

TEST REPORT

**CTK Co., Ltd.**

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Report No.:

CTK-2025-00360

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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 : 2025-01-06

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 Certification**4. Test Sample / Model:** RRU (RF4494) / RF4494-66A**5. Date of Test :** 2025-01-06 to 2025-02-07**6. Test Standard(method) used :** FCC 47 CFR 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	Technical Manager
	Bong-jun Jang: (Signature)	Young-taek Lee: (Signature)

Remark. This report is not related to KOLAS accreditation and relevant regulation.

2025-02-10

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MEASUREMENT REPORT

FCC Rule Part 27

Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
LTE_B66_1C_5M	2110 MHz to 2180 MHz	52.02	159.12	4M54G7D	QPSK
		52.01	158.85	4M54W7D	QAM
LTE_B66_1C_10M		55.21	331.79	9M09G7D	QPSK
		55.24	331.98	9M10W7D	QAM
LTE_B66_1C_15M		55.46	351.43	13M6G7D	QPSK
		55.46	351.91	13M7W7D	QAM
LTE_B66_1C_20M		55.28	336.92	18M1G7D	QPSK
		55.29	337.69	18M2W7D	QAM
NR_n66_1C_10M		55.08	321.82	9M37G7D	QPSK
		55.07	321.51	9M40W7D	QAM
NR_n66_1C_15M		55.10	323.87	14M3G7D	QPSK
		55.13	325.87	14M3W7D	QAM
NR_n66_1C_20M		55.12	325.17	19M1G7D	QPSK
		55.13	325.51	19M2W7D	QAM
LTE_B66_2C_5M+5M		55.32	340.31	9M59G7D	QPSK
		55.25	334.67	9M52W7D	QAM
LTE_B66_4C_5M+5M+ 5M+20M		55.11	324.17	33M9G7D	QPSK
		55.04	318.98	33M9W7D	QAM
B(n)66_2C_LTE_10M+ NR_10M		55.10	323.25	19M3G7D	QPSK
		55.06	320.68	19M3W7D	QAM
B(n)66_3C_LTE_5M+1 5M+NR_15M		55.18	329.78	34M5G7D	QPSK
		55.20	330.76	34M5W7D	QAM

EUT Overview

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1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
CTK-2025-00360	02/10/2025	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(RF4494) FCC ID: A3LRF4494-66A**. 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 27.

3.2 Device Capabilities

This device supports the following conditional features and filter information:

FCC ID:	A3LRF4494-66A		
FCC Classification	Licensed Non-Broadcast Station Transmitter		
EUT Type:	RRU(RF4494)		
Model Name:	RF4494-66A		
Test Device Serial No:	SN-F1595		
Device Capabilities:	LTE, 5G NR		
Operating Band/Frequency Range:	Band	Tx (Downlink)	Rx (Uplink)
	B(n)66:	2110 MHz to 2180 MHz	1710 MHz to 1780 MHz
Supported Modulation:	QPSK, 16QAM, 64QAM, 256QAM		
Supported Number of Carriers and Channel Bandwidth:	5/10/15/20 MHz bandwidth for LTE B66 with up to 4CC aggregated of Max. Bandwidth 35 MHz. 10/15/20 MHz bandwidth for NR n66. 5/10/15/20 MHz bandwidth for LTE B66 and 10/15/20 MHz bandwidth for NR n66 with up to 3CC aggregated of Max. Bandwidth 35 MHz.		
Supported Configurations:	Single carrier, Multi carrier		
Maximum Output Power	320W/Unit		
RF Chain:	4T4R		
Antenna Gain:	Antenna is not provided by manufacture.		
Input Voltage:	DC -48V		

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3.3 Test Configuration

The setup is as follows:

- The EUT ("RRU(RF4494)") and a Data Unit (DU) are each powered by -48V DC 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
- 4C: Contiguous 4 carriers in multi-carrier operation
- 4NC: Non-Contiguous 4 carriers in multi-carrier operation

Configuration	No. of Carriers	Total Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Conducted Power (W/path)
			Lowest	Middle	Highest	
LTE_B66_1C_5M	1	5	2112.5	2145.0	2177.5	40/path
LTE_B66_1C_10M NR_n66_1C_10M	1	10	2115.0	2415.0	2175.0	80W/path
LTE_B66_1C_15M NR_n66_1C_15M	1	15	2117.5	2145.0	2172.5	
LTE_B66_1C_20M NR_n66_1C_20M	1	20	2120.0	2145.0	2170.0	
LTE_B66_2C_5M+5M	2	10 (5+5)	2115.0	2415.0	2175.0	
LTE_B66_2NC_5M+5M			2112.5 + 2177.5			
LTE_B66_4C_5M+5M+5M+20M	4	35 (5+5+5+20)	2127.5	2145.0	2162.5	
LTE_B66_4NC_5M+5M+5M+20M			2112.5 + 2135.0 + 2140.0 + 2170.0			
B(n)66_2C_LTE_10M+NR_10M	2	20 (10+10)	2120.0	2145.0	2170.0	
B(n)66_2NC_LTE_10M+NR_10M			2115.0 + 2175.0			
B(n)66_3C_LTE_5M+15M+NR_15M	3	35 (5+15+15)	2127.5	2145.0	2162.5	
B(n)66_3NC_LTE_5M+15M+NR_15M			2112.5 + 2140.0 + 2172.5			

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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	2024-04-29	Annual	2025-04-29	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	2024-04-16	Annual	2025-04-16	00078895
Keysight	N9020B	Signal Analyzer	2024-10-07	Annual	2025-10-07	MY55470135
BIRD	300-WA-FFN-30	Attenuator	2024-03-20	Annual	2025-03-20	0205453
BIRD	300-WA-FFN-30	Attenuator	2024-03-20	Annual	2025-03-20	0205452
BIRD	300-WA-FFN-30	Attenuator	2024-03-20	Annual	2025-03-20	0205340
BIRD	300-WA-FFN-30	Attenuator	2024-03-20	Annual	2025-03-20	0204983
REACHLINE	RL50W40GKF-20	Attenuator	2024-04-08	Annual	2025-04-08	ey20db001
K&L MICROWAVE	11SH10-3075/U18000-O/O	High Pass Filter	2024-07-10	Annual	2025-07-10	00004
Agilent	6674A	System DC Power Supply	2024-03-29	Annual	2025-03-29	US36372372
ESPEC	EBE-2E20W6P3T-38	Temperature Chamber	2024-06-14	Annual	2025-06-14	3015007507

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 = 4M5G7D

Occupied Bandwidth = 4.54 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 4M5W7D

Occupied Bandwidth = 4.54 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: A3LRF4494-66A
FCC Classification: Licensed Non-Broadcast Station 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, § 27.50(d)	Equivalent Isotropic Radiated Power (Power Spectral Density)	< 1640 W/MHz		PASS	Section 8.3 (Note 4)
§ 2.1046, § 27.50(d)	Peak-to-average ratio	≤ 13 dB		PASS	Section 8.4
§ 2.1051, § 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, § 27.53(h)	Spurious and Harmonic Emissions at Antenna Terminal			PASS	Section 8.6
§ 2.1055 § 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 8.7
§ 2.1055, § 27.53(h)	Radiated unwanted emission	< 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions	RADIATED	PASS	Section 8.8

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) The maximum antenna gain and Limit are determined at the time of licensing depending on the Geographical Location of the base station.

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.

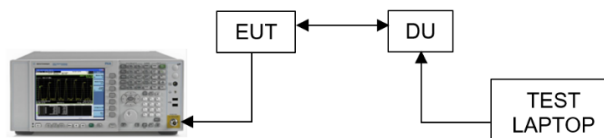


Figure 8-1. Test Instrument & Measurement Setup

Test Notes

None

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	4.52	4.53	4.52	4.52
	1	4.54	4.53	4.53	4.53
	2	4.52	4.51	4.53	4.52
	3	4.53	4.53	4.53	4.52
Middle	0	4.53	4.50	4.54	4.52
	1	4.53	4.52	4.53	4.54
	2	4.53	4.51	4.53	4.54
	3	4.54	4.52	4.54	4.53
High	0	4.53	4.52	4.53	4.53
	1	4.53	4.52	4.52	4.53
	2	4.54	4.52	4.53	4.53
	3	4.52	4.52	4.53	4.54

Table 8-2. Occupied Bandwidth Summary Data (LTE_B66_1C_5M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	9.07	9.09	9.07	9.04
	1	9.05	9.07	9.09	9.06
	2	9.09	9.07	9.09	9.03
	3	9.04	9.06	9.08	9.07
Middle	0	9.04	9.08	9.09	9.06
	1	9.07	9.05	9.07	9.04
	2	9.07	9.07	9.08	9.07
	3	9.08	9.06	9.09	9.05
High	0	9.07	9.06	9.08	9.06
	1	9.08	9.10	9.08	9.03
	2	9.09	9.08	9.08	9.04
	3	9.06	9.09	9.06	9.07

Table 8-3. Occupied Bandwidth Summary Data (LTE_B66_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	13.60	13.62	13.57	13.57
	1	13.57	13.67	13.60	13.55
	2	13.58	13.62	13.60	13.57
	3	13.59	13.62	13.60	13.58
Middle	0	13.60	13.63	13.57	13.58
	1	13.60	13.64	13.56	13.57
	2	13.60	13.61	13.58	13.54
	3	13.59	13.66	13.58	13.57
High	0	13.58	13.65	13.58	13.58
	1	13.59	13.64	13.59	13.59
	2	13.57	13.61	13.58	13.59
	3	13.60	13.60	13.55	13.54

Table 8-4. Occupied Bandwidth Summary Data (LTE_B66_1C_15M)

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	18.12	18.13	18.12	18.11
	1	18.11	18.17	18.08	18.08
	2	18.14	18.18	18.07	18.07
	3	18.14	18.13	18.06	18.12
Middle	0	18.13	18.17	18.09	18.08
	1	18.12	18.14	18.09	18.10
	2	18.11	18.11	18.15	18.07
	3	18.16	18.21	18.09	18.08
High	0	18.07	18.17	18.16	18.10
	1	18.09	18.19	18.13	18.11
	2	18.10	18.18	18.09	18.12
	3	18.08	18.20	18.12	18.07

Table 8-5. Occupied Bandwidth Summary Data (LTE_B66_1C_20M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	9.36	9.35	9.39	9.38
	1	9.37	9.36	9.38	9.35
	2	9.35	9.36	9.36	9.40
	3	9.37	9.35	9.38	9.35
Middle	0	9.36	9.36	9.35	9.37
	1	9.37	9.35	9.38	9.38
	2	9.37	9.35	9.38	9.38
	3	9.35	9.37	9.38	9.36
High	0	9.37	9.36	9.39	9.38
	1	9.34	9.35	9.37	9.39
	2	9.36	9.34	9.39	9.38
	3	9.36	9.38	9.36	9.38

