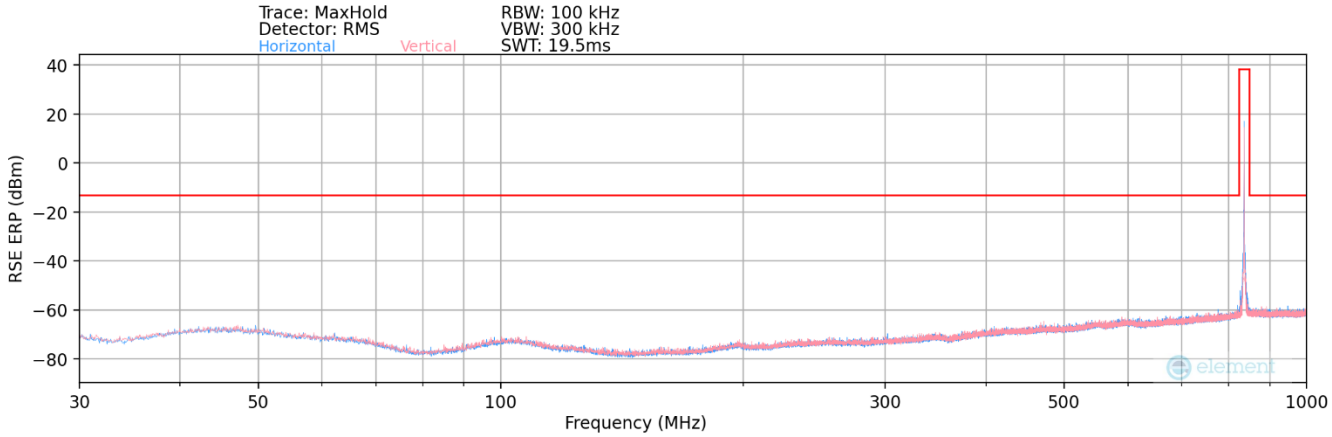
Table 7-17. Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	844
RB / Offset:	1 / 25
Detector / Trace Mode:	RMS / Average
RBW / VBW:	1MHz / 3MHz

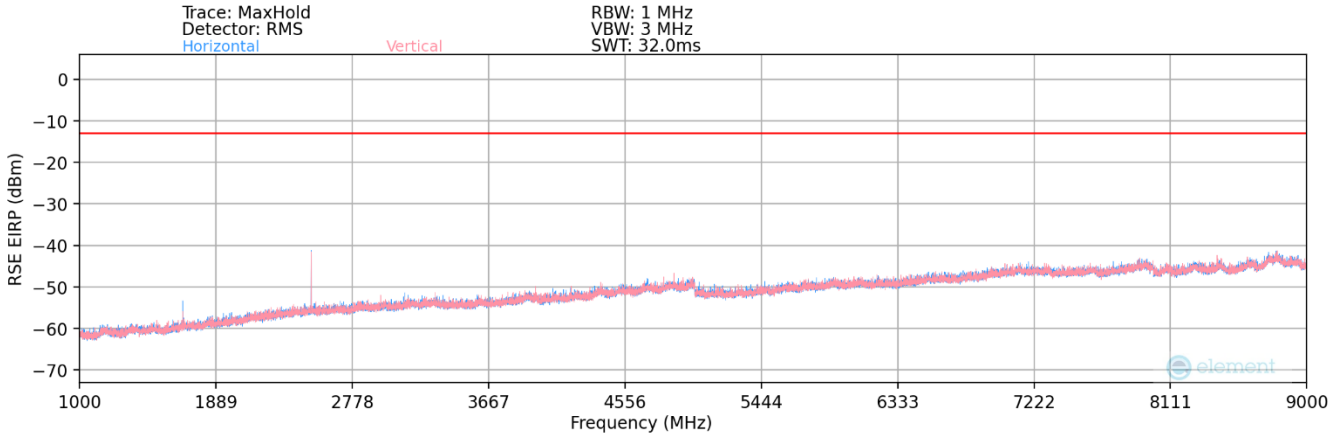
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1688.00	H	169	144	-75.12	-6.04	25.84	-69.41	-13.00	-56.41
2532.00	H	155	202	-73.43	-2.31	31.26	-64.00	-13.00	-51.00
3376.00	H	-	-	-77.96	0.19	29.23	-66.03	-13.00	-53.03
4220.00	H	-	-	-77.78	1.54	30.76	-64.50	-13.00	-51.50
5064.00	H	-	-	-79.28	3.54	31.26	-64.00	-13.00	-51.00

