

TEST REPORT

	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2025-01161 Page (1) / (110) pages	
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1. Applicant

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea
- Date of Receipt : 2025-04-04

2. Manufacturer

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

3. Use of Report : For FCC Class II permissive change

4. Test Sample / Model: RRU (RF4437d) / RF4437d-25D

5. Date of Test : 2025-04-04 to 2025-04-25

6. Test Standard(method) used : FCC 47 CFR Part 24, Part 27, ANSI C63.26-2015

7. Testing Environment: refer to 10 page

8. Test Results : Compliance

9. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

(Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
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Approval	Tested by  Won-Jae Jang: (Signature)	Technical Manager  Byung-Kwon In: (Signature)
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2025-04-30

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MEASUREMENT REPORT

FCC Rule Part 24, Part 27

Mode	Tx Frequency (MHz)	Equivalent Isotropic Radiated Power		Max Emission Designator	Modulation
		Max. EIRP (dBm/MHz)	Max. EIRP (W/MHz)		
n25(n2)_NR_1C_25M	1 930 ~ 1 990	45.64	36.64	24M0G7D	QPSK
		45.65	36.73	24M0W7D	QAM
n25(n2)_NR_2C_5M+25M		44.95	31.26	29M3G7D	QPSK
		45.05	31.99	29M3W7D	QAM
B/n25(B/n2)_NR_1C_25M+ LTE_1C_5M		45.01	31.70	29M3G7D	QPSK
		45.33	34.12	29M3W7D	QAM
n66(n4)_NR_1C_25M	2 110 ~ 2 180	45.85	38.46	24M0G7D	QPSK
		45.84	38.37	24M0W7D	QAM
n66(n4)_NR_1C_30M		44.92	31.05	28M8G7D	QPSK
		44.98	31.48	28M9W7D	QAM
n66(n4)_NR_3C_5M+10M+25M		44.11	25.76	39M3G7D	QPSK
		44.06	25.47	39M4W7D	QAM
B/n66(B/n4)_NR_1C_25M+LTE_ 2C_10M+5M		44.00	25.12	39M3G7D	QPSK
		44.27	26.73	39M3W7D	QAM
B/n66(B/n4)_NR_1C_30M+ LTE_2C_5M+5M		43.91	24.60	39M2G7D	QPSK
		44.06	25.47	39M2W7D	QAM
B/n66(B/n4)_NR_1C_25M+ DSS_1C_15M		43.87	24.38	39M1G7D	QPSK
		44.24	26.55	39M1W7D	QAM
B/n66(B/n4)_NR_1C_30M+ DSS_1C_10M		43.96	24.89	39M1G7D	QPSK
		44.02	25.23	39M1W7D	QAM
B/n66(B/n4)_NR_1C_25M+ DSS_1C_10M+LTE_1C_5M		43.87	24.38	39M3G7D	QPSK
		44.20	26.30	39M3W7D	QAM

EUT Overview

Note. Output power is Effective Isotropic Radiated Power (EIRP)

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1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
CTK-2025-01161	04/30/2025	Initial Issue

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2.0 INTRODUCTION

2.1 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.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	CN : 8737A CAB ID : KR0025
KOREA	NRRA	KR0025

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3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung RRU(RF4437d) FCC ID: A3LRF4437D-25D**. 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 24&27.

3.2 Device Capabilities

This device supports the following conditional features and filter information:

FCC ID:	A3LRF4437D-25D		
FCC Classification	PCS Licensed Transmitter		
EUT Type:	RRU(RF4437d)		
Model Name:	RF4437d-25D		
Device Capabilities:	LTE, 5G NR		
Operating Band/Frequency Range:	Band	Tx (Downlink)	Rx (Uplink)
	B/n25(B/n2):	1 930 MHz ~ 1 990 MHz	1 850 MHz ~ 1 910 MHz
	B/n66(B/n4):	2 110 MHz ~ 2 180 MHz	1 710 MHz ~ 1 780 MHz
Supported Modulation:	QPSK, 16QAM, 64QAM, 256QAM		
B/n25(B/n2)_Supported Number of Carriers and Channel Bandwidth:	LTE supports bandwidths of 5/10/15/20 MHz with up to 3CC and a maximum bandwidth of 30 MHz NR supports bandwidths of 5/10/15/20/25 MHz with up to 3CC and a maximum bandwidth of 30 MHz DSS supports bandwidths of 10/15/20 MHz with up to 3CC and a maximum bandwidth of 30 MHz		
B/n66(B/n4)_Supported Number of Carriers and Channel Bandwidth:	LTE supports bandwidths of 5/10/15/20 MHz with up to 4CC and a maximum bandwidth of 40 MHz NR supports bandwidths of 5/10/15/20/25/30 MHz with up to 3CC and a maximum bandwidth of 40 MHz DSS supports bandwidths of 10/15/20 MHz with up to 3CC and a maximum bandwidth of 40 MHz		
Multi-Band_Supported Number of Carriers and Channel Bandwidth:	Multi-Band with B/n25(B/n2) and B/n66(B/n4) supports up to 6CC and a maximum bandwidth of 70 MHz		
Supported Configurations:	Single carrier, Multi carrier		
Maximum Output Power	40 W/Unit		
RF Chain:	4T4R		
Antenna Gain:	12.5 dBi		
Input Voltage:	AC 100 ~ 240 V		



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3.3 Test Configuration

The setup is as follows:

- The EUT ("RRU(RF4437d)") and a Data Unit (DU) are each powered by AC 100 V power supply.
- The DU is connected to a test laptop via an ethernet cable acting as backhaul.
- DU connects to the EUT through a fiber optic cable.
- An RF cable connects the signal analyzer and the EUT Ports for respective measurement.

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 971168 D01 v03r01. See Section 8.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

Distribution unit (DU) which were used in test, that authorized under the SDoC procedure.

The following information is about configurations of carrier frequency and output power per port declared by the manufacturer.

* Abbreviations:

- 1C: 1 single carrier
- 2C: Contiguous 2 carriers in multi-carrier operation
- 2NC: Non-Contiguous 2 carriers in multi-carrier operation
- 3C: Contiguous 3 carriers in multi-carrier operation
- 3NC: Non-Contiguous 3 carriers in multi-carrier operation

Configuration	No of Carriers	Carrier Bandwidth (MHz)	Frequency Configuration (MHz)			Rated Power (W/path)
			Low	Middle	High	
n25(n2)_NR_1C_25M	1	25	1 942.5	1 960.0	1 977.5	10 W/path
n25(n2)_NR_2C_5M+25M	2	30	1 945.5	1 960.0	1 975.0	
n25(n2)_NR_2NC_5M+25M			1 932.5 + 1 977.5			
B/n25(B/n2)_NR_1C_25M+ LTE_1C_5M	2	30	1 945.5	1 960.0	1 975.0	
B/n25(B/n2)_NC_NR_1C_25M+ LTE_1C_5M			1 942.5 + 1 987.5			
n66(n4)_NR_1C_25M	1	25	2 122.5	2 145.0	2 167.5	
n66(n4)_NR_1C_30M	1	30	2 125.0	2 145.0	2 165.0	
n66(n4)_NR_3C_5M+10M+25M	3	40	2 130.0	2 145.0	2 160.0	
n66(n4)_NR_3NC_5M+10M+25M			2 112.5 + 2 135.0 +2 167.5			
B/n66(B/n4)_NR_1C_25M+ LTE_2C_10M+5M	3	40	2 130.0	2 145.0	2 160.0	
B/n66(B/n4)_NC_NR_1C_25M+ LTE_2C_10M+5M			2 122.5 + 2 155.0 + 2 177.5			
B/n66(B/n4)_NR_1C_30M+ LTE_2C_5M+5M	3	40	2 130.0	2 145.0	2 160.0	
B/n66(B/n4)_NC_NR_1C_30M+ LTE_2C_5M+5M			2 125.0 + 2 157.5 + 2 177.5			
B/n66(B/n4)_NR_1C_25M+ DSS_1C_15M	2	40	2 130.0	2 145.0	2 160.0	
B/n66(B/n4)_NC_NR_1C_25M+ DSS_1C_15M			2 122.5 + 2 172.5			
B/n66(B/n4)_NR_1C_30M+ DSS_1C_10M	2	40	2 130.0	2 145.0	2 160.0	
B/n66(B/n4)_NC_NR_1C_30M+ DSS_1C_10M			2 125.0 + 2 175.0			

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B/n66(B/n4)_NR_1C_25M+ DSS_1C_10M+LTE_1C_5M	3	40	2 130.0	2 145.0	2 160.0	
B/n66(B/n4)_NC_NR_1C_25M+ DSS_1C_10M+LTE_1C_5M			2 122.5 + 2 155.0 + 2 177.5			
Multi-Band_ n25(n2)_NR_2C_5M+25M+ n66(n4)_NR_3C_5M+15M+20M	5	70	1 932.5 + 1 947.5 + 2 142.5 + 2 152.5 + 2 170.0			
Multi-Band_NC_ n25(n2)_NR_2C_5M+25M+ n66(n4)_NR_3C_5M+15M+20M			1 932.5 + 1 977.5 + 2 112.5 + 2 145.0 + 2 170.0			
Multi-Band_ n25(n2)_NR_3C_5M+5M+20M+ n66(n4)_NR_2C_10M+30M	6	70	1 932.5 + 1 937.5 + 1 950.0 + 2 145.0 + 2 165.0			
Multi-Band_NC n25(n2)_NR_3C_5M+5M+20M+ n66(n4)_NR_2C_10M+30M			1 932.5 + 1 960.0 + 1 980.0 + 2 145.0 + 2 165.0			

3.4 EMI Suppression Device(s)/Modifications

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



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4.0 DESCRIPTION OF TESTS

4.1 Measurement Procedure

The measurement procedures described in the document titled “American National Standard for Compliance Testing of Transmitter Used in Licensed Radio Service” (ANSI C63.26-2015) and the guidance provided in KDB 971168 D01 v03r01, and KDB 662911 D01 v02r01 and KDB 940660 D01 v03 were used in the measurement of the EUT.

Occupied Bandwidth:

KDB 971168 D01 v03r01 – Section 4.3
ANSI C63.26-2015 – Section 5.4.4

Modulation Characteristics:

ANSI C63.26 - Section 5.3

Conducted Power Measurement and EIRP and PSD

KDB 971168 D01 v03r01 – Section 5.3
KDB 971168 D01 v03r01 – Section 5.4
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.5
ANSI C63.26-2015 – Section 5.2.4

Peak-to-Average Power Ratio:

KDB 971168 D01 v03r01 – Section 5.7
ANSI C63.26-2015 – Section 5.2.3.4

Channel Edge Emissions at Antenna Terminal

KDB 971168 D01 v03r01 – Section 6
KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements
a) Absolute Emission Limits
iii) Measure and add $10 \log(N_{ANT})$ dB
ANSI C63.26-2015 – Section 5.7

Spurious and Harmonic Emissions at Antenna Terminal

KDB 971168 D01 v03r01 – Section 6
KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements
a) Absolute Emission Limits
iii) Measure and add $10 \log(N_{ANT})$ dB
ANSI C63.26-2015 – Section 5.7

Radiated unwanted emission

KDB 971168 D01 v03r01 – Section 7
ANSI C63.26-2015 – Section 5.8

Frequency Stability / Temperature Variation

KDB 971168 D01 v03r01 – Section 9
ANSI C63.26-2015 – Section 5.6

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4.2 Measurement Software

Test item	Name	Version
Conducted Measurement	Node B automation	1.0
Radiated Measurement	EP5RE	6.0.1.0
	ES10	10.001

4.3 Enviromental Conditions

The temperature is controlled within the range of 15°C to 35°C. The relative humidity is controlled within the range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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5.0 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.