Table 8-6. Occupied Bandwidth Summary Data (NR_n66_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	14.24	14.27	14.25	14.24
	1	14.21	14.25	14.26	14.27
	2	14.24	14.22	14.26	14.24
	3	14.24	14.23	14.25	14.25
Middle	0	14.26	14.25	14.23	14.26
	1	14.22	14.24	14.28	14.25
	2	14.26	14.26	14.23	14.24
	3	14.24	14.25	14.23	14.23
High	0	14.23	14.27	14.23	14.24
	1	14.21	14.22	14.26	14.25
	2	14.28	14.23	14.25	14.26
	3	14.23	14.21	14.24	14.25

Table 8-7. Occupied Bandwidth Summary Data (NR_n66_1C_15M)

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Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	19.07	19.11	19.08	19.09
	1	19.08	19.10	19.12	19.13
	2	19.14	19.07	19.10	19.09
	3	19.07	19.12	19.10	19.07
Middle	0	19.08	19.11	19.12	19.13
	1	19.09	19.09	19.13	19.10
	2	19.07	19.20	19.08	19.12
	3	19.08	19.15	19.11	19.08
High	0	19.11	19.09	19.09	19.12
	1	19.10	19.12	19.12	19.11
	2	19.06	19.09	19.07	19.10
	3	19.11	19.13	19.10	19.10

Table 8-8. Occupied Bandwidth Summary Data (NR_n66_1C_20M)

Channel	Port	OBW (MHz)			
		LTE_B66_2C_5M+5M		LTE_B66_4C_5M+5M+5M+20M	
		QPSK	QAM	QPSK	QAM
Low	0	9.53	9.49	33.78	33.80
	1	9.55	9.51	33.84	33.81
	2	9.52	9.47	33.83	33.86
	3	9.54	9.49	33.84	33.89
Middle	0	9.57	9.51	33.89	33.76
	1	9.52	9.49	33.88	33.85
	2	9.55	9.51	33.83	33.88
	3	9.53	9.50	33.85	33.87
High	0	9.59	9.52	33.84	33.78
	1	9.52	9.50	33.81	33.76
	2	9.54	9.49	33.91	33.79
	3	9.54	9.49	33.82	33.82

Table 8-9. Occupied Bandwidth Summary Data (LTE_B66_Multi-carrier)

Channel	Port	OBW (MHz)			
		B(n)66_2C_LTE_10M+NR_10M		B(n)66_3C_LTE_5M+15M+NR_15M	
		QPSK	QAM	QPSK	QAM
Low	0	19.22	19.24	34.44	34.31
	1	19.18	19.23	34.40	34.31
	2	19.20	19.21	34.43	34.36
	3	19.22	19.24	34.40	34.30
Middle	0	19.21	19.29	34.40	34.39
	1	19.21	19.23	34.49	34.36
	2	19.20	19.23	34.39	34.33
	3	19.19	19.24	34.42	34.39
High	0	19.22	19.25	34.41	34.48
	1	19.25	19.21	34.40	34.39
	2	19.18	19.24	34.38	34.35
	3	19.20	19.21	34.41	34.37

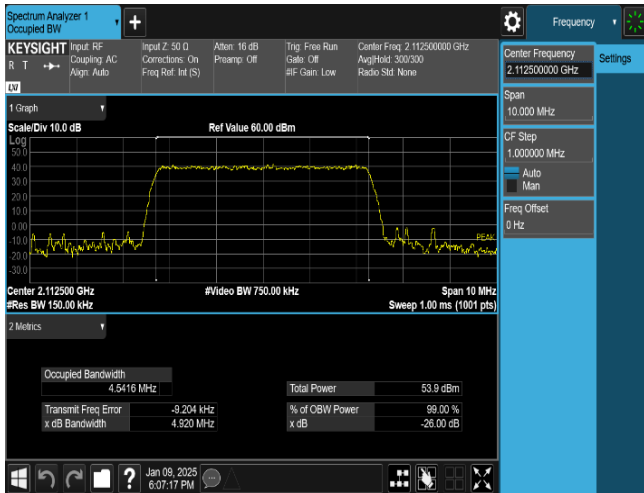
Table 8-10. Occupied Bandwidth Summary Data (B(n)66_Multi-carrier)



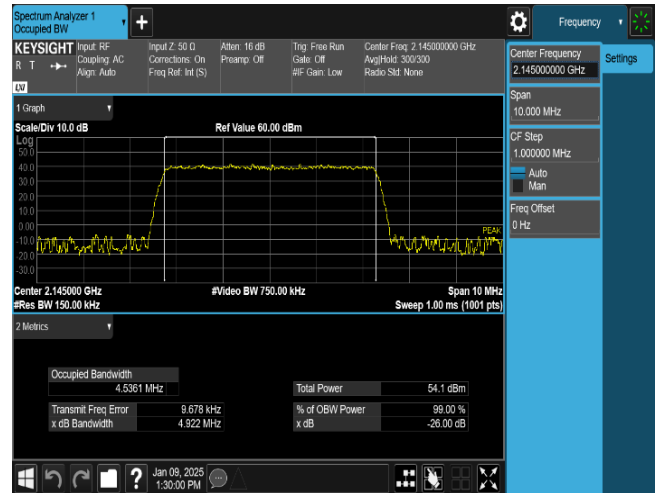
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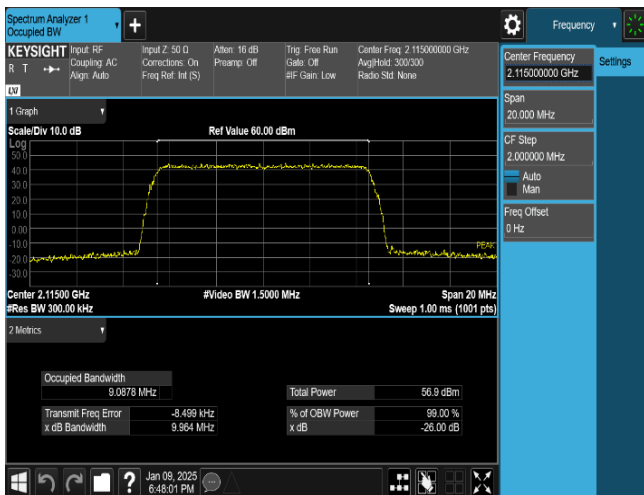
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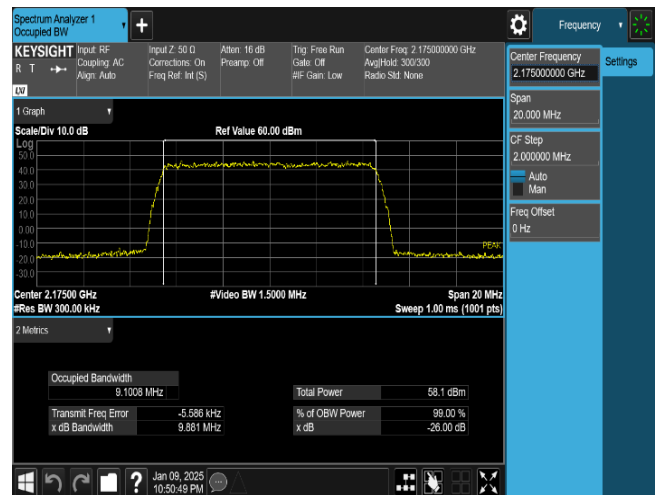
Plot 8-1. Occupied Bandwidth Plot
(LTE_B66_1C_5M_QPSK - Low Channel, Port 1)



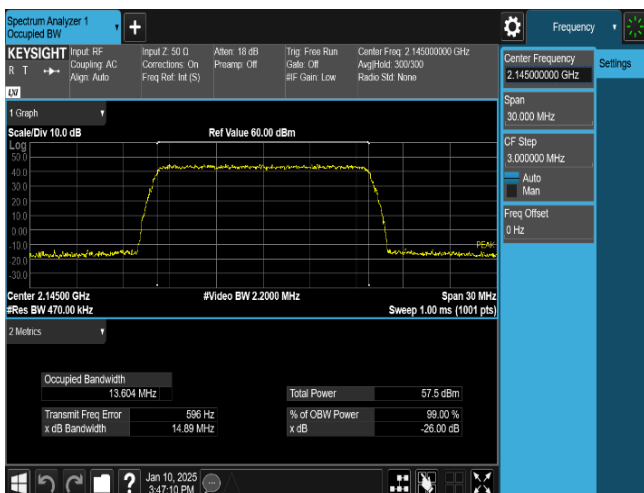
Plot 8-2. Occupied Bandwidth Plot
(LTE_B66_1C_5M_64QAM - Mid Channel, Port 0)



Plot 8-3. Occupied Bandwidth Plot
(LTE_B66_1C_10M_QPSK - Low Channel, Port 2)



Plot 8-4. Occupied Bandwidth Plot
(LTE_B66_1C_10M_16QAM - High Channel, Port 1)



Plot 8-5. Occupied Bandwidth Plot
(LTE_B66_1C_15M_QPSK - Mid Channel, Port 2)



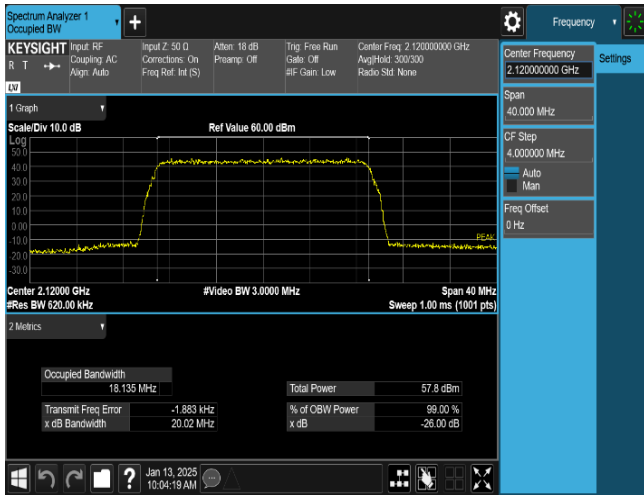
Plot 8-6. Occupied Bandwidth Plot
(LTE_B66_1C_15M_16QAM - Low Channel, Port 1)