Table 7-18. Radiated Spurious Data (LTE Band 26/5 – High Channel)

NR Band n26/5



Plot 7-43. Radiated Spurious Plot Below 1GHz (NR Band n26/5)



Plot 7-44. Radiated Spurious Plot Above 1GHz (NR Band n26/5)

Bandwidth (MHz):	20
Frequency (MHz):	839
RB / Offset:	1 / 53
Mode:	Stand Alone

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
120.91	H	-	-	-89.14	20.97	38.83	-58.58	-13.00	-45.58
243.42	H	-	-	-88.96	18.97	37.01	-60.40	-13.00	-47.40
497.51	H	-	-	-88.97	25.87	43.90	-53.50	-13.00	-40.50

Table 7-19. Radiated Spurious Data (NR Band n26/5 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	834
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1668.00	H	-	-	-75.90	-6.51	24.59	-70.67	-13.00	-57.67
2502.00	H	247	241	-73.31	-2.84	30.85	-64.41	-13.00	-51.41
3336.00	H	-	-	-76.69	0.16	30.47	-64.79	-13.00	-51.79
4170.00	H	-	-	-77.37	1.72	31.35	-63.91	-13.00	-50.91
5004.00	H	-	-	-78.04	3.00	31.96	-63.30	-13.00	-50.30

Table 7-20. Radiated Spurious Data (NR Band n26/5 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	836.5
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1673.00	H	-	-	-75.74	-6.40	24.86	-70.40	-13.00	-57.40
2509.50	H	243	301	-71.68	-2.71	32.61	-62.65	-13.00	-49.65
3346.00	H	-	-	-76.78	0.15	30.37	-64.89	-13.00	-51.89
4182.50	H	-	-	-77.38	1.67	31.29	-63.97	-13.00	-50.97
5019.00	H	-	-	-78.42	3.18	31.76	-63.50	-13.00	-50.50

Table 7-21. Radiated Spurious Data (NR Band n26/5 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	839
RB / Offset:	1 / 53
Mode:	Stand Alone

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]
1678.00	H	-	-	-76.34	-6.28	24.38	-70.88	-13.00	-57.88
2517.00	H	203	296	-70.04	-2.58	34.38	-60.88	-13.00	-47.88
3356.00	H	-	-	-76.74	0.14	30.40	-64.85	-13.00	-51.85
4195.00	H	-	-	-77.46	1.61	31.15	-64.11	-13.00	-51.11
5034.00	H	-	-	-78.49	3.35	31.86	-63.39	-13.00	-50.39

Table 7-22. Radiated Spurious Data (NR Band n26/5 – High Channel)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