Description	Uncertainty
Conducted Power Measurement and EIRP	1.5 dB (C.L. : Approx. 95%, $k = 2$)
Occupied bandwidth	0.1 MHz (C.L. : Approx. 95%, $k = 2$)
Peak-to-average power ratio	1.0 dB (C.L. : Approx. 95%, $k = 2$)
Band Edge Emissions at Antenna Terminal	3.0 dB (C.L. : Approx. 95%, $k = 2$)
Spurious and Harmonic Emissions at Antenna Terminal	3.0 dB (C.L. : Approx. 95%, $k = 2$)
Radiated Emissions ($f \leq 1$ GHz)	3.88 dB (C.L. : Approx. 95%, $k = 2$)
Radiated Emissions ($f > 1$ GHz)	4.50 dB (C.L. : Approx. 95%, $k = 2$)
Frequency Stability	0.1 kHz (C.L. : Approx. 95%, $k = 2$)

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6.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacture	Model	Description	Cal Date	Cal interval	Cal Due	Serial Number
Rohde & Schwarz	FSV30	Signal Analyzer	2024-11-26	Annual	2025-11-26	100925
Rohde & Schwarz	FSV40	Spectrum Analyzer	2025-01-10	Annual	2026-01-10	101574
Rohde & Schwarz	ESW44	EMI TEST RECEIVER	2025-04-28	Annual	2026-04-28	102039
TESEQ	CBL6111D	Bilog Antenna	2024-08-21	Annual	2025-08-21	60654
PASTERNAK	PE7AP006-06	Attenuator	2024-07-31	Annual	2025-07-31	L20210504000 023
SONOMA	310N	AMPLIFIER	2024-07-31	Annual	2025-07-31	411011
Agilent	8449B	Preamplifier	2024-04-11	Annual	2025-04-11	3008A00620
ETS-Lindgren	3115	Double Ridged Guide Antenna	2025-03-13	Annual	2026-03-13	00078895
Keysight	N9020B	Signal Analyzer	2024-10-07	Annual	2025-10-07	MY55470135
REACHLINE	250W18NN-40	Attenuator	2025-03-13	Annual	2026-03-13	ey40db003
REACHLINE	250W18NN-40	Attenuator	2025-03-13	Annual	2026-03-13	ey40db004
REACHLINE	250W18NN-40	Attenuator	2025-03-13	Annual	2026-03-13	ey40db006
REACHLINE	250W18NN-40	Attenuator	2025-03-13	Annual	2026-03-13	ey40db007
REACHLINE	RL50W40GKF-20	Attenuator	2026-03-28	Annual	2026-03-28	ey20db001
K&L MICROWAVE	11SH10-6200/T18000-O/O	High Pass Filter	2024-07-10	Annual	2025-07-10	00002
AC POWER KOREA	ACPD-60150	System DC Power Supply	2025-04-04	Annual	2026-04-04	DC-1
MINICIRCUITS	RC-2SP6T-40	RF SWITCH	2026-03-20	Annual	2026-03-20	01911060057

Table 6-1. 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. All testing was performed before the calibration due date.

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7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 24M0G7D

Occupied Bandwidth = 23.99 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 24M0W7D

Occupied Bandwidth = 23.97 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

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8.0 TEST RESULTS

8.1 Summary

Company Name: SAMSUNG Electronics Co., Ltd.

FCC ID: A3LRF4437D-25D

FCC Classification: PCS Licensed Transmitter

Mode(s): LTE, NR

FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
§ 2.1046	Conducted Average Output Power	N/A	CONDUCTED	PASS	Annex A
§ 2.1049	Occupied Bandwidth	N/A		PASS	Section 8.2
§ 2.1046, § 24.232, § 27.50(d)	Equivalent Isotropic Radiated Power	< 1640 W/MHz		PASS	Section 8.3
§ 2.1046, § 24.232, § 27.50(d)	Peak-to-average ratio	≤ 13 dB		PASS	Section 8.4
§ 2.1051, § 24.238, § 27.53(h)	Band Edge Emissions at Antenna Terminal	< 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions		PASS	Section 8.5
§ 2.1051, § 24.238, § 27.53(h)	Spurious and Harmonic Emissions at Antenna Terminal			PASS	Section 8.6
§ 2.1055 § 24.235 § 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block		N/A	(Note 4)
§ 2.1055, § 24.238, § 27.53(h)	Radiated unwanted emission	< 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions	RADIATED	PASS	Section 8.7

Table 8-1. 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.
- 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 and attenuators.
- 4) This is a variant report for Carrier power changed by software without hardware change. The test item does not affect those operation. And it was performed in the original report.



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8.2 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 Procedures Used

KDB 971168 D01 v03r01 – Section 4.3

ANSI C63.26-2015 – Section 5.4.4

Test Setting

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

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 $\geq 3 \times$ 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.

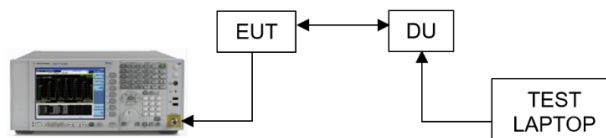


Figure 8-1. Test Instrument & Measurement Setup

Test Notes

None

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	23.94	23.95	23.97	23.92
	1	23.89	23.88	23.89	23.92
	2	23.96	23.91	23.94	23.87
	3	23.99	23.97	23.93	23.88
Middle	0	23.90	23.92	23.94	23.97
	1	23.95	23.95	23.94	23.88
	2	23.99	23.97	23.88	23.91
	3	23.96	23.96	23.91	23.95
High	0	23.87	23.96	23.97	23.91
	1	23.96	23.96	23.92	23.92
	2	23.91	23.97	23.91	23.96
	3	23.92	23.94	23.93	23.97

Table 8-2. Occupied Bandwidth Summary Data (n25(n2)_NR_1C_25M)

Channel	Port	OBW (MHz)			
		n25(n2)_NR_2C_5M+25M		n25(n2)_NR_1C_25M + LTE_1C_5M	
		QPSK	QAM	QPSK	QAM
Low	0	29.25	29.26	29.22	29.18
	1	29.27	29.22	29.19	29.21
	2	29.23	29.27	29.23	29.23
	3	29.28	29.31	29.23	29.23
Middle	0	29.27	29.20	29.19	29.24
	1	29.25	29.26	29.23	29.22
	2	29.27	29.25	29.20	29.21
	3	29.27	29.24	29.19	29.25
High	0	29.28	29.25	29.24	29.26
	1	29.27	29.25	29.23	29.21
	2	29.21	29.30	29.20	29.24
	3	29.26	29.25	29.30	29.23

Table 8-3. Occupied Bandwidth Summary Data (B/n25(B/n2)_Multi-carrier operation)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	23.89	23.87	23.84	23.89
	1	23.96	23.85	23.94	23.86
	2	23.87	23.92	23.87	23.84
	3	23.86	23.89	23.91	23.85
Middle	0	23.93	23.92	23.94	23.89
	1	23.99	23.91	23.98	23.91
	2	23.92	23.93	23.94	23.93
	3	23.95	23.96	23.98	23.92
High	0	23.89	23.93	23.90	23.89
	1	23.97	23.94	23.90	23.87
	2	23.93	23.94	23.90	23.96
	3	23.91	23.95	23.93	23.93

Table 8-4. Occupied Bandwidth Summary Data (n66(n4)_NR_1C_25M)

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	28.70	28.75	28.71	28.61
	1	28.77	28.70	28.74	28.71
	2	28.75	28.71	28.77	28.71
	3	28.73	28.74	28.76	28.71
Middle	0	28.84	28.73	28.83	28.76
	1	28.75	28.78	28.80	28.84
	2	28.75	28.77	28.85	28.82
	3	28.83	28.73	28.86	28.77
High	0	28.80	28.74	28.82	28.77
	1	28.76	28.71	28.83	28.80
	2	28.78	28.79	28.78	28.79
	3	28.76	28.76	28.83	28.79

Table 8-5. Occupied Bandwidth Summary Data (n66(n4)_NR_1C_30M)

Channel	Port	OBW (MHz)					
		n66(n4)_NR_3C_5M+ 10M+25M		B/n66(B/n4)_NR_1C_25M+ LTE 2C 10M+5M		B/n66(B/n4)_NR_1C_30M+ LTE 2C 5M+5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Low	0	39.22	39.09	39.10	39.18	39.03	39.01
	1	39.15	39.08	39.12	39.13	39.07	39.06
	2	39.16	39.27	39.17	39.17	39.14	39.09
	3	39.15	39.18	39.22	39.15	39.10	39.08
Middle	0	39.21	39.34	39.18	39.25	39.20	39.15
	1	39.18	39.29	39.23	39.22	39.21	39.24
	2	39.21	39.35	39.27	39.22	39.20	39.16
	3	39.27	39.28	39.31	39.21	39.15	39.18
High	0	39.17	39.28	39.31	39.18	39.17	39.20
	1	39.24	39.29	39.21	39.20	39.24	39.15
	2	39.15	39.21	39.30	39.29	39.21	39.17
	3	39.23	39.23	39.16	39.20	39.20	39.16

Table 8-6. Occupied Bandwidth Summary Data (B/n66(B/n4)_Multi-carrier operation)

Channel	Port	OBW (MHz)					
		B/n66(B/n4)_NR_1C_25M+ DSS 1C 15M		B/n66(B/n4)_NR_1C_30M+ DSS 1C 10M		B/n66(B/n4)_NR_1C_25M+ DSS 1C 10M+LTE 1C 5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Low	0	38.82	38.83	38.88	38.97	39.17	39.15
	1	38.88	38.88	38.99	38.91	39.18	39.16
	2	38.89	38.96	39.00	38.88	39.24	39.14
	3	38.92	38.88	38.96	39.02	39.15	39.28
Middle	0	39.02	38.98	39.05	39.11	39.30	39.22
	1	39.09	38.97	38.95	39.10	39.26	39.25
	2	39.02	39.08	39.00	39.03	39.32	39.27
	3	38.99	38.99	39.02	38.96	39.26	39.25
High	0	38.99	38.98	39.10	39.04	39.29	39.24
	1	38.96	39.00	39.03	39.04	39.27	39.20
	2	39.02	39.01	39.09	38.95	39.23	39.25
	3	39.11	38.98	39.05	38.97	39.26	39.25

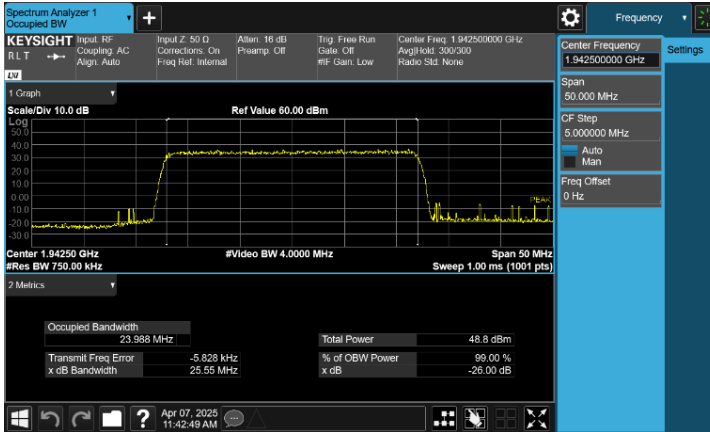
Table 8-7. Occupied Bandwidth Summary Data (B/n66(B/n4)_Multi-carrier operation)