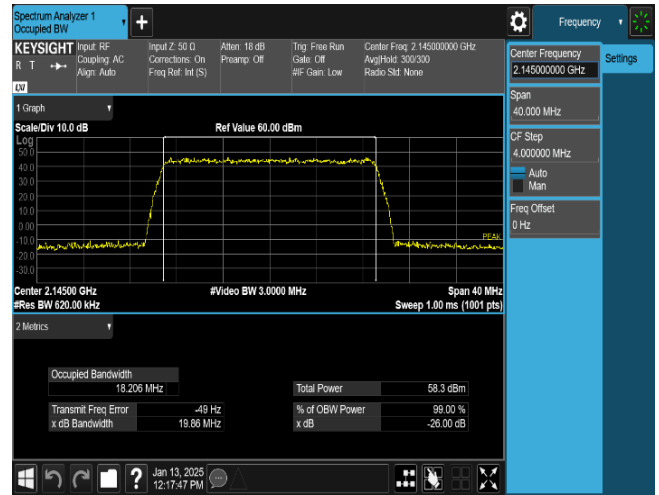
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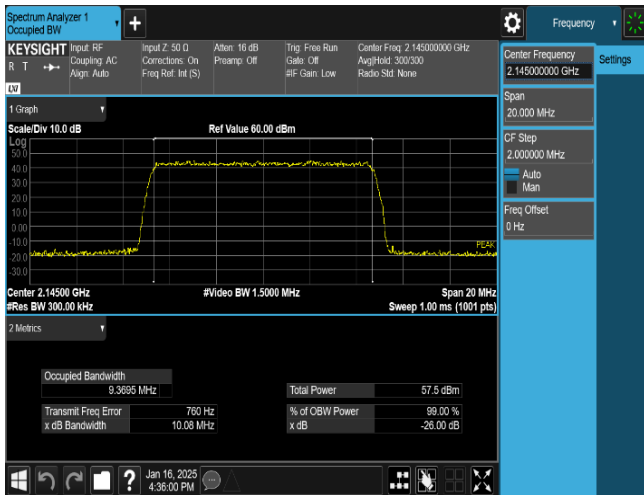
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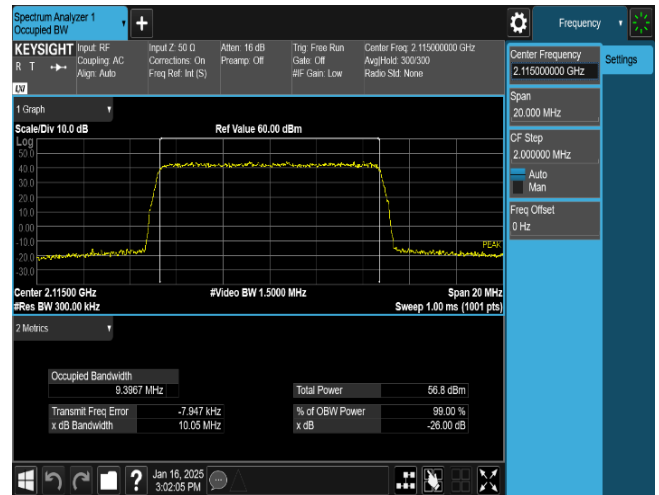
Plot 8-7. Occupied Bandwidth Plot
(LTE_B66_1C_20M_QPSK - Low Channel, Port 3)



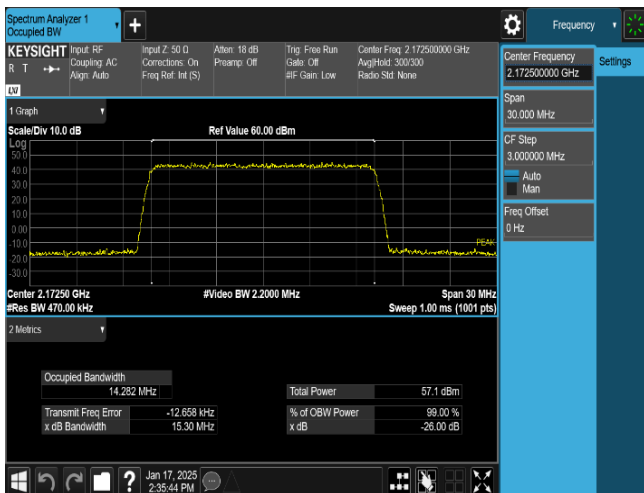
Plot 8-8. Occupied Bandwidth Plot
(LTE_B66_1C_20M_16QAM - Mid Channel, Port 3)



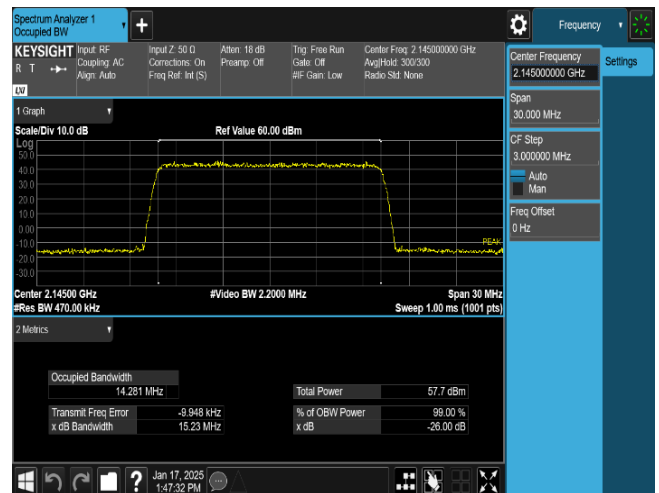
Plot 8-9. Occupied Bandwidth Plot
(NR_n66_1C_10M_QPSK - Mid Channel, Port 1)



Plot 8-10. Occupied Bandwidth Plot
(NR_n66_1C_10M_256QAM - Low Channel, Port 2)



Plot 8-11. Occupied Bandwidth Plot
(NR_n66_1C_15M_QPSK - High Channel, Port 2)



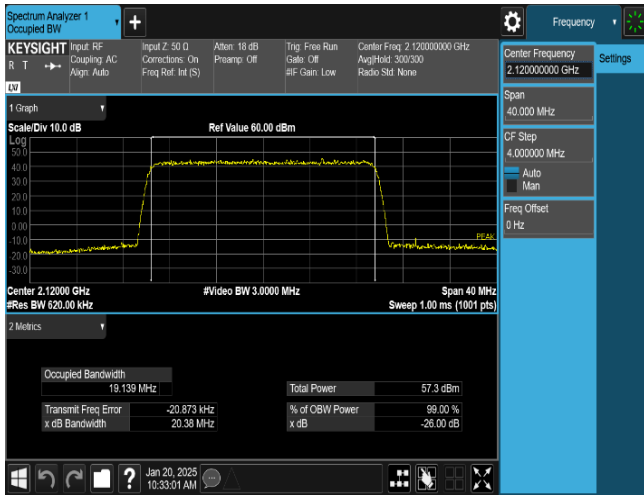
Plot 8-12. Occupied Bandwidth Plot
(NR_n66_1C_15M_64QAM - Mid Channel, Port 1)



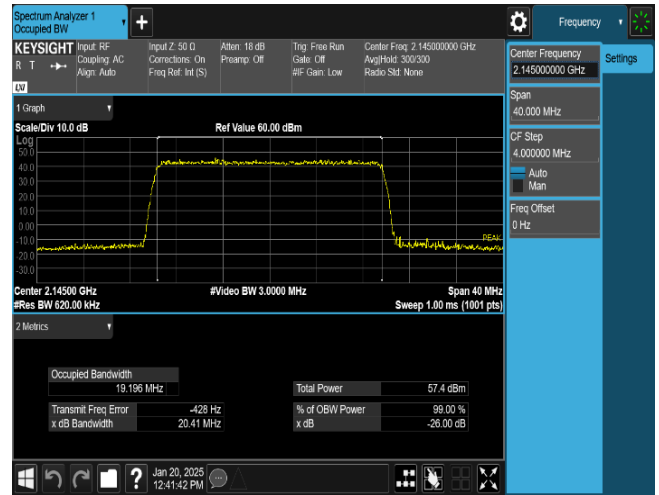
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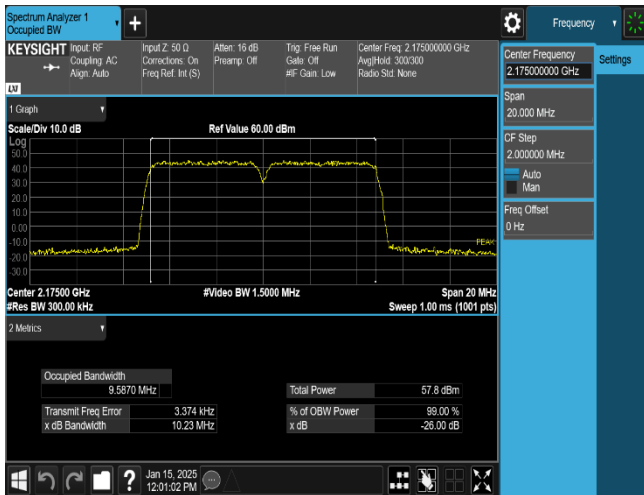
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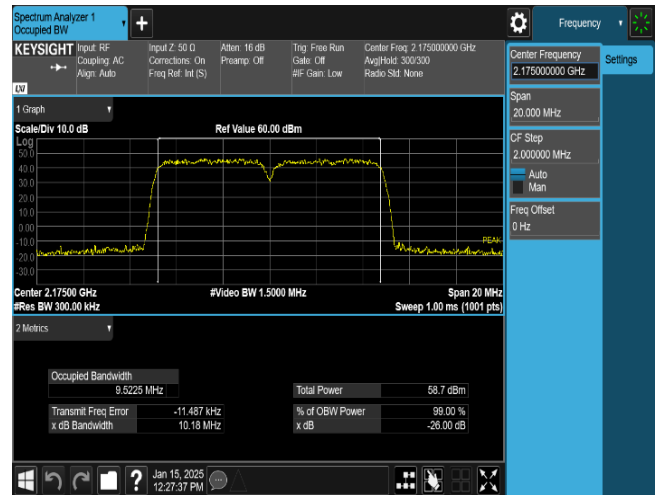
Plot 8-13. Occupied Bandwidth Plot
(NR_n66_1C_20M_QPSK - Low Channel, Port 2)



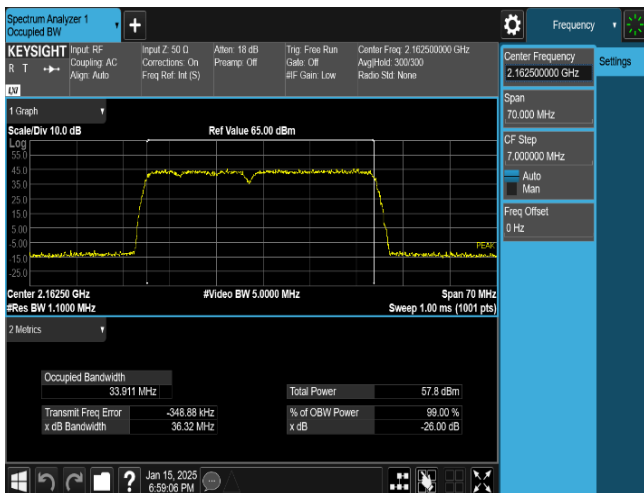
Plot 8-14. Occupied Bandwidth Plot
(NR_n66_1C_20M_16QAM - Mid Channel, Port 2)