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

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

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

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

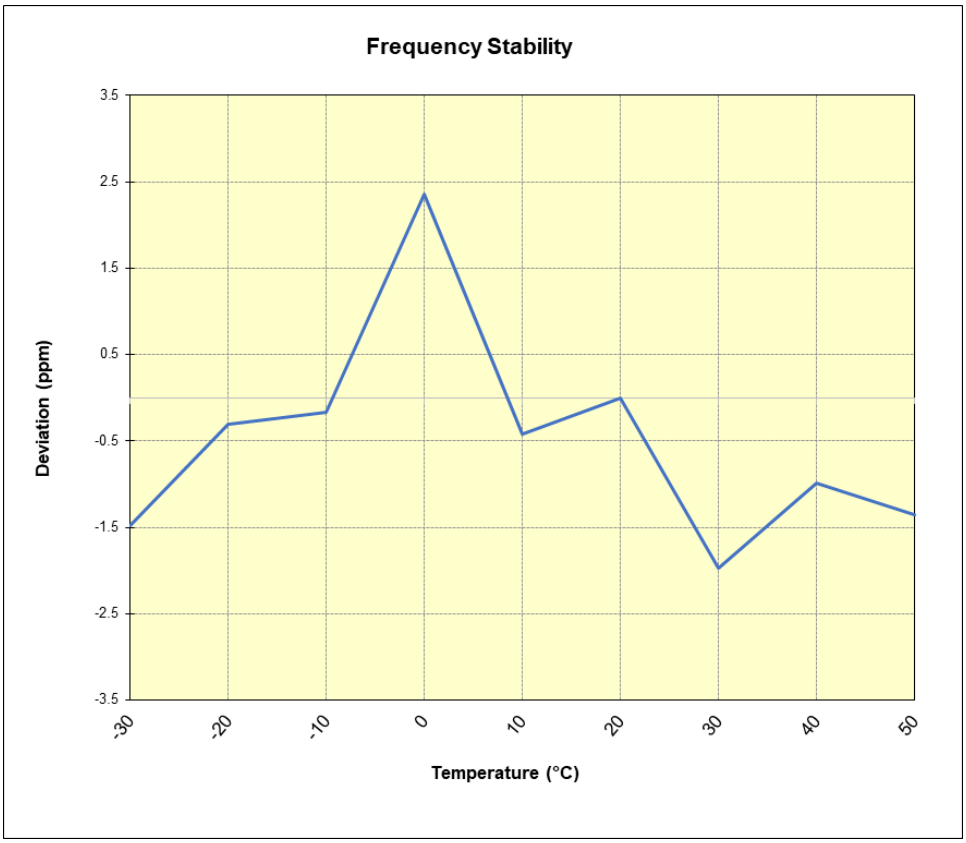
WCDMA Cell

WCDMA Cellular

Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	3.863
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.863	- 30	836,598,014	-1,233	-0.0001474
		- 20	836,598,987	-260	-0.0000311
		- 10	836,599,109	-138	-0.0000165
		0	836,601,222	1,975	0.0002361
		+ 10	836,598,899	-348	-0.0000416
		+ 20 (Ref)	836,599,247	0	0.0000000
		+ 30	836,597,599	-1,648	-0.0001970
		+ 40	836,598,418	-829	-0.0000991
		+ 50	836,598,117	-1,130	-0.0001351
Battery Endpoint	3.174	+ 20	836,597,556	-1,691	-0.0002021

Table 7-23. WCDMA Cell Frequency Stability Data



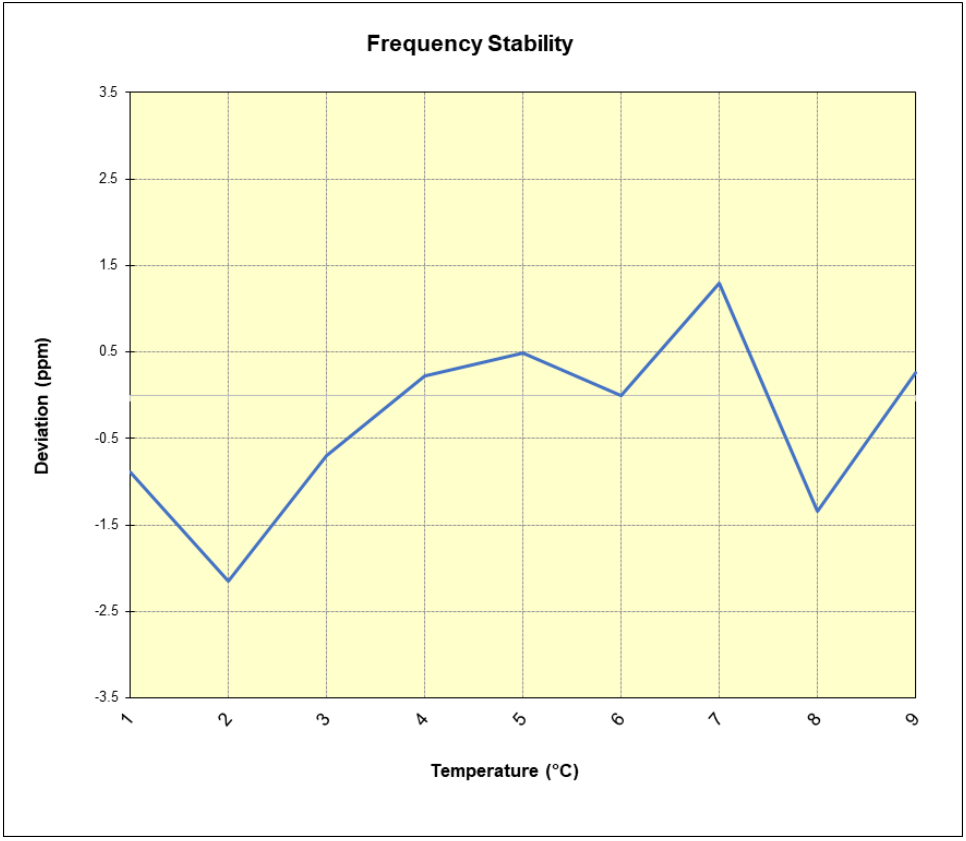
Plot 7-45. WCDMA Cell Frequency Stability Chart