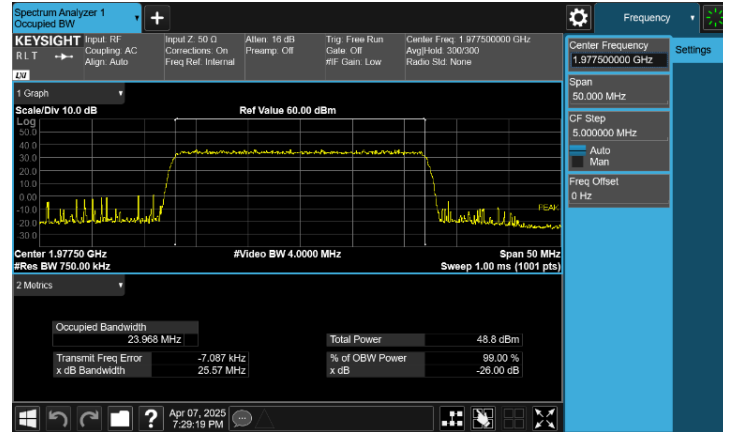
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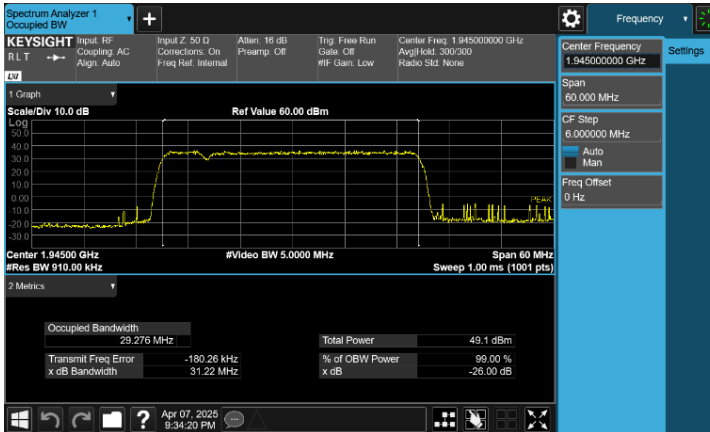
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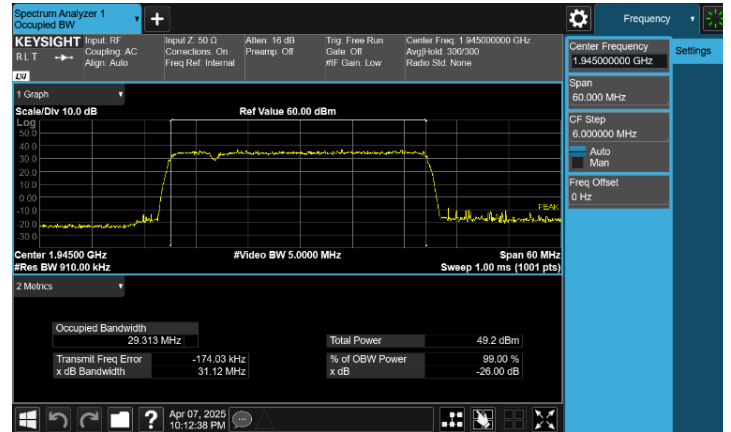
Plot 8-1. Occupied Bandwidth Plot
(n25(n2)_NR_1C_25M_QPSK - Low Channel, Port 3)



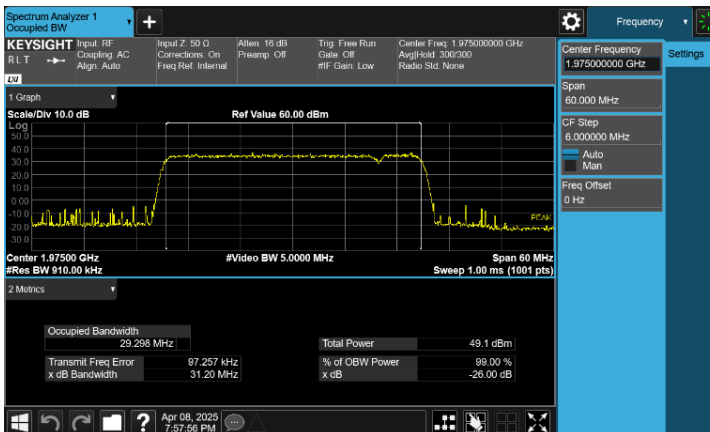
Plot 8-2. Occupied Bandwidth Plot
(n25(n2)_NR_1C_25M_16QAM - High Channel, Port 2)



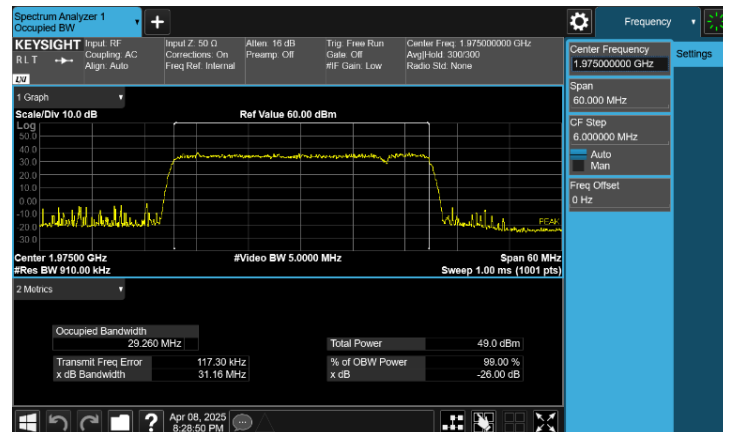
Plot 8-3. Occupied Bandwidth Plot
(n25(n2)_NR_2C_5M+25M_QPSK - Low Channel, Port 3)



Plot 8-4. Occupied Bandwidth Plot
(n25(n2)_NR_2C_5M+25M_16QAM - Low Channel, Port 3)



Plot 8-5. Occupied Bandwidth Plot
(B/n25(B/n2)_NR_1C_25M+LTE_1C_5M_QPSK
- High Channel, Port 3)



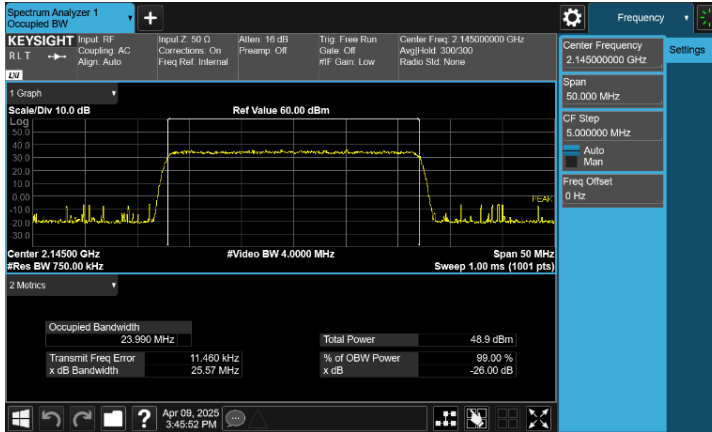
Plot 8-6. Occupied Bandwidth Plot
(B/n25(B/n2)_NR_1C_25M+LTE_1C_5M_16QAM
- High Channel, Port 0)



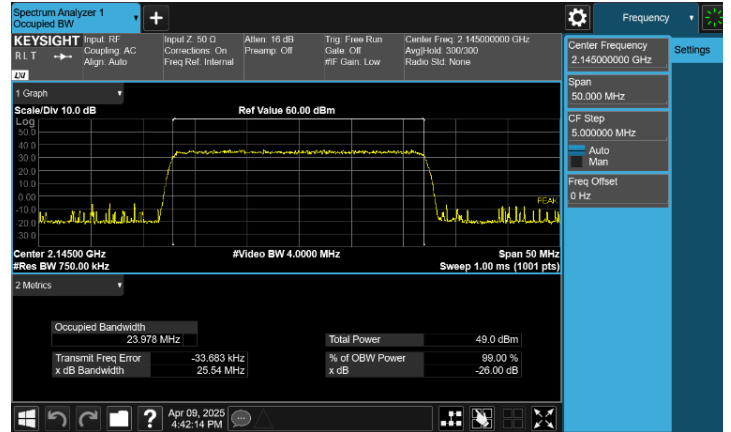
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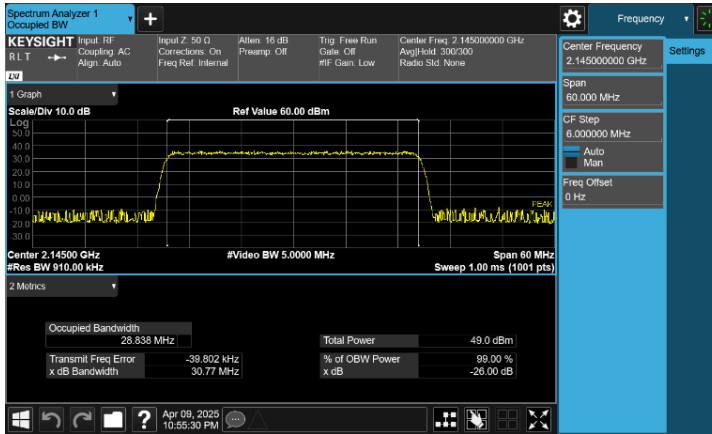
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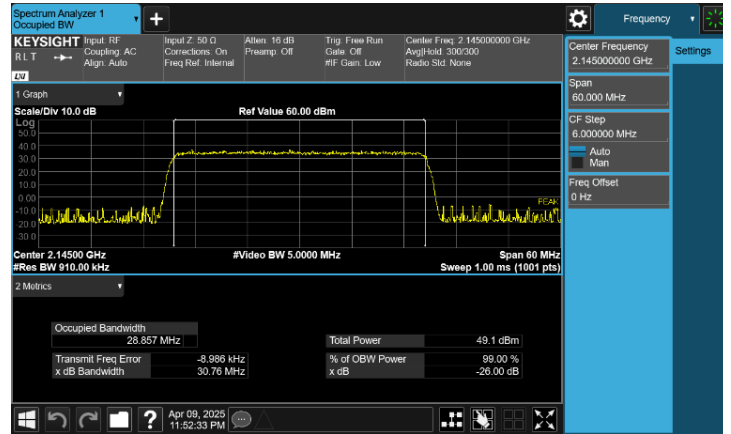
Plot 8-7. Occupied Bandwidth Plot
(n66(n4)_NR_1C_25M_QPSK - Mid Channel, Port 1)



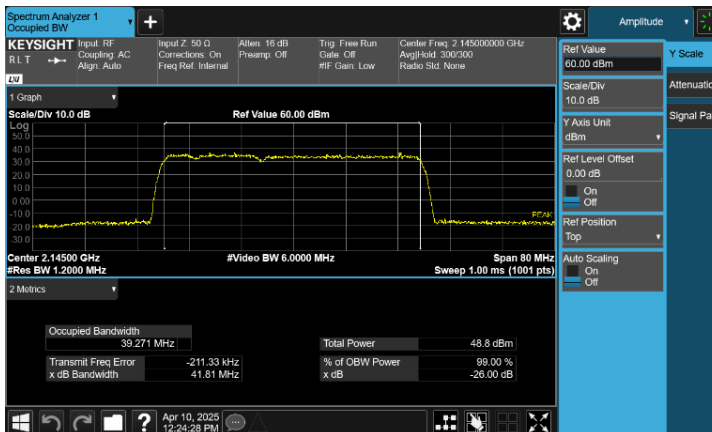
Plot 8-8. Occupied Bandwidth Plot
(n66(n4)_NR_1C_25M_64QAM - Mid Channel, Port 1)



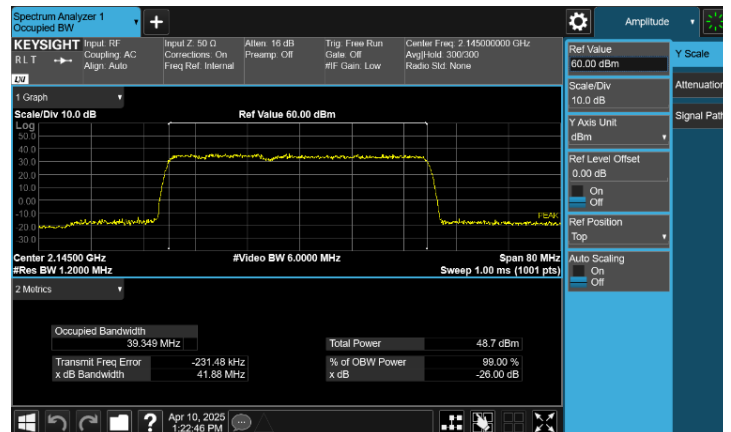
Plot 8-9. Occupied Bandwidth Plot
(n66(n4)_NR_1C_30M_QPSK - Mid Channel, Port 0)



Plot 8-10. Occupied Bandwidth Plot
(n66(n4)_NR_1C_30M_64QAM - Mid Channel, Port 3)



Plot 8-11. Occupied Bandwidth Plot
(n66(n4)_NR_3C_5M+10M+25M_QPSK - Mid Channel, Port 3)