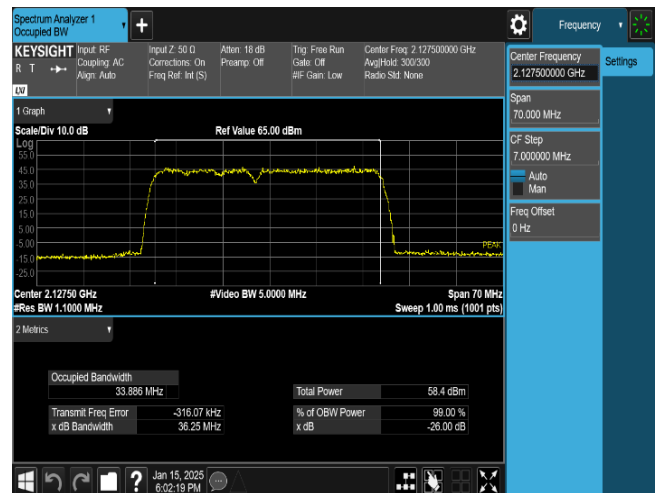
Plot 8-15. Occupied Bandwidth Plot
(LTE_B66_2C_5M+5M_QPSK - High Channel, Port 0)



Plot 8-16. Occupied Bandwidth Plot
(LTE_B66_2C_5M+5M_16QAM - High Channel, Port 0)



Plot 8-17. Occupied Bandwidth Plot
(LTE_B66_4C_5M+5M+5M+20M_QPSK - High Channel, Port 2)



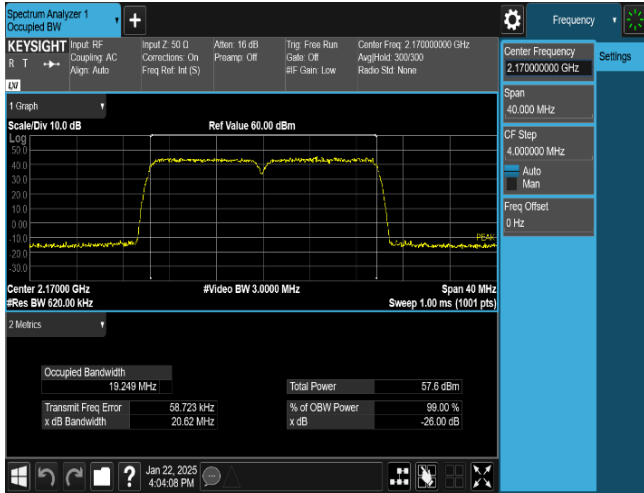
Plot 8-18. Occupied Bandwidth Plot
(LTE_B66_4C_5M+5M+5M+20M_16QAM - Low Channel, Port 3)



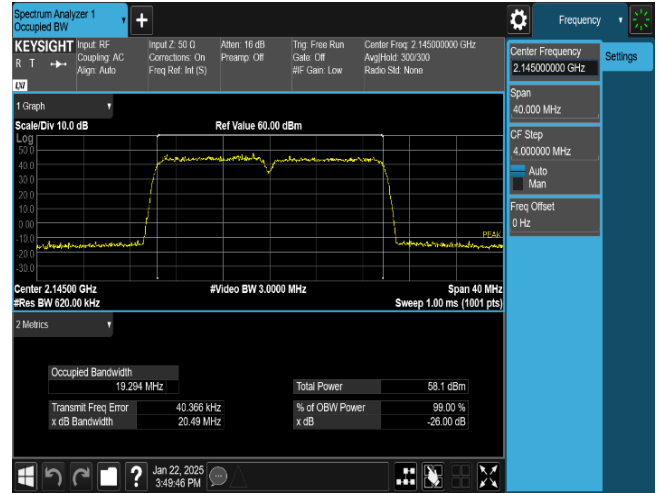
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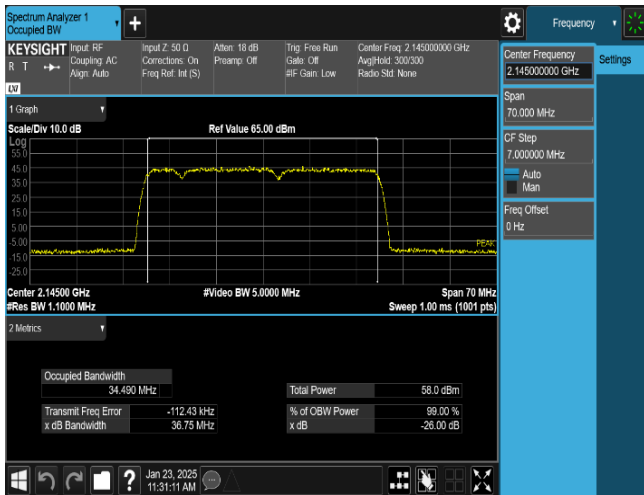
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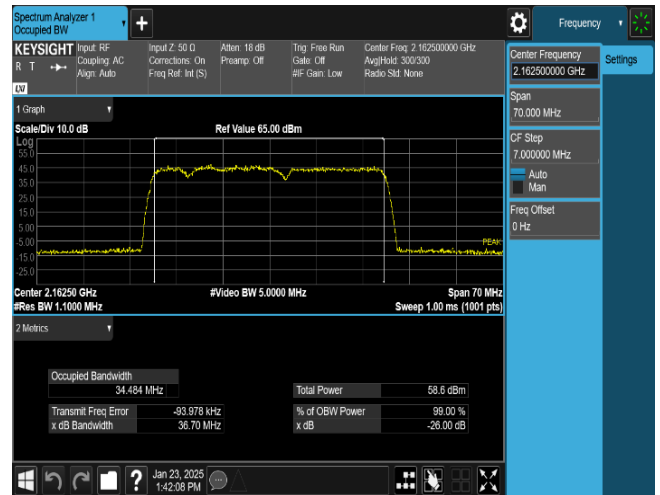
Plot 8-19. Occupied Bandwidth Plot
(B(n)66_LTE_10M+NR_10M_QPSK – High Channel, Port 1)



Plot 8-20. Occupied Bandwidth Plot
(B(n)66_LTE_10M+NR_10M_16QAM – Mid Channel, Port 0)



Plot 8-21. Occupied Bandwidth Plot
(B(n)66_LTE_5M+15M+NR_15M_QPSK – Mid Channel, Port 1)



Plot 8-22. Occupied Bandwidth Plot
(B(n)66_LTE_5M+15M+NR_15M_16QAM – High Channel, Port 0)

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

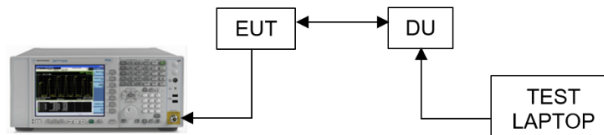


Figure 8-2. Test Instrument & Measurement Setup

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Limit

§ 27.50(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 36510.43 milliWatts
- b)

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		36510.43	mW/
Summed MIMO Conducted Power (dBm)	$= 10 * \log (36510.43) =$	45.62	dBm

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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.20	40.68	40.32	40.43
	1	39.24	40.33	40.14	40.22
	2	39.31	40.17	39.69	39.61
	3	39.60	40.40	40.11	40.02
Total MIMO PSD (mW/MHz)		36510.43	43821.38	40673.41	40724.54
Total MIMO PSD (dBm/MHz)		45.62	46.42	46.09	46.10
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.22	40.40	40.37	40.28
	1	40.13	40.34	40.30	40.19
	2	39.71	40.03	39.70	39.67
	3	40.13	40.39	40.24	40.13
Total MIMO PSD (mW/MHz)		40479.99	42782.24	41507.19	40662.99
Total MIMO PSD (dBm/MHz)		46.07	46.31	46.18	46.09
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.41	40.54	40.27	40.44
	1	40.18	40.45	40.14	40.10
	2	39.66	39.91	39.93	39.78
	3	40.23	40.43	40.24	40.21
Total MIMO PSD (mW/MHz)		41208.05	43268.65	41370.46	41304.69
Total MIMO PSD (dBm/MHz)		46.15	46.36	46.17	46.16

Table 8-11. Power Spectral Density Table (LTE_B66_1C_5M)

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.73	41.01	40.70	40.76
	1	40.30	40.56	40.35	40.45
	2	39.92	40.15	39.93	39.88
	3	40.37	40.59	40.44	40.49
Total MIMO PSD (mW/MHz)		43250.84	45774.41	43495.01	43903.12
Total MIMO PSD (dBm/MHz)		46.36	46.61	46.38	46.42
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.46	40.80	40.57	40.61
	1	40.35	40.72	40.44	40.51
	2	39.89	40.24	40.02	40.04
	3	40.36	40.63	40.56	40.47
Total MIMO PSD (mW/MHz)		42553.62	45931.76	43883.49	43999.15
Total MIMO PSD (dBm/MHz)		46.29	46.62	46.42	46.43
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.64	41.11	40.68	40.73
	1	40.42	40.66	40.28	40.40
	2	40.04	40.29	39.93	40.06
	3	40.39	40.72	40.37	40.50
Total MIMO PSD (mW/MHz)		43634.82	47007.16	43080.07	44150.41
Total MIMO PSD (dBm/MHz)		46.40	46.72	46.34	46.45

Table 8-12. Power Spectral Density Table (LTE_B66_1C_10M)

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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	39.31	39.94	39.26	39.32
	1	38.98	39.65	38.86	38.84
	2	38.44	39.26	38.36	38.46
	3	38.85	39.50	38.96	38.91
Total MIMO PSD (mW/MHz)		31106.06	36431.74	30828.48	30982.23
Total MIMO PSD (dBm/MHz)		44.93	45.61	44.89	44.91
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	39.07	39.78	39.21	39.09
	1	38.88	39.48	39.07	38.96
	2	38.48	39.11	38.44	38.52
	3	38.90	39.55	38.90	38.93
Total MIMO PSD (mW/MHz)		30625.90	35533.05	31150.03	30906.90
Total MIMO PSD (dBm/MHz)		44.86	45.51	44.93	44.90
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	39.06	39.89	39.05	39.20
	1	38.84	39.48	38.83	38.89
	2	38.63	39.24	38.40	38.48
	3	38.93	39.48	38.90	38.95
Total MIMO PSD (mW/MHz)		30795.75	35862.86	30330.95	30971.87
Total MIMO PSD (dBm/MHz)		44.88	45.55	44.82	44.91