LTE Band 26/5

Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	3.863
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.863	- 30	836,702,288	-746	-0.0000892
		- 20	836,701,238	-1,796	-0.0002147
		- 10	836,702,448	-586	-0.0000700
		0	836,703,217	183	0.0000219
		+ 10	836,703,446	412	0.0000492
		+ 20 (Ref)	836,703,034	0	0.0000000
		+ 30	836,704,118	1,084	0.0001296
		+ 40	836,701,908	-1,126	-0.0001346
		+ 50	836,703,255	221	0.0000264
Battery Endpoint	3.174	+ 20	836,703,211	177	0.0000212

Table 7-24. LTE Band 26/5 Frequency Stability Data



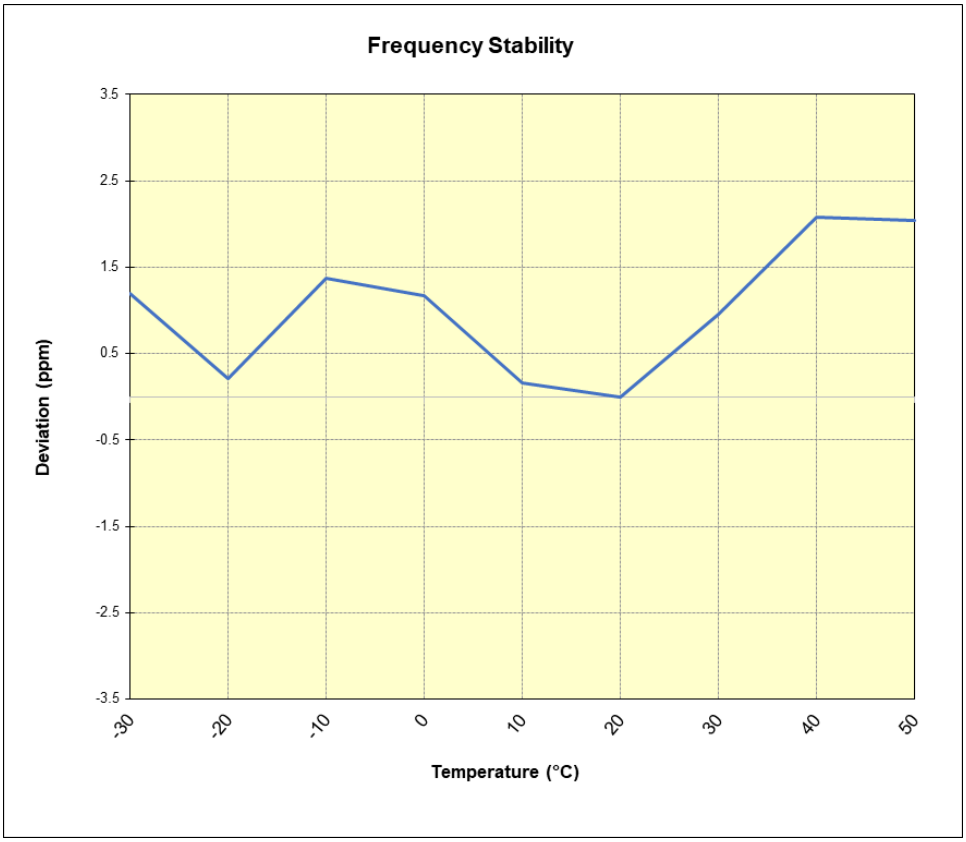
Plot 7-46. LTE Band 26/5 Frequency Stability Chart

NR Band n26/5

NR Band n26/5	
Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	3.863
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.863	- 30	836,592,307	1,000	0.0001195
		- 20	836,591,489	182	0.0000218
		- 10	836,592,456	1,149	0.0001373
		0	836,592,282	975	0.0001165
		+ 10	836,591,444	137	0.0000164
		+ 20 (Ref)	836,591,307	0	0.0000000
		+ 30	836,592,111	804	0.0000961
		+ 40	836,593,049	1,742	0.0002082
		+ 50	836,593,011	1,704	0.0002037
Battery Endpoint	3.174	+ 20	836,591,428	121	0.0000145

Table 7-25. NR Band n26/5 Frequency Stability Data



Plot 7-47. NR Band n26/5 Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Electronics Co., Ltd. Portable Tablet FCC ID: A3LSMX828U** complies with all the requirements of Part 22 of the FCC rules.