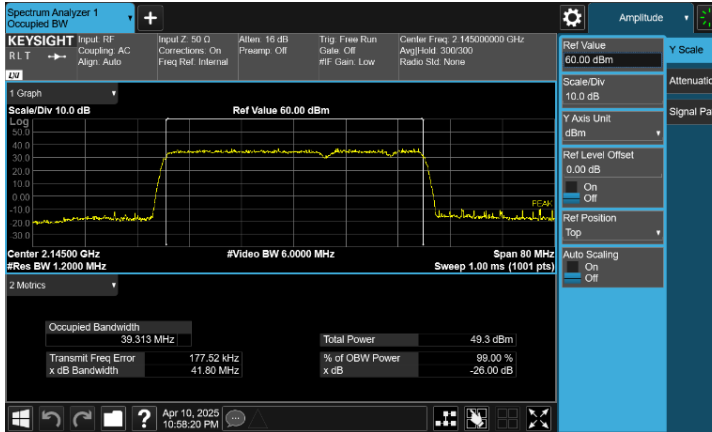
Plot 8-12. Occupied Bandwidth Plot
(n66(n4)_NR_3C_5M+10M+25M_16QAM - Mid Channel, Port 2)



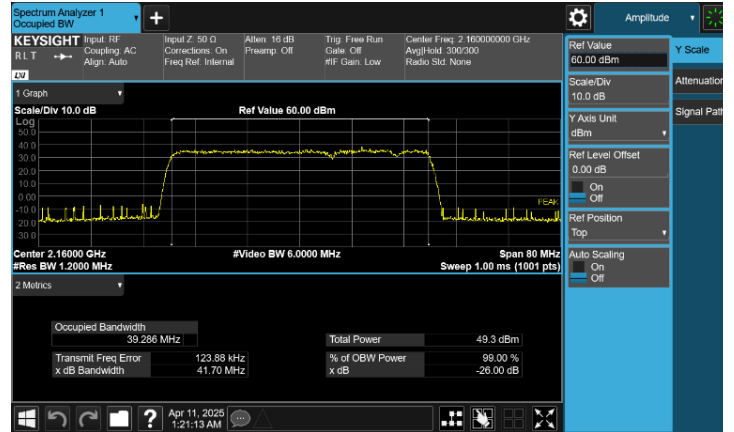
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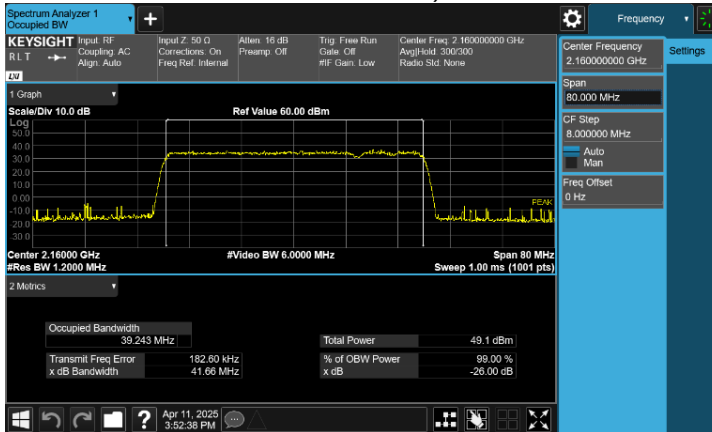
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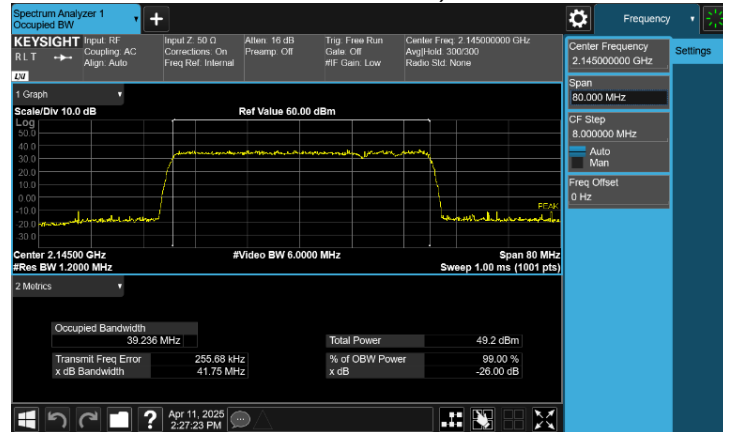
Plot 8-13. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+LTE_2C_10M+5M_QPSK - Mid Channel, Port 3)



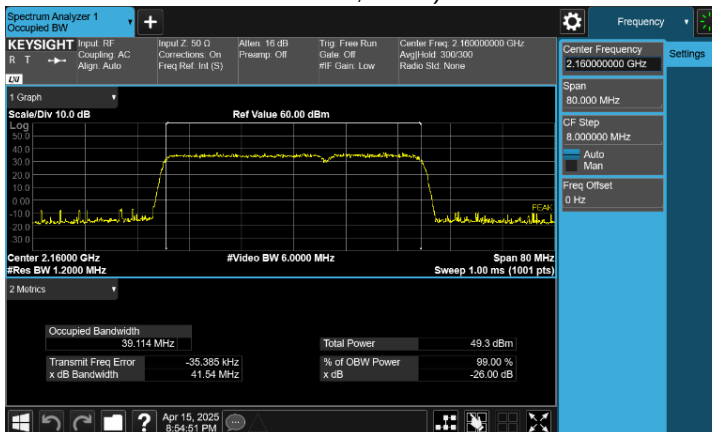
Plot 8-14. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+LTE_2C_10M+5M_16QAM - High Channel, Port 2)



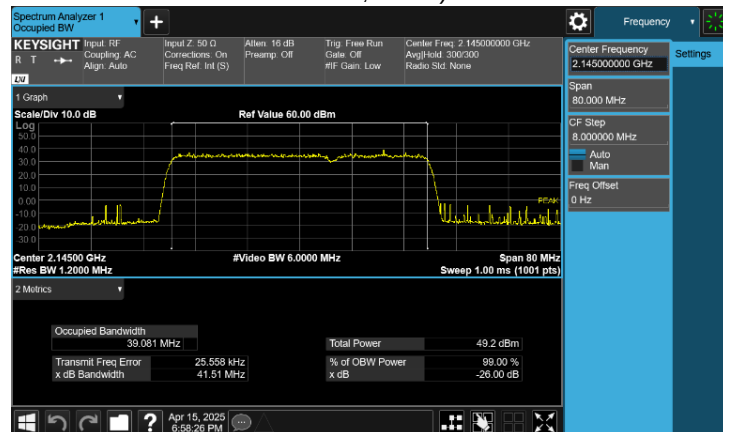
Plot 8-15. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_30M+LTE_2C_5M+5M_QPSK - High Channel, Port 1)



Plot 8-16. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_30M+LTE_2C_5M+5M_16QAM - Mid Channel, Port 1)



Plot 8-17. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_15M_QPSK - High Channel, Port 3)



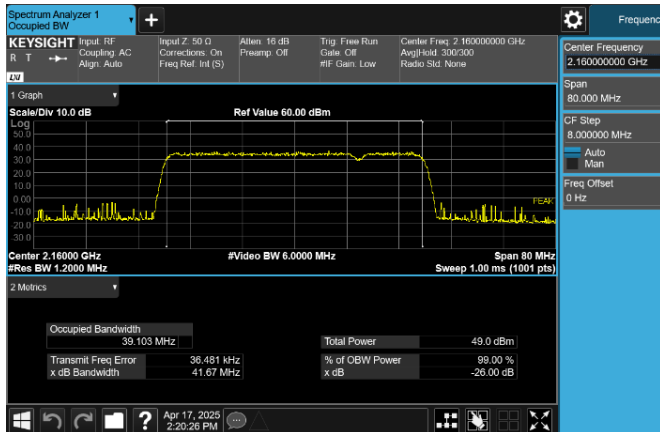
Plot 8-18. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_15M_16QAM - Mid Channel, Port 2)



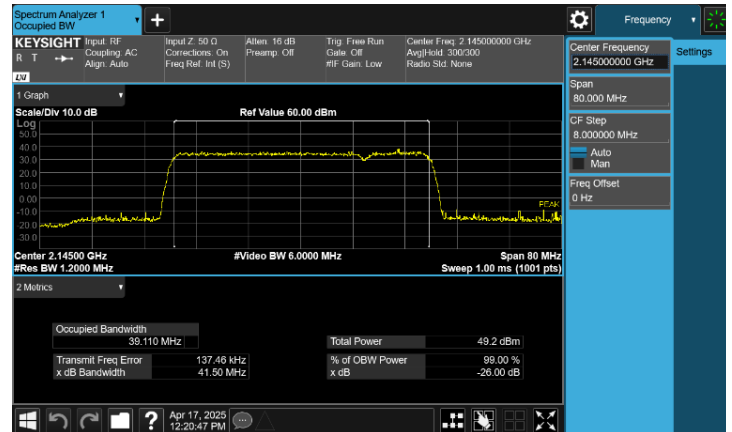
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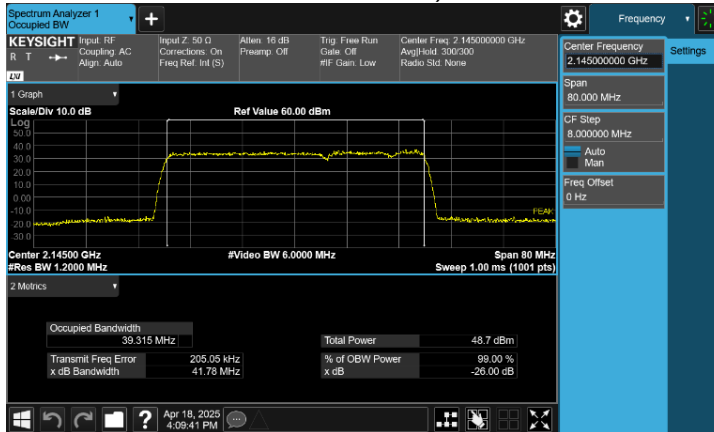
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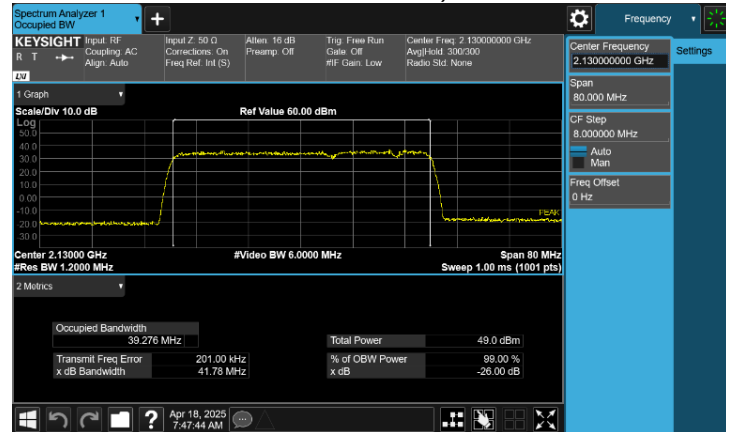
Plot 8-19. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_30M+DSS_1C_10M_QPSK - High
Channel, Port 0)



Plot 8-20. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_30M+DSS_1C_10M_16QAM - Mid
Channel, Port 0)



Plot 8-21. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_10M+LTE_1C_5M_QPSK
- Mid Channel, Port 2)



Plot 8-22. Occupied Bandwidth Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_10M+LTE_1C_5M_16QA
M - Low Channel, Port 3)

8.3 Equivalent Isotropically Radiated Power

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. 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 Description

KDB 971168 D01 v03r01 – Section 5

KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements

ANSI C63.26-2015 – Section 5.2.4.4.1

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. Conducted power measurements are performed using the signal analyzer's "SA" measurement capability for signals with continuous operation.
2. Set span to $2 \times$ to $3 \times$ the OBW.
3. Set RBW = 1 MHz (the reference bandwidth)
4. Set VBW $\geq 3 \times$ RBW.
5. Set number of measurement points in sweep $\geq 2 \times$ span / RBW.
6. Sweep time:
 - a) Set $\geq$ auto-couple, and enable trace averaging, or
 - b) Set $\geq [10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ and enable a single sweep (automation-compatible) measurement. The sweep time should never be faster than the auto-coupled sweep time.
7. Detector = power averaging (rms).
8. The trace was allowed to stabilize
9. Use the peak marker function to determine the maximum amplitude level. ($=P_{\text{Meas}}$)
10. The relevant equation for determining the maximum EIRP from the measured RF output power is given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$
 where
 GT: gain of the transmitting antenna, in dBi (EIRP).