Table 8-13. Power Spectral Density Table (LTE_B66_1C_15M)

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.74	38.01	37.89	37.71
	1	37.50	37.67	37.51	37.51
	2	37.26	37.39	37.08	37.10
	3	37.39	37.83	37.47	37.48
Total MIMO PSD (mW/MHz)		22367.66	23708.69	22465.52	22264.48
Total MIMO PSD (dBm/MHz)		43.50	43.75	43.52	43.48
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.53	37.98	37.74	37.70
	1	37.56	37.63	37.54	37.56
	2	36.94	37.20	37.10	37.15
	3	37.42	37.78	37.48	37.40
Total MIMO PSD (mW/MHz)		21828.65	23314.53	22348.85	22284.78
Total MIMO PSD (dBm/MHz)		43.39	43.68	43.49	43.48
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.64	37.83	37.68	37.80
	1	37.35	37.71	37.44	37.46
	2	36.98	37.27	37.04	37.28
	3	37.49	37.81	37.43	37.41
Total MIMO PSD (mW/MHz)		21826.23	23334.13	22005.68	22436.79
Total MIMO PSD (dBm/MHz)		43.39	43.68	43.43	43.51

Table 8-14. Power Spectral Density Table (LTE_B66_1C_20M)



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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.44	40.37	40.48	40.31
	1	40.06	40.06	40.08	39.96
	2	39.70	39.75	39.77	39.57
	3	40.08	40.07	39.99	40.05
Total MIMO PSD (mW/MHz)		40726.11	40608.12	40814.46	39809.36
Total MIMO PSD (dBm/MHz)		46.10	46.09	46.11	46.00
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.31	40.17	40.26	40.28
	1	40.14	40.03	40.10	40.11
	2	39.77	39.70	39.76	39.66
	3	40.16	40.27	40.10	40.07
Total MIMO PSD (mW/MHz)		40943.87	40422.94	40514.48	40310.07
Total MIMO PSD (dBm/MHz)		46.12	46.07	46.08	46.05
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	40.45	40.35	40.26	40.31
	1	40.04	40.08	40.01	39.99
	2	39.77	39.70	39.67	39.72
	3	40.13	40.34	40.08	40.07
Total MIMO PSD (mW/MHz)		40986.49	41146.32	40089.32	40240.86
Total MIMO PSD (dBm/MHz)		46.13	46.14	46.03	46.05

Table 8-15. Power Spectral Density Table (NR_n66_1C_10M)

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	38.64	38.64	38.59	38.57
	1	38.40	38.37	38.43	38.41
	2	38.02	37.97	38.00	38.03
	3	38.24	38.29	38.40	38.39
Total MIMO PSD (mW/MHz)		27230.44	27169.90	27434.22	27373.65
Total MIMO PSD (dBm/MHz)		44.35	44.34	44.38	44.37
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	38.34	38.62	38.47	38.51
	1	38.38	38.30	38.31	38.32
	2	37.87	37.93	37.93	37.96
	3	38.35	38.34	38.35	38.44
Total MIMO PSD (mW/MHz)		26661.97	27074.60	26861.34	27106.82
Total MIMO PSD (dBm/MHz)		44.26	44.33	44.29	44.33
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	38.48	38.73	38.62	38.48
	1	38.20	38.32	38.19	38.29
	2	37.93	38.10	38.02	37.89
	3	38.23	38.25	38.36	38.35
Total MIMO PSD (mW/MHz)		26512.15	27379.64	27060.83	26777.02
Total MIMO PSD (dBm/MHz)		44.23	44.37	44.32	44.28

Table 8-16. Power Spectral Density Table (NR_n66_1C_15M)



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Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.36	37.25	37.22	37.45
	1	37.29	37.02	37.18	37.07
	2	36.80	36.73	36.61	36.72
	3	37.17	37.21	37.13	37.16
Total MIMO PSD (mW/MHz)		20795.73	20324.26	20239.85	20555.33
Total MIMO PSD (dBm/MHz)		43.18	43.08	43.06	43.13
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.25	37.41	37.08	37.21
	1	37.18	37.17	37.11	37.03
	2	36.71	36.68	36.82	36.65
	3	37.11	37.07	37.09	37.17
Total MIMO PSD (mW/MHz)		20358.26	20476.05	20176.81	20146.91
Total MIMO PSD (dBm/MHz)		43.09	43.11	43.05	43.04
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Power Spectral Density (dBm/MHz)	0	37.11	37.07	37.12	37.10
	1	36.94	36.96	36.91	36.86
	2	36.65	36.54	36.62	36.63
	3	37.04	36.91	36.94	37.01
Total MIMO PSD (mW/MHz)		19757.76	19471.65	19601.82	19608.75
Total MIMO PSD (dBm/MHz)		42.96	42.89	42.92	42.92

Table 8-17. Power Spectral Density Table (NR_n66_1C_20M)

Low Channel	Port	LTE_B66_2C_5M+5M		LTE_B66_4C_5M+5M+5M+20M	
		QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	40.75	40.95	35.10	35.32
	1	40.42	40.69	34.74	35.20
	2	40.02	40.45	34.45	34.73
	3	40.42	40.69	34.82	35.06
Total MIMO PSD (mW/MHz)		43956.27	46967.42	12037.05	12894.93
Total MIMO PSD (dBm/MHz)		46.43	46.72	40.81	41.10
Middle Channel	Port	QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	40.75	40.96	35.09	35.55
	1	40.38	40.78	34.79	35.08
	2	40.14	40.22	34.54	34.89
	3	40.45	40.84	34.84	35.21
Total MIMO PSD (mW/MHz)		44229.02	47107.27	12136.72	13219.99
Total MIMO PSD (dBm/MHz)		46.46	46.73	40.84	41.21
High Channel	Port	QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	40.68	41.07	35.14	35.41
	1	40.38	40.61	35.00	35.05
	2	39.96	40.43	34.52	34.95
	3	40.54	40.80	34.85	35.25
Total MIMO PSD (mW/MHz)		43872.20	47337.74	12313.50	13140.78
Total MIMO PSD (dBm/MHz)		46.42	46.75	40.90	41.19

Table 8-18. Power Spectral Density Table (LTE_B66_Multi-carrier)



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Low Channel	Port	B(n)66_2C_LTE_10M+NR_10M		B(n)66_3C_LTE_5M+15M+NR_15M	
		QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	37.46	37.77	35.07	35.88
	1	37.29	37.46	34.77	35.42
	2	36.75	37.03	34.30	34.96
	3	37.34	37.72	35.05	35.88
Total MIMO PSD (mW/MHz)		21092.26	22522.00	12098.46	14361.60
Total MIMO PSD (dBm/MHz)		43.24	43.53	40.83	41.57
Middle Channel	Port	QPSK	16QAM	QPSK	16QAM
		QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	37.49	37.62	35.14	36.07
	1	37.19	37.45	34.80	35.46
	2	36.88	37.33	34.49	35.42
	3	37.18	37.55	35.05	35.72
Total MIMO PSD (mW/MHz)		20942.45	22442.67	12298.29	14775.18
Total MIMO PSD (dBm/MHz)		43.21	43.51	40.90	41.70
High Channel	Port	QPSK	16QAM	QPSK	16QAM
		QPSK	16QAM	QPSK	16QAM
Power Spectral Density (dBm/MHz)	0	37.33	37.49	35.24	36.02
	1	37.16	37.42	34.74	35.31
	2	36.97	37.16	34.73	35.45
	3	37.12	37.40	34.95	35.79
Total MIMO PSD (mW/MHz)		20721.55	21814.00	12410.39	14692.81
Total MIMO PSD (dBm/MHz)		43.16	43.39	40.94	41.67

Table 8-19. Power Spectral Density Table (LTE+NR_B(n)66_Multi-carrier)



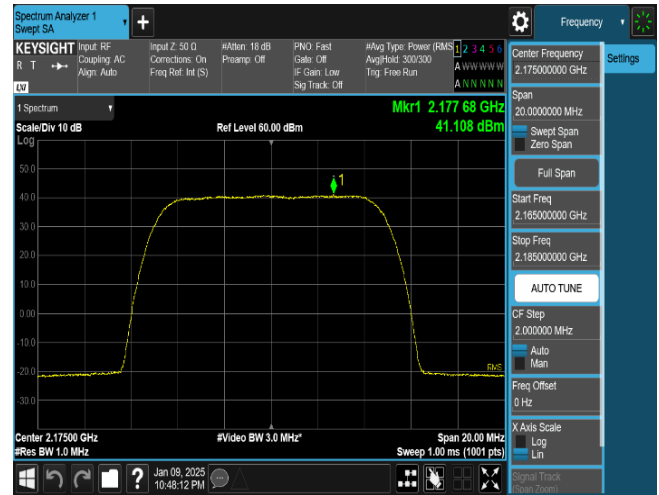
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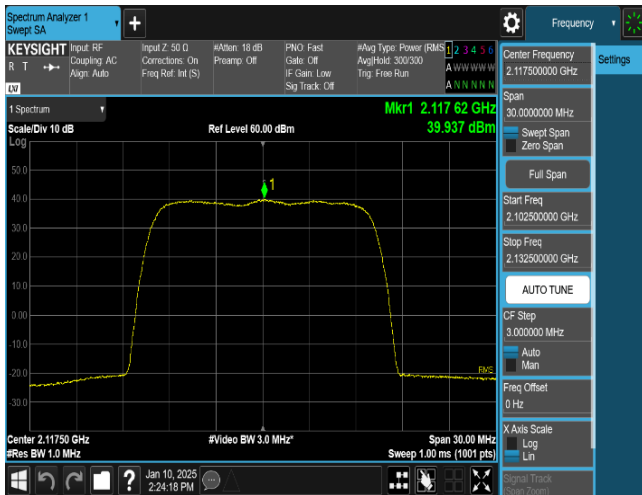
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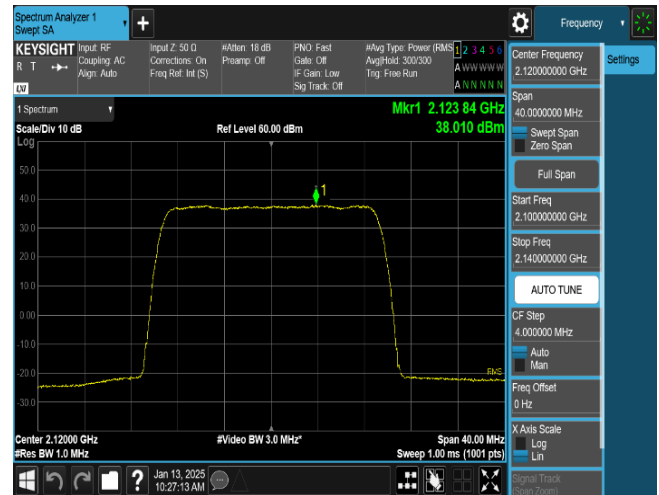
Plot 8-23. Equivalent Radiated Power Plot
(LTE_B66_1C_5M_16QAM - Low Channel, Port 0)