Test Setup

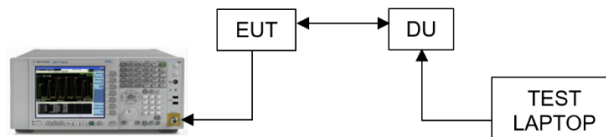


Figure 8-2. Test Instrument & Measurement Setup

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Limit**§ 24.232(a) (2)**

Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

§ 24.232(d) (2) (ii)

An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

Note: The maximum antenna gain and ERP limit are determined at the time of licensing depending on the geographical location of the base station. For limit, an estimated calculate maximum permissible ERP reported.

Test Notes

1. For test results, an estimated calculated maximum permissible EIRP reported. And the required reduction measurements will be performed when after the installation.
2. Consider the following factors for MIMO:
The output power per each port is measured as dBm/MHz or dBm, the output powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01 - Section E) 2).
3. The output power per port (dBm/MHz or dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO Conducted Power (mW). We convert this back to logarithmic scale for further output power calculations.
4. Sample Calculation:
Let us assume the following numbers:
 - a) Total MIMO Conducted Power as 2060.95 mW
 - b) Antenna Gain = 12.50 dBi

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		2060.95	mW
Summed MIMO Conducted Power (dBm)	$= 10 * \log (2060.95) =$	33.14	dBm
Antenna Gain		12.50	dBi
Total MIMO EIRP		45.64	dBm



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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.10	27.46	27.46	27.50
	1	27.09	27.02	26.99	27.03
	2	27.01	26.77	26.74	26.72
	3	27.28	26.43	26.42	26.25
MIMO PSD (mW/MHz)		2060.95	1974.73	1967.02	1958.60
MIMO PSD (dBm/MHz)		33.14	32.96	32.94	32.92
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.64	45.46	45.44	45.42
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.04	27.07	26.96	26.84
	1	27.03	27.06	27.11	26.82
	2	26.91	27.04	27.06	26.94
	3	27.24	27.27	27.32	27.16
MIMO PSD (mW/MHz)		2031.28	2055.22	2057.29	1978.22
MIMO PSD (dBm/MHz)		33.08	33.13	33.13	32.96
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.58	45.63	45.63	45.46
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.07	27.02	26.99	26.92
	1	26.93	26.83	27.05	26.91
	2	27.03	27.02	27.12	27.07
	3	27.22	27.41	27.33	27.24
MIMO PSD (mW/MHz)		2035.10	2039.49	2063.27	2022.28
MIMO PSD (dBm/MHz)		33.09	33.10	33.15	33.06
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.59	45.60	45.65	45.56
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15

Table 8-8. Equivalent Radiated Power Table (n25(n2)_NR_1C_25M)



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Low Channel	Port	n25(n2)_NR_2C_5M+25M		n25(n2)_NR_1C_25M+LTE_1C_5M	
		QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	26.23	26.34	26.44	26.50
	1	26.33	26.61	26.28	26.57
	2	26.25	26.31	26.45	26.78
	3	26.88	26.85	26.62	27.00
MIMO PSD (mW/MHz)		1757.78	1799.28	1765.45	1877.06
MIMO PSD (dBm/MHz)		32.45	32.55	32.47	32.73
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.95	45.05	44.97	45.23
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	26.43	26.14	26.34	26.60
	1	26.29	26.16	26.24	26.30
	2	26.20	26.32	26.44	26.53
	3	26.50	26.53	26.50	26.76
MIMO PSD (mW/MHz)		1727.91	1702.43	1737.39	1806.34
MIMO PSD (dBm/MHz)		32.38	32.31	32.40	32.57
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.88	44.81	44.90	45.07
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
High Channel	Port	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	26.24	26.10	26.40	26.70
	1	26.17	26.51	26.42	26.65
	2	26.32	26.35	26.36	26.98
	3	26.50	26.75	26.75	26.91
MIMO PSD (mW/MHz)		1708.38	1760.16	1780.60	1919.59
MIMO PSD (dBm/MHz)		32.33	32.46	32.51	32.83
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.83	44.96	45.01	45.33
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15

Table 8-9. Equivalent Radiated Power Table (B/n25(B/n2)_Multi-carrier operation)



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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.20	27.20	27.10	27.00
	1	27.27	27.19	27.20	27.11
	2	27.17	27.10	27.27	27.17
	3	27.31	27.37	27.27	27.35
MIMO PSD (mW/MHz)		2117.37	2107.16	2104.46	2079.05
MIMO PSD (dBm/MHz)		33.26	33.24	33.23	33.18
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.76	45.74	45.73	45.68
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.13	27.08	27.08	27.04
	1	27.19	27.17	27.39	27.20
	2	27.03	27.26	26.98	27.05
	3	27.17	27.35	27.43	27.32
MIMO PSD (mW/MHz)		2064.58	2106.00	2111.11	2076.76
MIMO PSD (dBm/MHz)		33.15	33.23	33.25	33.17
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.65	45.73	45.75	45.67
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	27.47	27.03	27.13	27.15
	1	27.20	27.37	27.39	27.19
	2	27.24	27.18	27.33	27.17
	3	27.38	27.51	27.42	27.38
MIMO PSD (mW/MHz)		2160.47	2136.33	2157.15	2110.98
MIMO PSD (dBm/MHz)		33.35	33.30	33.34	33.24
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		45.85	45.80	45.84	45.74
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15

Table 8-10. Equivalent Radiated Power Table (n66(n4)_NR_1C_25M)



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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	26.25	26.27	26.40	26.25
	1	26.25	26.39	26.31	26.41
	2	26.26	26.33	26.54	26.42
	3	26.49	26.42	26.58	26.63
MIMO PSD (mW/MHz)		1712.31	1726.44	1769.39	1757.42
MIMO PSD (dBm/MHz)		32.34	32.37	32.48	32.45
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.84	44.87	44.98	44.95
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	26.29	26.17	26.44	26.35
	1	26.44	26.37	26.39	26.47
	2	26.41	26.35	26.32	26.32
	3	26.45	26.58	26.59	26.46
MIMO PSD (mW/MHz)		1745.74	1733.90	1760.78	1745.28
MIMO PSD (dBm/MHz)		32.42	32.39	32.46	32.42
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.92	44.89	44.96	44.92
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	26.38	26.17	26.24	26.35
	1	26.43	26.45	26.52	26.37
	2	26.26	26.44	26.38	26.36
	3	26.54	26.56	26.64	26.51
MIMO PSD (mW/MHz)		1747.11	1749.25	1765.60	1744.36
MIMO PSD (dBm/MHz)		32.42	32.43	32.47	32.42
Antenna Gain (dBi)		12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.92	44.93	44.97	44.92
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15

Table 8-11. Equivalent Radiated Power Table (n66(n4)_NR_1C_30M)

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Low Channel	Port	n66(n4)_NR_3C_5M +10M+25M		B/n66(B/n4)_NR_1C_25M +LTE_2C_10M+5M		B/n66(B/n4)_NR_1C_30M +LTE_2C_5M+5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.65	25.38	25.13	25.61	25.04	25.22
	1	25.62	25.61	25.23	25.68	25.19	25.20
	2	25.42	25.62	25.27	25.38	25.12	25.17
	3	25.67	25.57	25.39	25.76	25.23	25.42
MIMO PSD (mW/MHz)		1448.42	1433.72	1341.35	1455.57	1308.25	1341.53
MIMO PSD (dBm/MHz)		31.61	31.56	31.28	31.63	31.17	31.28
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		44.11	44.06	43.78	44.13	43.67	43.78
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.25	25.31	25.23	25.59	25.45	25.48
	1	25.35	25.24	25.32	25.66	25.30	25.49
	2	25.27	25.24	25.46	25.63	25.28	25.52
	3	25.37	25.32	25.65	25.76	25.51	25.65
MIMO PSD (mW/MHz)		1358.82	1348.43	1392.40	1472.58	1382.44	1430.66
MIMO PSD (dBm/MHz)		31.33	31.30	31.44	31.68	31.41	31.56
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		43.83	43.80	43.94	44.18	43.91	44.06
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15
High Channel	Port	QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.02	25.20	25.32	25.72	25.06	25.52
	1	25.20	25.17	25.58	25.89	25.41	25.47
	2	25.22	25.12	25.40	25.65	25.21	25.45
	3	25.28	25.17	25.63	25.73	25.44	25.63
MIMO PSD (mW/MHz)		1318.85	1314.00	1413.57	1502.52	1350.17	1424.76
MIMO PSD (dBm/MHz)		31.20	31.19	31.50	31.77	31.30	31.54
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		43.70	43.69	44.00	44.27	43.80	44.04
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15

Table 8-12. Equivalent Radiated Power Table (B/n66(B/n4)_Multi-carrier operation)

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Low Channel	Port	B/n66(B/n4)_NR_1C_25M+ DSS_1C_15M		B/n66(B/n4)_NR_1C_30M+ DSS_1C_10M		B/n66(B/n4)_NR_1C_25M +DSS_1C_10M+ LTE_1C_5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.19	25.40	25.21	25.16	25.11	25.46
	1	25.31	25.45	25.24	25.44	25.24	25.18
	2	25.16	25.36	25.26	25.36	24.96	25.41
	3	25.29	25.55	25.49	25.60	25.30	25.59
MIMO PSD (mW/MHz)		1335.92	1399.58	1355.92	1384.91	1310.66	1390.41
MIMO PSD (dBm/MHz)		31.26	31.46	31.32	31.41	31.17	31.43
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		43.76	43.96	43.82	43.91	43.67	43.93
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15
Middle Channel	Port	QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.11	25.52	25.41	25.43	25.15	25.62
	1	25.34	25.48	25.43	25.49	25.31	25.49
	2	25.09	25.45	25.33	25.47	25.38	25.68
	3	25.38	25.70	25.59	25.62	25.53	25.91
MIMO PSD (mW/MHz)		1334.07	1431.26	1399.55	1419.69	1369.94	1478.07
MIMO PSD (dBm/MHz)		31.25	31.56	31.46	31.52	31.37	31.70
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		43.75	44.06	43.96	44.02	43.87	44.20
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15
High Channel	Port	QPSK	QAM	QPSK	QAM	QPSK	QAM
Power Spectral Density (dBm/MHz)	0	25.26	25.60	25.12	25.34	25.19	25.39
	1	25.32	25.71	25.25	25.27	25.30	25.61
	2	25.35	25.73	25.20	25.28	25.13	25.64
	3	25.45	25.84	25.24	25.40	25.60	25.74
MIMO PSD (mW/MHz)		1369.74	1493.46	1325.15	1362.21	1357.58	1451.34
MIMO PSD (dBm/MHz)		31.37	31.74	31.22	31.34	31.33	31.62
Antenna Gain (dBi)		12.50	12.50	12.50	12.50	12.50	12.50
MIMO EIRP (dBm/MHz)		43.87	44.24	43.72	43.84	43.83	44.12
EIRP Limit (dBm/MHz)		62.15	62.15	62.15	62.15	62.15	62.15

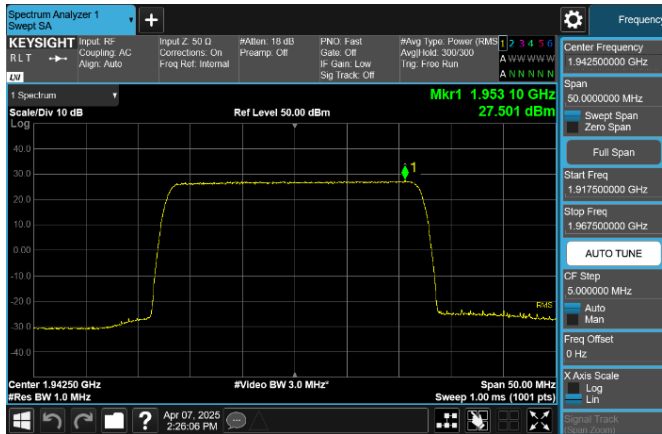
Table 8-13. Equivalent Radiated Power Table (B/n66(B/n4)_Multi-carrier operation)



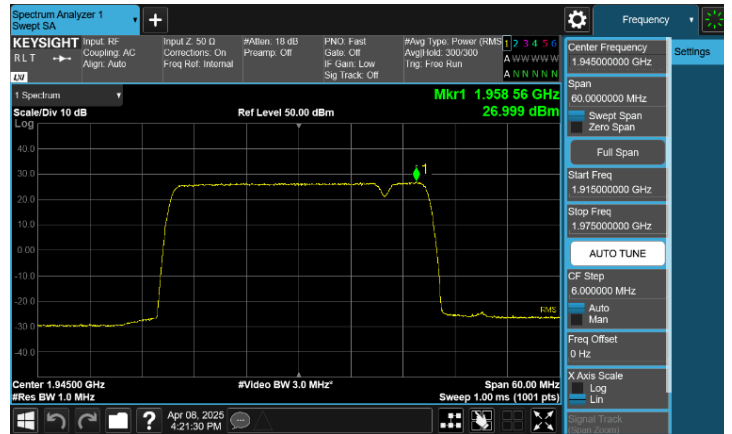
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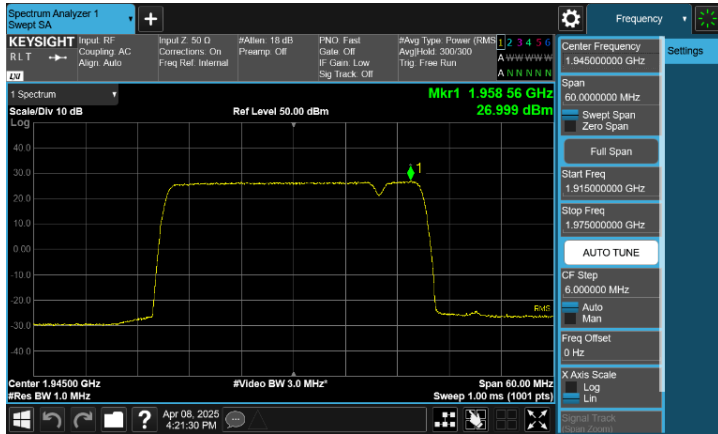
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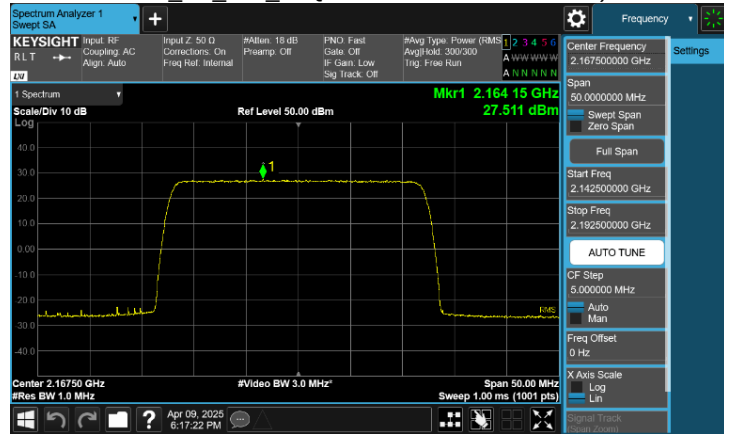
Plot 8-23. Equivalent Radiated Power Plot
(n25(n2)_NR_1C_25M_256QAM - Low Channel, Port 0)



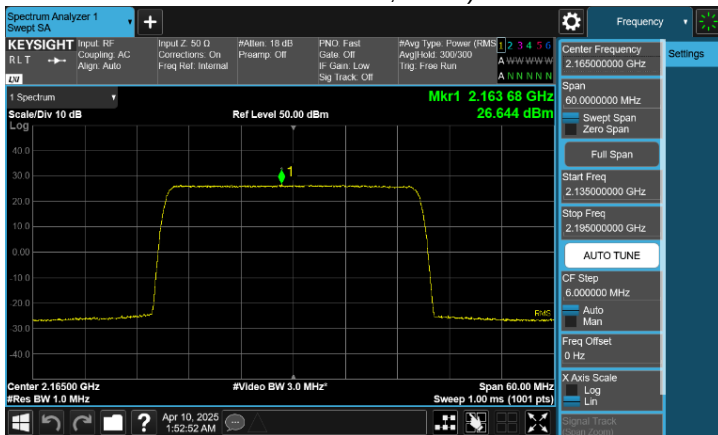
Plot 8-24. Equivalent Radiated Power Plot
(n25(n2)_NR_1C_25M
+LTE_1C_5M_16QAM - Low Channel, Port 3)



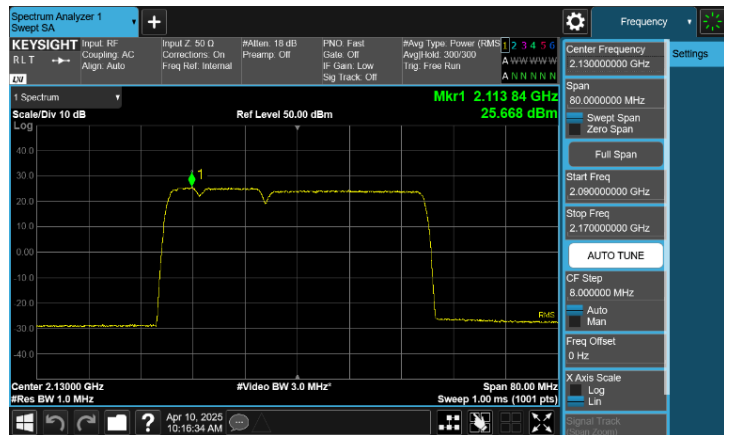
Plot 8-25. Equivalent Radiated Power Plot
(B/n25(B/n2)_NR_1C_25M+LTE_1C_5M_16QAM
- Low Channel, Port 3)



Plot 8-26. Equivalent Radiated Power Plot
(n66(n4)_NR_1C_25M_16QAM - High Channel, Port 3)



Plot 8-27. Equivalent Radiated Power Plot
(n66(n4)_NR_1C_30M_64QAM - High Channel, Port 3)



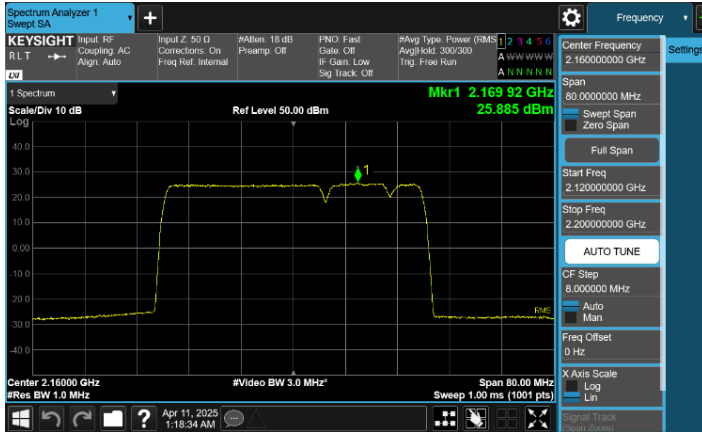
Plot 8-28. Equivalent Radiated Power Plot
(n66(n4)_NR_3C_5M+10M+25M_QPSK - Low Channel, Port 3)



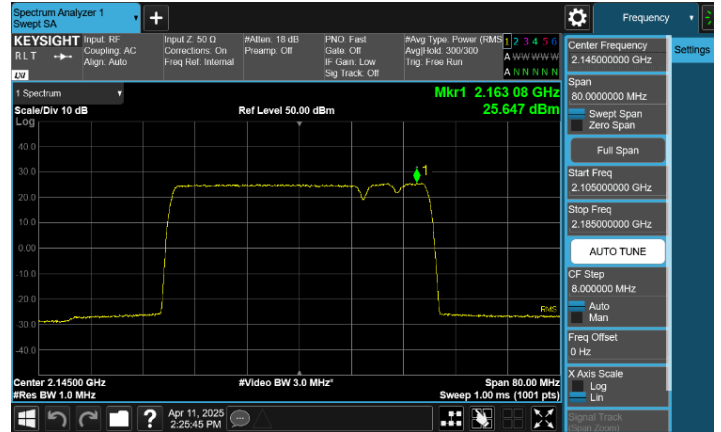
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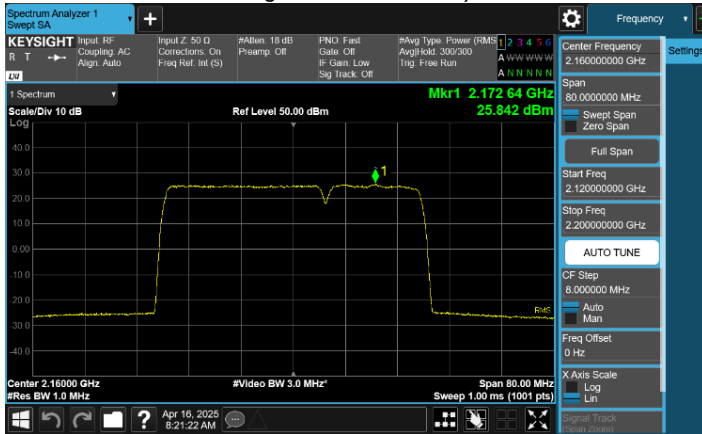
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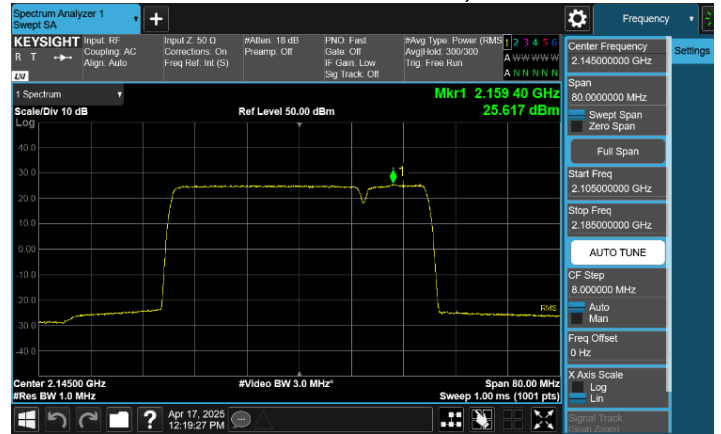
Plot 8-29. Equivalent Radiated Power Plot
(B/n66(B/n4)_NR_1C_25M+LTE_2C_10M+5M_16QAM
- High Channel, Port 1)



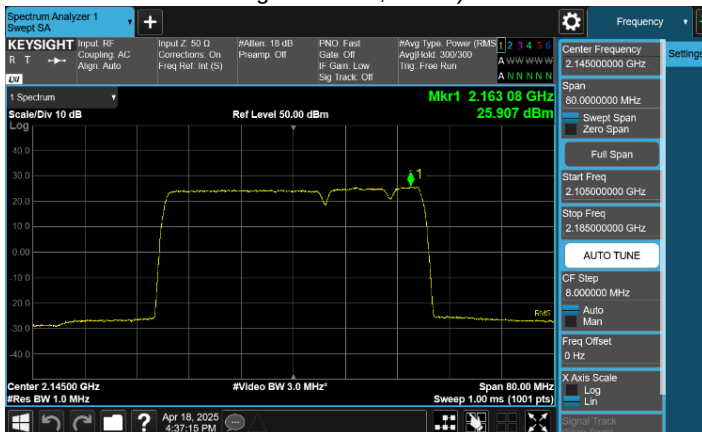
Plot 8-30. Equivalent Radiated Power Plot
(B/n66(B/n4)_NR_1C_30M+LTE_2C_5M+5M_16QAM
- Mid Channel, Port 3)



Plot 8-31. Equivalent Radiated Power Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_15M_16QAM -
High Channel, Port 3)



Plot 8-32. Equivalent Radiated Power Plot
(B/n66(B/n4)_NR_1C_30M+DSS_1C_10M_16QAM
- Mid Channel, Port 3)



Plot 8-33. Equivalent Radiated Power Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_10M
+LTE_1C_5M_16QAM - Mid Channel, Port 3)

8.4 Peak To Average Ratio

Test Overview

The peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7

ANSI C63.26-2015 – Section 5.2.3.4

Test Setting

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. The signal analyzer's CCDF function is enabled.
2. Frequency = carrier center frequency
3. Measurement BW $\geq$ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

Test Setup

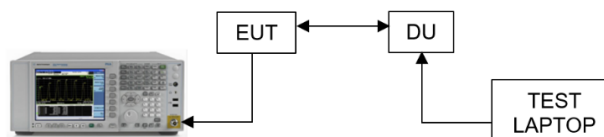


Figure 8-3. Test Instrument & Measurement Setup

Limit

§ 24.232,
 § 27.50(d)

The peak-to-average power ratio (PAPR) limit shall not exceed 13 dB for more than 0.1% of the time.