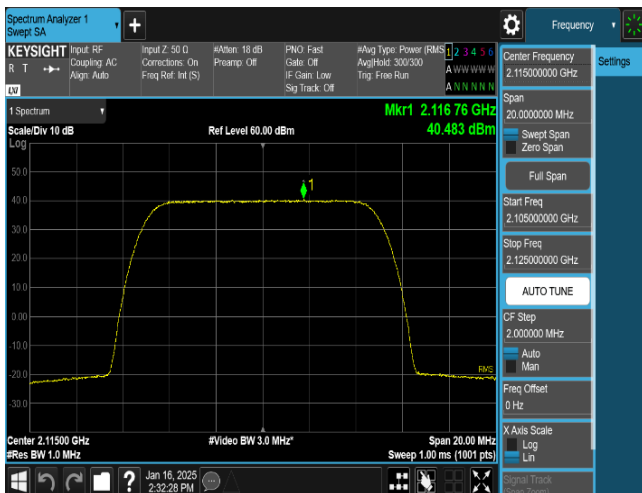
Plot 8-24. Equivalent Radiated Power Plot
(LTE_B66_1C_10M_16QAM - High Channel, Port 0)



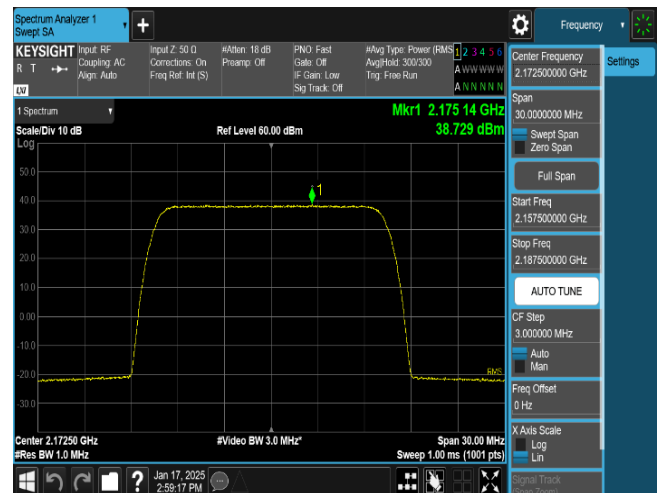
Plot 8-25. Equivalent Radiated Power Plot
(LTE_B66_1C_15M_16QAM - Low Channel, Port 0)



Plot 8-26. Equivalent Radiated Power Plot
(LTE_B66_1C_20M_16QAM - Low Channel, Port 0)



Plot 8-27. Equivalent Radiated Power Plot
(NR_n66_1C_10M_64QAM - Low Channel, Port 0)



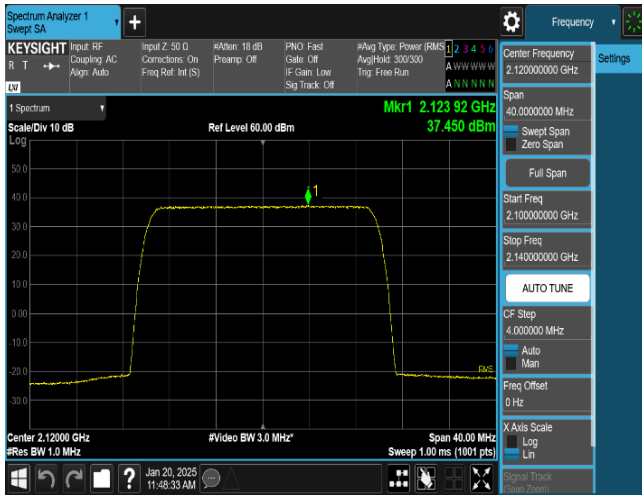
Plot 8-28. Equivalent Radiated Power Plot
(NR_n66_1C_15M_16QAM - High Channel, Port 0)



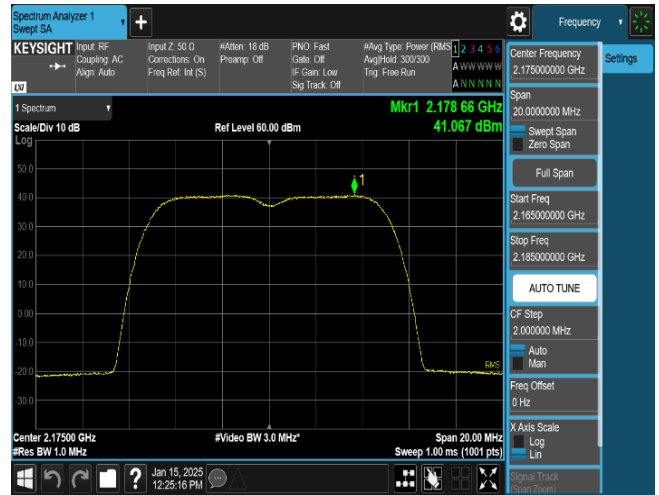
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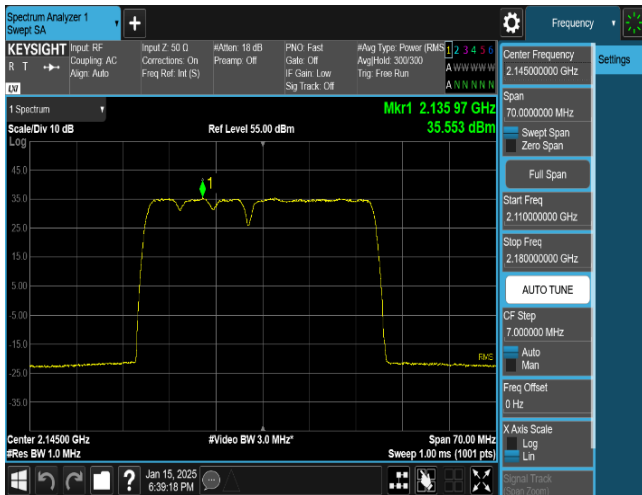
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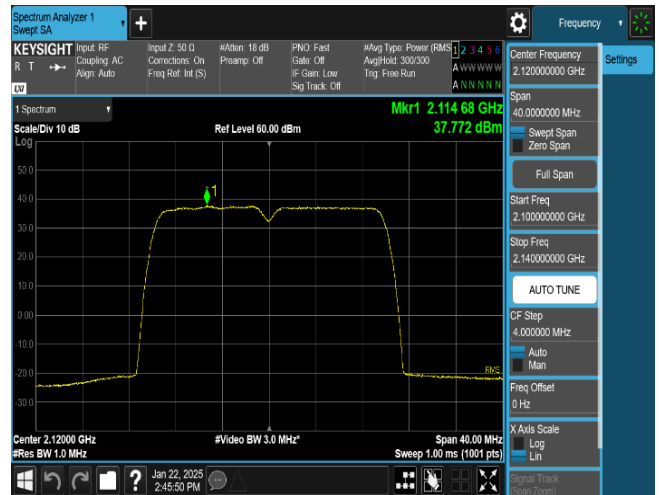
Plot 8-29. Equivalent Radiated Power Plot
(NR_n66_1C_20M_256QAM - Low Channel, Port 0)



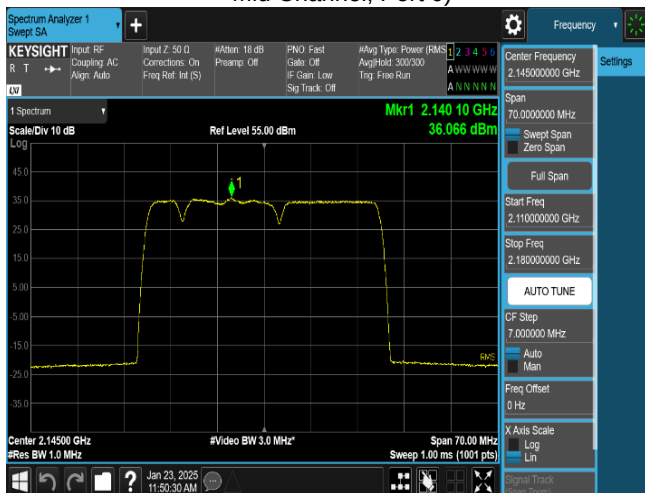
Plot 8-30. Equivalent Radiated Power Plot
(LTE_B66_2C_5M+5M_16QAM - High Channel, Port 0)



Plot 8-31. Equivalent Radiated Power Plot
(LTE_B66_4C_5M+5M+5M+20M_16QAM -
Mid Channel, Port 0)



Plot 8-32. Equivalent Radiated Power Plot
(B(n)66_LTE_10M+NR_10M_16QAM
- Low Channel, Port 0)



Plot 8-33. Equivalent Radiated Power Plot
(B(n)66_LTE_5M+15M+NR_15M_16QAM -
Mid Channel, Port 0)

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

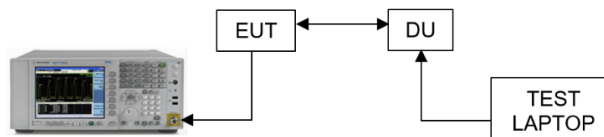


Figure 8-3. Test Instrument & Measurement Setup

Limit

§ 27.50(d)(5)

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	8.26	8.42	8.40	8.39
	1	8.27	8.45	8.40	8.39
	2	8.28	8.47	8.40	8.38
	3	8.31	8.41	8.38	8.39
Middle	0	8.30	8.48	8.41	8.39
	1	8.28	8.40	8.42	8.36
	2	8.27	8.44	8.41	8.39
	3	8.27	8.42	8.43	8.40
High	0	8.28	8.43	8.37	8.35
	1	8.29	8.50	8.42	8.40
	2	8.29	8.41	8.41	8.37
	3	8.27	8.44	8.40	8.36

Table 8-20. Peak To Average Power Ratio Summary Data (LTE_B66_1C_5M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.53	7.57	7.51	7.52
	1	7.53	7.57	7.51	7.51
	2	7.52	7.57	7.51	7.52
	3	7.53	7.56	7.51	7.52
Middle	0	7.53	7.57	7.51	7.52
	1	7.52	7.57	7.51	7.51
	2	7.53	7.57	7.52	7.51
	3	7.53	7.56	7.51	7.52
High	0	7.53	7.58	7.52	7.52
	1	7.53	7.57	7.51	7.51
	2	7.53	7.57	7.52	7.51
	3	7.53	7.56	7.52	7.52