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Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.72	7.76	7.76	7.75
	1	7.73	7.77	7.79	7.77
	2	7.75	7.77	7.80	7.72
	3	7.73	7.76	7.80	7.73
Middle	0	7.45	7.47	7.50	7.48
	1	7.47	7.49	7.50	7.47
	2	7.46	7.46	7.49	7.48
	3	7.48	7.47	7.48	7.47
High	0	7.51	7.48	7.52	7.50
	1	7.52	7.50	7.66	7.51
	2	7.50	7.49	7.52	7.51
	3	7.49	7.49	7.50	7.50

Table 8-14. Peak To Average Power Ratio Summary Data (n25(n2)_NR_1C_25M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		n25(n2)_NR_2C_5M+25M		n25(n2)_NR_1C_25M+LTE_1C_5M	
		QPSK	QAM	QPSK	QAM
Low	0	8.05	8.06	8.00	8.01
	1	8.05	8.03	8.01	8.07
	2	8.05	8.05	7.99	8.05
	3	8.00	8.03	8.00	8.06
Middle	0	7.83	7.85	7.89	7.88
	1	7.89	7.88	7.90	7.88
	2	7.88	7.88	7.88	7.89
	3	7.87	7.88	7.85	7.89
High	0	7.88	7.89	7.87	7.90
	1	7.88	7.89	7.86	7.88
	2	7.87	7.87	7.86	7.88
	3	7.87	7.88	7.88	7.89

Table 8-15. Peak To Average Power Ratio Summary Data (B/n25(B/n2)_Multi-carrier operation)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.66	7.68	7.67	7.64
	1	7.62	7.62	7.63	7.63
	2	7.64	7.63	7.63	7.62
	3	7.71	7.64	7.67	7.64
Middle	0	7.49	7.46	7.49	7.46
	1	7.50	7.47	7.49	7.60
	2	7.46	7.46	7.48	7.47
	3	7.48	7.47	7.49	7.46
High	0	7.47	7.47	7.49	7.46
	1	7.45	7.46	7.48	7.47
	2	7.47	7.48	7.49	7.46
	3	7.46	7.47	7.49	7.46

Table 8-16. Peak To Average Power Ratio Summary Data (n66(n4)_NR_1C_25M)

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Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.73	7.69	7.71	7.68
	1	7.65	7.65	7.65	7.64
	2	7.66	7.62	7.62	7.63
	3	7.69	7.66	7.65	7.67
Middle	0	7.49	7.49	7.49	7.47
	1	7.50	7.49	7.49	7.47
	2	7.49	7.48	7.48	7.49
	3	7.49	7.49	7.48	7.48
High	0	7.48	7.49	7.47	7.50
	1	7.49	7.50	7.50	7.51
	2	7.48	7.50	7.48	7.50
	3	7.49	7.49	7.46	7.49

Table 8-17. Peak To Average Power Ratio Summary Data (n66(n4)_NR_1C_30M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)					
		n66(n4)_NR_3C_5M+10M +25M		B/n66(B/n4)_NR_1C_25M +LTE_2C_10M+5M		B/n66(B/n4)_NR_1C_30M +LTE_2C_5M+5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Low	0	8.26	8.28	8.14	8.10	8.10	8.09
	1	8.26	8.26	8.15	8.14	8.14	8.11
	2	8.27	8.28	8.15	8.11	8.13	8.11
	3	8.28	8.25	8.11	8.11	8.09	8.11
Middle	0	8.30	8.26	8.16	8.11	8.13	8.15
	1	8.30	8.25	8.16	8.13	8.15	8.11
	2	8.27	8.28	8.15	8.11	8.12	8.12
	3	8.27	8.23	8.13	8.14	8.15	8.14
High	0	8.27	8.25	8.11	8.16	8.11	8.11
	1	8.26	8.28	8.10	8.12	8.10	8.12
	2	8.28	8.30	8.13	8.12	8.12	8.14
	3	8.32	8.34	8.11	8.07	8.11	8.13

Table 8-18. Peak To Average Power Ratio Summary Data (B/n66(B/n4)_Multi-carrier operation)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)					
		B/n66(B/n4)_NR_1C_25M+DS S_1C_15M		B/n66(B/n4)_NR_1C_30M+DS S_1C_10M		B/n66(B/n4)_NR_1C_25M+DS S_1C_10M+LTE_1C_5M	
		QPSK	QAM	QPSK	QAM	QPSK	QAM
Low	0	7.99	7.98	7.98	7.97	8.27	8.31
	1	7.97	7.97	7.96	7.93	8.31	8.30
	2	7.98	7.95	7.96	7.93	8.28	8.26
	3	8.00	7.99	8.02	8.06	8.30	8.29
Middle	0	7.94	7.96	8.02	7.92	8.33	8.30
	1	7.95	7.96	7.91	7.93	8.28	8.33
	2	7.91	7.95	7.88	7.89	8.31	8.32
	3	7.93	7.95	7.90	7.89	8.29	8.25
High	0	7.90	7.90	7.88	7.91	8.31	8.28
	1	7.94	7.92	7.89	7.91	8.28	8.29
	2	7.95	7.92	7.90	7.91	8.29	8.29
	3	7.93	7.93	7.88	7.90	8.31	8.30

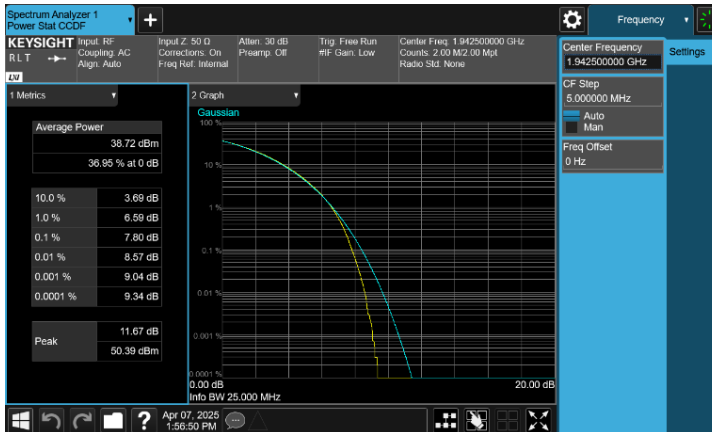
Table 8-19. Peak To Average Power Ratio Summary Data (B/n66(B/n4)_Multi-carrier operation)



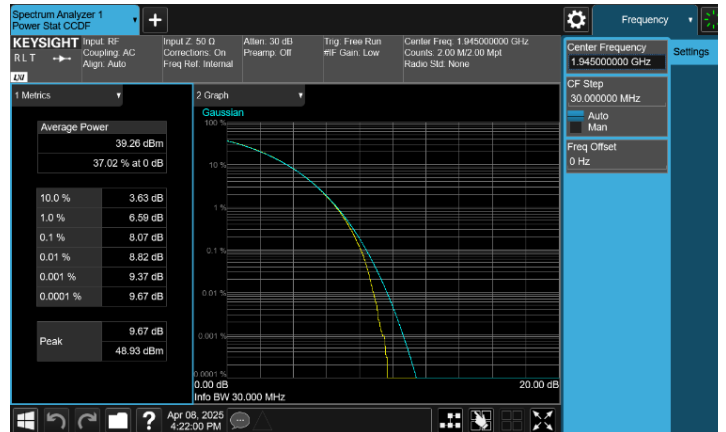
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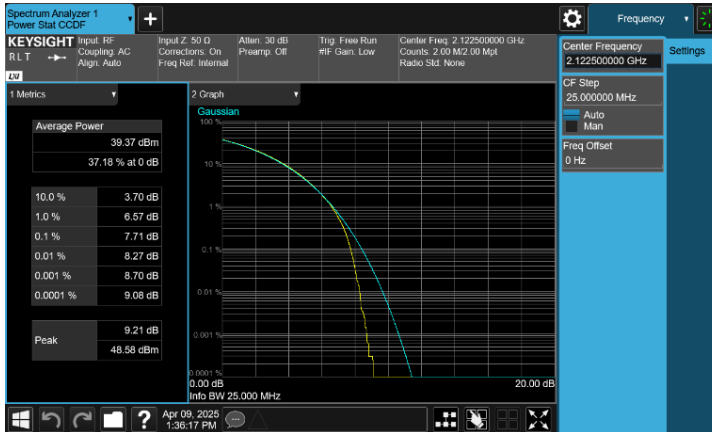
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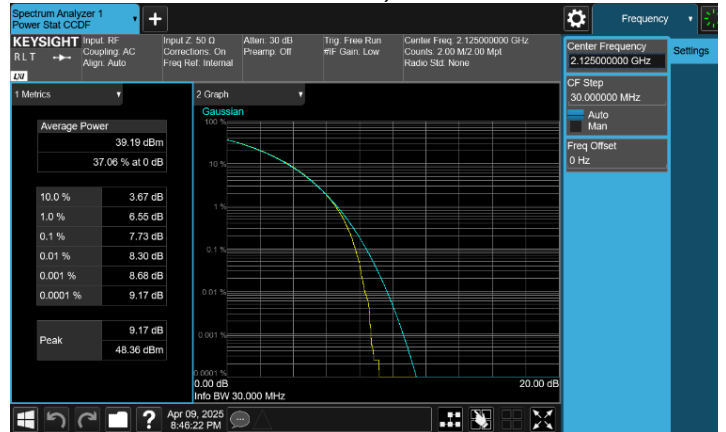
Plot 8-34. Peak To Average Power Ratio Plot
(n25(n2)_NR_1C_25M_64QAM - Low Channel, Port 2)



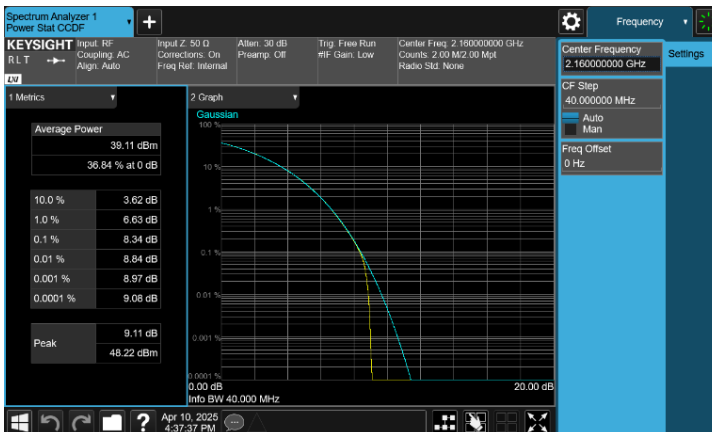
Plot 8-35. Peak To Average Power Ratio Plot
(n25(n2)_NR_1C_25M+LTE_1C_5M_16QAM- Low Channel, Port 1)