Table 8-21. Peak To Average Power Ratio Summary Data (LTE_B66_1C_10M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.45	7.47	7.47	7.46
	1	7.47	7.46	7.45	7.46
	2	7.47	7.47	7.47	7.47
	3	7.46	7.48	7.47	7.47
Middle	0	7.46	7.47	7.45	7.47
	1	7.46	7.47	7.45	7.47
	2	7.46	7.47	7.45	7.46
	3	7.45	7.46	7.45	7.46
High	0	7.46	7.46	7.44	7.45
	1	7.45	7.45	7.45	7.46
	2	7.45	7.46	7.44	7.45
	3	7.46	7.46	7.44	7.45

Table 8-22. Peak To Average Power Ratio Summary Data (LTE_B66_1C_15M)

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Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.58	7.59	7.58	7.56
	1	7.57	7.59	7.58	7.56
	2	7.57	7.59	7.58	7.56
	3	7.58	7.60	7.58	7.55
Middle	0	7.56	7.58	7.55	7.54
	1	7.56	7.58	7.55	7.54
	2	7.57	7.58	7.55	7.55
	3	7.56	7.58	7.56	7.54
High	0	7.55	7.58	7.55	7.54
	1	7.55	7.58	7.54	7.53
	2	7.57	7.57	7.55	7.53
	3	7.57	7.58	7.55	7.55

Table 8-23. Peak To Average Power Ratio Summary Data (LTE_B66_1C_20M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.51	7.52	7.52	7.55
	1	7.51	7.53	7.52	7.55
	2	7.51	7.53	7.53	7.54
	3	7.52	7.53	7.51	7.55
Middle	0	7.52	7.53	7.53	7.55
	1	7.52	7.54	7.53	7.56
	2	7.52	7.53	7.54	7.56
	3	7.52	7.53	7.54	7.55
High	0	7.52	7.53	7.53	7.55
	1	7.53	7.54	7.53	7.55
	2	7.53	7.53	7.53	7.55
	3	7.52	7.53	7.54	7.56

Table 8-24. Peak To Average Power Ratio Summary Data (NR_n66_1C_10M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.48	7.48	7.48	7.49
	1	7.48	7.47	7.48	7.48
	2	7.48	7.48	7.47	7.48
	3	7.49	7.49	7.47	7.48
Middle	0	7.46	7.46	7.46	7.47
	1	7.47	7.46	7.45	7.46
	2	7.46	7.47	7.46	7.47
	3	7.46	7.46	7.46	7.46
High	0	7.47	7.46	7.45	7.46
	1	7.46	7.46	7.45	7.45
	2	7.46	7.46	7.46	7.45
	3	7.46	7.45	7.46	7.45

Table 8-25. Peak To Average Power Ratio Summary Data (NR_n66_1C_15M)

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Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		QPSK	16QAM	64QAM	256QAM
Low	0	7.59	7.61	7.61	7.58
	1	7.60	7.60	7.61	7.58
	2	7.58	7.61	7.61	7.56
	3	7.58	7.62	7.59	7.58
Middle	0	7.57	7.58	7.57	7.56
	1	7.56	7.58	7.59	7.56
	2	7.58	7.59	7.58	7.56
	3	7.56	7.58	7.58	7.56
High	0	7.55	7.58	7.57	7.54
	1	7.55	7.58	7.58	7.55
	2	7.57	7.58	7.58	7.56
	3	7.55	7.57	7.57	7.56

Table 8-26. Peak To Average Power Ratio Summary Data (NR_n66_1C_20M)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		LTE_B66_2C_5M+5M		LTE_B66_4C_5M+5M+5M+20M	
		QPSK	QAM	QPSK	QAM
Low	0	7.87	7.93	7.98	7.96
	1	7.86	7.92	7.96	7.97
	2	7.85	7.92	7.96	7.98
	3	7.86	7.95	7.97	7.98
Middle	0	7.88	7.95	7.94	7.97
	1	7.87	7.94	7.94	7.97
	2	7.87	7.94	7.94	7.97
	3	7.88	7.94	7.95	7.98
High	0	7.87	7.93	7.94	7.97
	1	7.87	7.94	7.95	7.97
	2	7.88	7.94	7.95	7.96
	3	7.87	7.95	7.94	7.97

Table 8-27. Peak To Average Power Ratio Summary Data (LTE_B66_Multi-carrier)

Channel	Port	Peak To Average Power Ratio (PAPR) (dB)			
		B(n)66_2C_LTE_10M+NR_10M		B(n)66_3C_LTE_5M+15M+NR_15M	
		QPSK	QAM	QPSK	QAM
Low	0	7.83	7.84	7.92	7.95
	1	7.83	7.84	7.95	7.95
	2	7.83	7.84	7.95	7.94
	3	7.82	7.83	7.95	7.94
Middle	0	7.85	7.85	7.97	7.94
	1	7.85	7.86	7.92	7.95
	2	7.85	7.86	7.92	7.93
	3	7.86	7.86	7.92	7.95
High	0	7.83	7.86	7.91	7.93
	1	7.84	7.87	7.92	7.95
	2	7.85	7.85	7.95	7.94
	3	7.85	7.86	7.95	7.95

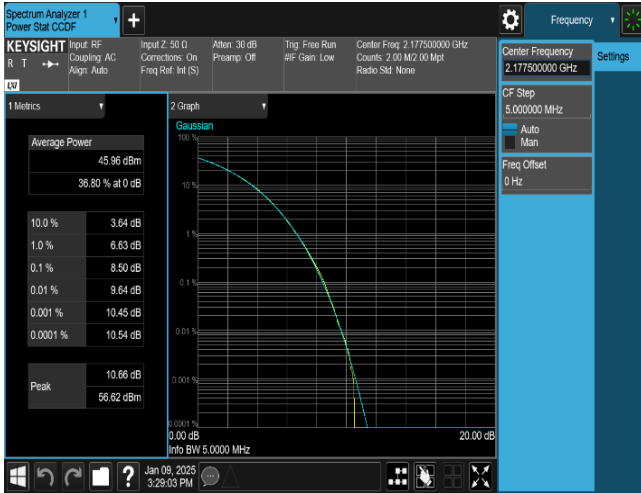
Table 8-28. Peak To Average Power Ratio Summary Data (LTE+NR_B(n)66_Multi-carrier)



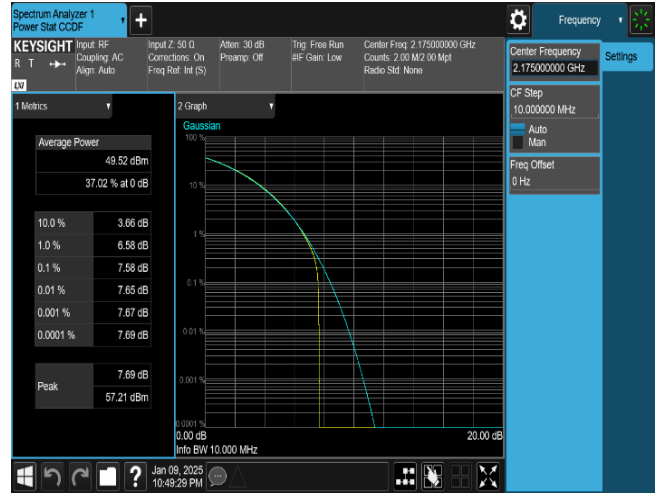
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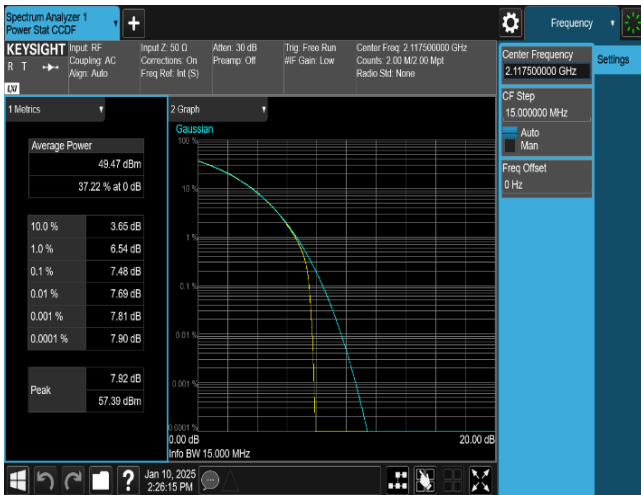
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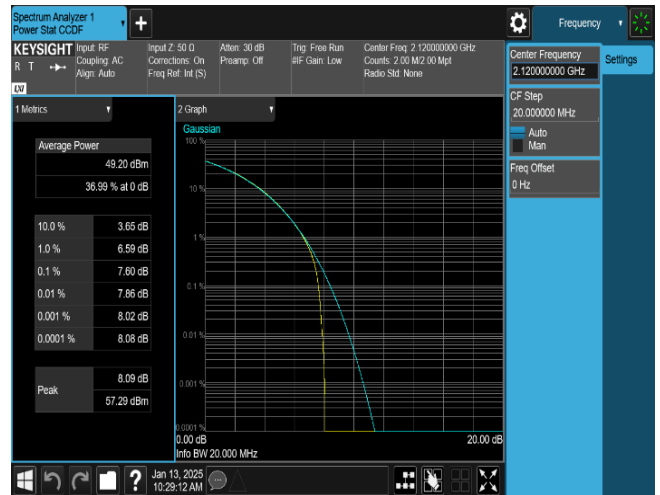
Plot 8-34. Peak To Average Power Ratio Plot
(LTE_B66_1C_5M_16QAM - High Channel, Port 1)



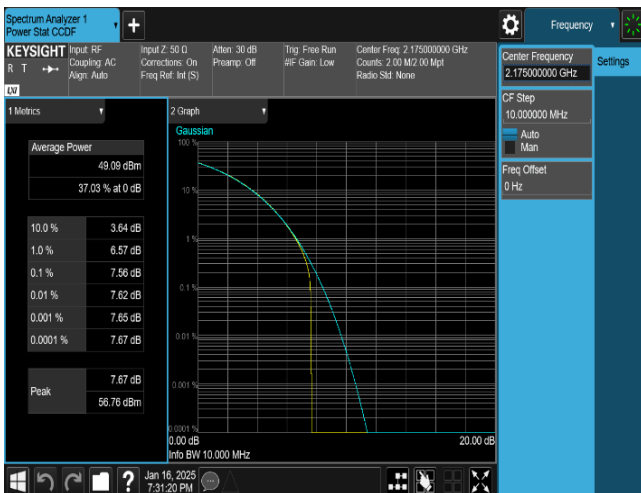
Plot 8-35. Peak To Average Power Ratio Plot
(LTE_B66_1C_10M_16QAM - High Channel, Port 0)