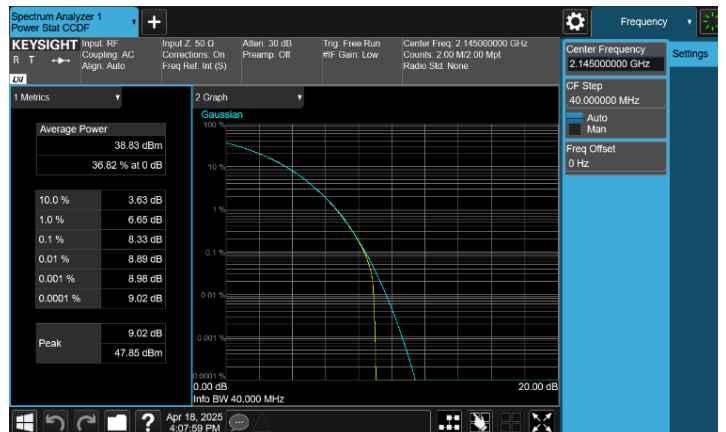
Plot 8-36. Peak To Average Power Ratio Plot
(n66(n4)_NR_1C_25M_QPSK - Low Channel, Port 3)



Plot 8-37. Peak To Average Power Ratio Plot
(n66(n4)_NR_1C_30M_QPSK - Low Channel, Port 0)



Plot 8-38. Peak To Average Power Ratio Plot
(n66(n4)_NR_3C_5M+10M
+25M_16QAM - High Channel, Port 3)



Plot 8-39. Peak To Average Power Ratio Plot
(B/n66(B/n4)_NR_1C_25M+DSS_1C_10M+LTE_1C_5M_QPSK
- Mid Channel, Port 0)

8.5 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 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

KDB 971168 D01 v03r01 – Section 6

KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements

a) Absolute Emission Limits

iii) Measure and add $10 \log(N_{ANT})$ dB

ANSI C63.26-2015 – Section 5.7.3

Test Setting

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: Please see test notes below.
4. $VBW \geq 3 \times RBW$
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span}/RBW$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

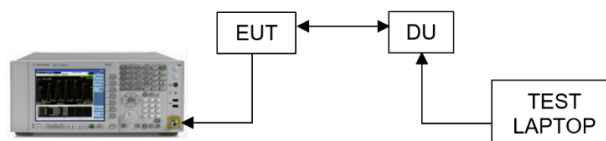


Figure 8-4. Test Instrument & Measurement Setup

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Limit**§ 24.238**

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

§ 27.53

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

Test Notes

1. Per Part 24, Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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 emissions are attenuated at least 26 dB below the transmitter power.
2. Per Part 27, Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's 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 emissions are attenuated at least 26 dB below the transmitter power.
3. Detect with a margin of under 1dB to limit, the integration method was performed using the spectrum analyzer's band power functions according to ANSI C63.26-2015 – Section 5.7 and using the method KDB 971168 D01 v03r01 - Section E) 3) ii). The integration value was set to a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter.
4. The limits were adjusted by a factor of $[-10 \cdot \log(4)]$ dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911. MIMO Factor calculation as below:
 $MIMO \text{ Factor} = 10 \cdot \log(4) = 6.02 \text{ dB}$

Frequency range	Basic Limit (dBm/MHz)	4Tx MIMO Factor (dB)	RBW Factor (dB)	Adjusted limit (dBm)
Low band edge – 1MHz	-13.00	6.02	0	-19.02
High band edge + 1MHz	-13.00	6.02	0	-19.02

Note: Adjusted limit (dBm/MHz) = Basic limit (dBm/1MHz) - MIMO Factor - RBW Factor

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Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	1929 to 1930 MHz	-22.92	-24.87	-26.05	-25.63	-19.02	-3.90
	1		-25.14	-24.28	-25.23	-26.54		-5.26
	2		-22.42	-24.51	-23.60	-22.11		-3.09
	3		-21.98	-22.52	-23.10	-24.46		-2.96
High	0	1990 to 1991 MHz	-22.30	-23.57	-23.35	-22.13		-3.11
	1		-22.71	-25.83	-24.61	-22.39		-3.37
	2		-25.07	-25.51	-24.73	-26.74		-5.71
	3		-23.69	-23.65	-25.34	-25.60		-4.63

Table 8-20. Band Edge Emission Summary Data (n25(n2)_NR_1C_25M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			n25(n2)_NR_2C_5M+25M		n25(n2)_NR_1C_25M + LTE_1C_5M			
			QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-31.56	-31.74	-32.97	-32.85	-19.02	-12.54
	1		-31.72	-32.07	-32.95	-32.65		-12.70
	2		-32.16	-32.26	-32.73	-32.69		-13.14
	3		-31.26	-31.52	-32.18	-32.49		-12.24
High	0	2180 to 2181 MHz	-31.88	-30.97	-31.92	-32.58		-11.95
	1		-31.76	-31.52	-31.85	-30.30		-11.28
	2		-31.57	-32.08	-32.49	-33.03		-12.55
	3		-32.24	-31.87	-32.17	-32.22		-12.85

Table 8-21. Band Edge Emission Summary Data (B/n25(B/n2)_Multi-carrier operation)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			n25(n2)_NR_2NC_5M+25M		n25(n2)_NC_NR_1C_25M + LTE_1C_5M			
			QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-32.97	-32.26	-32.98	-33.18	-19.02	-13.24
	1		-32.30	-32.67	-33.81	-33.82		-13.28
	2		-32.05	-32.02	-31.82	-32.85		-12.80
	3		-31.88	-31.87	-32.22	-32.53		-12.85
High	0	2180 to 2181 MHz	-32.53	-33.04	-32.79	-33.96		-13.51
	1		-33.25	-33.04	-32.69	-33.48		-13.67
	2		-33.81	-33.98	-32.17	-32.78		-13.15
	3		-33.27	-32.73	-32.40	-32.68		-13.38

Table 8-22. Band Edge Emission Summary Data (B/n25(B/n2)_NC_Multi-carrier operation)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-25.00	-24.39	-22.95	-23.56	-19.02	-3.93
	1		-23.10	-21.00	-26.41	-26.35		-1.98
	2		-24.19	-27.43	-26.39	-22.44		-3.42
	3		-24.97	-20.08	-24.14	-24.05		-1.06
High	0	2180 to 2181 MHz	-24.50	-22.10	-22.63	-23.91		-3.08
	1		-23.20	-26.82	-21.56	-24.73		-2.54
	2		-26.26	-23.56	-24.09	-23.81		-4.54
	3		-27.41	-21.64	-23.74	-23.69		-2.62

Table 8-23. Band Edge Emission Summary Data (n66(n4)_NR_1C_25M)

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Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-25.12	-27.61	-26.38	-24.70	-19.02	-5.68
	1		-25.50	-29.02	-25.86	-27.01		-6.48
	2		-27.06	-25.63	-25.80	-26.87		-6.61
	3		-27.50	-26.65	-27.86	-25.22		-6.20
High	0	2180 to 2181 MHz	-24.40	-22.47	-24.19	-26.02		-3.45
	1		-24.20	-25.07	-26.29	-26.56		-5.18
	2		-24.85	-24.18	-25.80	-25.75		-5.16
	3		-24.37	-25.38	-25.00	-24.07		-5.05

Table 8-24. Band Edge Emission Summary Data (n66(n4)_NR_1C_30M)

Edge	Port	Measured Range	Max. Value (dBm)						Limit (dBm)	Worst Margin (dB)
			n66(n4)_NR_3C_5M+10M+25M		B/n66(B/n4)_NR_1C_25M+LTE_2C_10M+5M		B/n66(B/n4)_NR_1C_30M+LTE_2C_5M+5M			
			QPSK	16QAM	QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-32.74	-33.55	-33.96	-33.39	-33.44	-33.45	-19.02	-13.72
	1		-32.94	-32.92	-32.87	-32.55	-33.34	-33.04		-13.53
	2		-32.58	-32.96	-33.28	-33.55	-33.40	-32.82		-13.56
	3		-32.78	-32.97	-33.51	-32.68	-33.21	-33.33		-13.66
High	0	2180 to 2181 MHz	-29.35	-31.08	-31.17	-31.44	-31.29	-31.24		-10.33
	1		-29.73	-31.53	-31.36	-31.41	-30.82	-31.12		-10.71
	2		-31.11	-31.87	-31.33	-31.93	-31.25	-31.14		-12.09
	3		-31.14	-31.10	-31.57	-30.77	-30.96	-31.19		-11.75

Table 8-25. Band Edge Emission Summary Data (B/n66(B/n4)_Multi-carrier operation)

Edge	Port	Measured Range	Max. Value (dBm)						Limit (dBm)	Worst Margin (dB)
			B/n66(B/n4)_NR_1C_25M+DSS_1C_15M		B/n66(B/n4)_NR_1C_30M+DSS_1C_10M		B/n66(B/n4)_NR_1C_25M+DSS_1C_10M+LTE_1C_5M			
			QPSK	16QAM	QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-32.73	-33.11	-32.80	-32.17	-33.65	-33.46	-19.02	-13.15
	1		-32.62	-32.59	-31.90	-32.31	-33.00	-33.33		-12.88
	2		-33.00	-32.72	-32.09	-33.05	-33.25	-33.33		-13.07
	3		-32.38	-32.80	-32.35	-33.01	-33.09	-33.20		-13.33
High	0	2180 to 2181 MHz	-30.89	-30.61	-30.23	-30.80	-31.20	-31.66		-11.21
	1		-29.95	-30.18	-31.02	-31.09	-30.67	-31.06		-10.93
	2		-31.13	-30.45	-30.50	-29.49	-31.35	-31.33		-10.47
	3		-30.19	-29.92	-30.10	-29.61	-30.53	-30.58		-10.59

Table 8-26. Band Edge Emission Summary Data (B/n66(B/n4)_Multi-carrier operation)

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Edge	Port	Measured Range	Max. Value (dBm)						Limit (dBm)	Worst Margin (dB)
			n66(n4)_NR_3NC_5M+10M+25M		B/n66(B/n4)_NC_NR_1C_25M+LTE_2C_10M+5M		B/n66(B/n4)_NC_NR_1C_30M+LTE_2C_5M+5M			
			QPSK	16QAM	QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-33.64	-32.81	-34.53	-34.19	-27.31	-33.52	-19.02	-8.29
	1		-32.74	-32.86	-34.29	-33.39	-26.80	-32.52		-7.78
	2		-33.52	-33.28	-34.05	-33.22	-29.93	-32.78		-10.91
	3		-33.12	-33.55	-33.51	-32.69	-31.58	-33.05		-12.56
High	0	2180 to 2181 MHz	-30.86	-31.18	-31.68	-32.12	-31.67	-31.91		-11.84
	1		-31.03	-31.35	-31.58	-31.84	-31.75	-31.72		-12.01
	2		-31.75	-31.53	-31.88	-31.80	-31.72	-31.75		-12.51
	3		-31.30	-31.68	-31.43	-31.01	-31.09	-31.25		-11.99

Table 8-27. Band Edge Emission Summary Data (BB/n66(B/n4)_NC_Multi-carrier operation)

Edge	Port	Measured Range	Max. Value (dBm)						Limit (dBm)	Worst Margin (dB)
			B/n66(B/n4)_NC_NR_1C_25M+DSS_1C_15M		B/n66(B/n4)_NC_NR_1C_30M+DSS_1C_10M		B/n66(B/n4)_NC_NR_1C_25M+DSS_1C_10M+LTE_1C_5M			
			QPSK	16QAM	QPSK	16QAM	QPSK	16QAM		
Low	0	2109 to 2110 MHz	-33.98	-33.88	-33.47	-33.32	-34.67	-34.71	-19.02	-14.30
	1		-33.60	-32.92	-33.16	-32.48	-34.17	-34.22		-13.46
	2		-33.83	-33.33	-32.95	-32.76	-33.88	-33.86		-13.74
	3		-33.32	-33.21	-33.16	-32.95	-33.83	-33.37		-13.93
High	0	2180 to 2181 MHz	-31.32	-31.24	-30.92	-31.64	-31.99	-31.98		-11.90
	1		-31.22	-31.49	-30.72	-31.14	-32.18	-31.90		-11.70
	2		-31.36	-31.03	-31.22	-31.60	-31.91	-32.18		-12.01
	3		-30.67	-30.67	-30.73	-31.17	-31.41	-32.05		-11.65

Table 8-28. Band Edge Emission Summary Data (B/n66(B/n4)_NC_Multi-carrier operation)