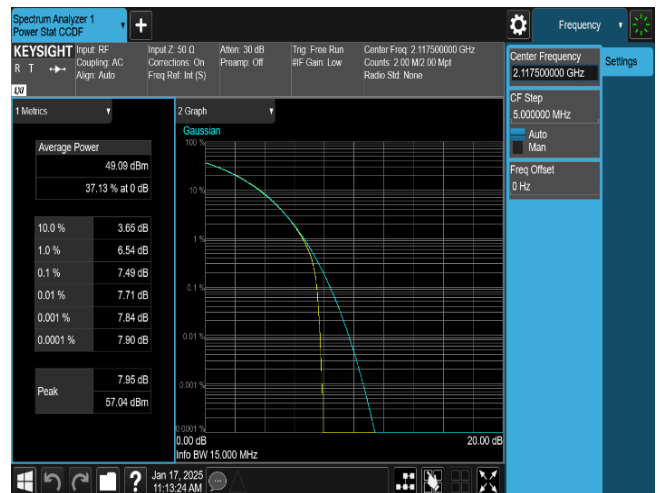
Plot 8-36. Peak To Average Power Ratio Plot
(LTE_B66_1C_15M_16QAM - Low Channel, Port 3)



Plot 8-37. Peak To Average Power Ratio Plot
(LTE_B66_1C_20M_16QAM - Low Channel, Port 3)



Plot 8-38. Peak To Average Power Ratio Plot
(NR_n66_1C_10M_256QAM - High Channel, Port 3)



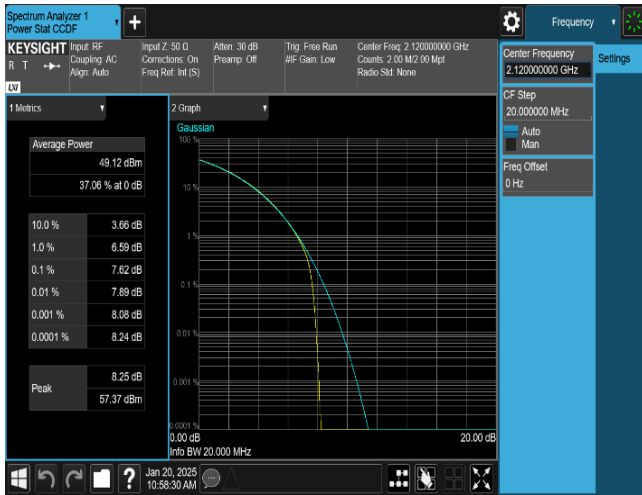
Plot 8-39. Peak To Average Power Ratio Plot
(NR_n66_1C_15M_QPSK - Low Channel, Port 3)



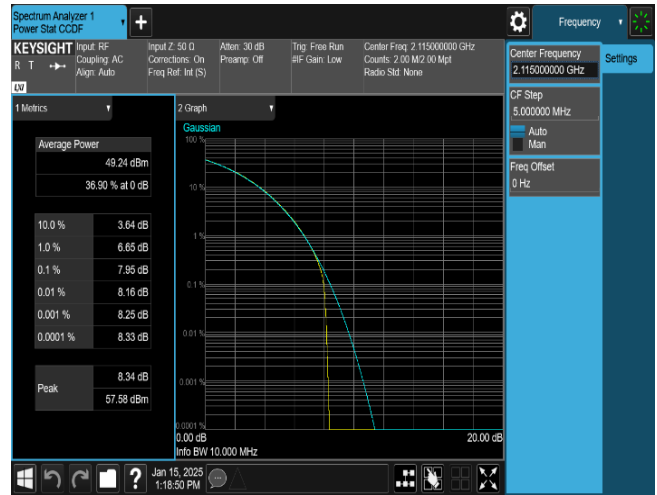
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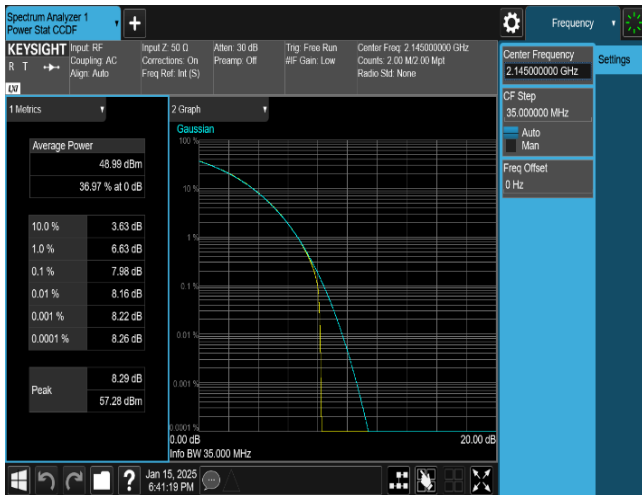
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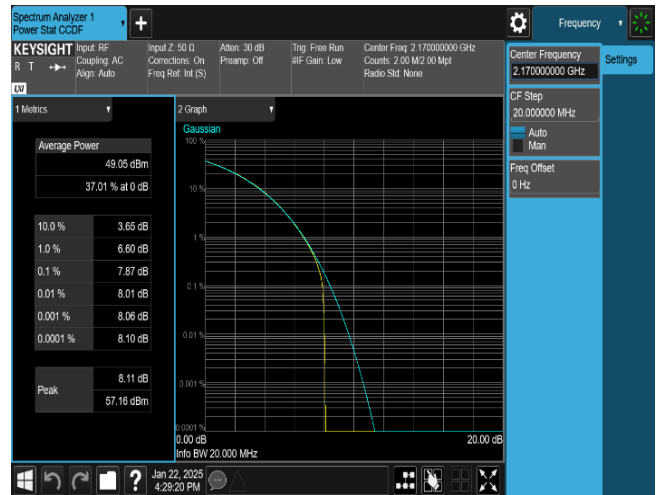
Plot 8-40. Peak To Average Power Ratio Plot
(NR_n66_1C_20M_16QAM - Low Channel, Port 3)



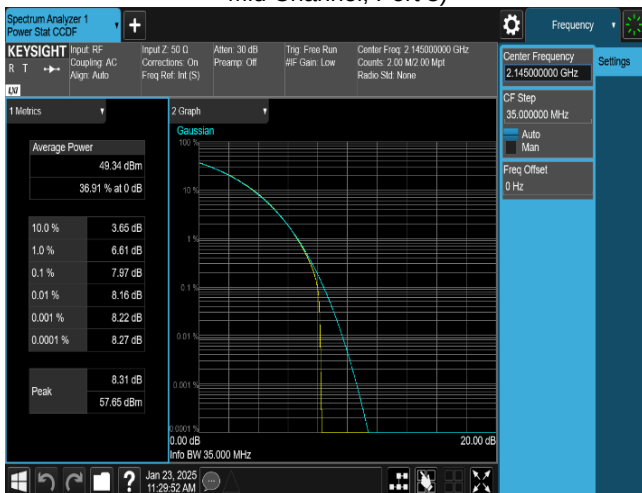
Plot 8-41. Peak To Average Power Ratio Plot
(LTE_B66_2C_5M+5M_16QAM - Low Channel, Port 3)



Plot 8-42. Peak To Average Power Ratio Plot
(LTE_B66_4C_5M+5M+5M+20M_16QAM
- Mid Channel, Port 3)



Plot 8-43. Peak To Average Power Ratio Plot
(B(n)66_LTE_10M+NR_10M_16QAM
- High Channel, Port 1)



Plot 8-44. Peak To Average Power Ratio Plot
(B(n)66_LTE_5M+15M+NR_15M_16QAM -
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

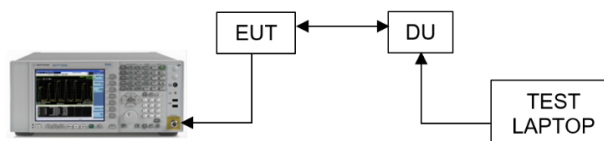


Figure 8-4. Test Instrument & Measurement Setup

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Limit

§ 27.53(h)

(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 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.
2. 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.
3. 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:
 $\text{MIMO Factor} = 10 \cdot \log(4) = 6.02$ 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	2109 to 2110 MHz	-27.97	-28.59	-27.50	-27.27	-19.02	-8.25
	1		-28.83	-27.65	-28.24	-27.58		-8.56
	2		-26.80	-30.09	-28.19	-28.34		-7.78
	3		-28.03	-28.70	-29.00	-28.25		-9.01
High	0	2180 to 2181 MHz	-26.75	-26.89	-27.30	-27.13		-7.73
	1		-27.21	-28.17	-23.37	-28.77		-4.35
	2		-27.73	-28.57	-27.61	-27.74		-8.59
	3		-27.55	-28.45	-27.70	-27.64		-8.53

Table 8-29. Band Edge Emission Summary Data (LTE_B66_1C_5M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-23.17	-21.34	-24.38	-22.99	-19.02	-2.32
	1		-23.44	-25.10	-23.22	-25.16		-4.20
	2		-25.00	-25.84	-24.12	-24.42		-5.10
	3		-22.49	-23.92	-23.64	-23.62		-3.47
High	0	2180 to 2181 MHz	-22.49	-24.28	-23.64	-22.79		-3.47
	1		-22.95	-22.11	-24.33	-23.38		-3.09
	2		-24.47	-23.01	-22.64	-24.04		-3.62
	3		-24.35	-24.40	-22.33	-23.93		-3.31

Table 8-30. Band Edge Emission Summary Data (LTE_B66_1C_10M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-25.76	-25.37	-25.43	-25.84	-19.02	-6.35
	1		-26.12	-25.22	-25.48	-26.39		-6.20
	2		-26.50	-26.29	-25.96	-26.84		-6.94
	3		-25.66	-25.88	-25.03	-26.08		-6.01
High	0	2180 to 2181 MHz	-25.71	-24.72	-25.39	-24.37		-5.35
	1		-24.47	-25.37	-25.11	-24.73		-5.45
	2		-25.46	-26.19	-25.74	-26.21		-6.44
	3		-26.09	-25.36	-25.33	-25.34		-6.31

Table 8-31. Band Edge Emission Summary Data (LTE_B66_1C_15M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-25.45	-26.89	-26.47	-26.34	-19.02	-6.43
	1		-26.29	-26.84	-26.59	-26.09		-7.07
	2		-26.10	-27.57	-27.30	-27.16		-7.08
	3		-26.22	-25.77	-25.88	-26.49		-6.75
High	0	2180 to 2181 MHz	-26.31	-26.68	-26.24	-26.79		-7.22
	1		-25.37	-25.68	-26.93	-25.73		-6.35
	2		-27.09	-27.29	-27.30	-27.19		-8.07
	3		-25.56	-25.76	-26.13	-26.51		-6.54

Table 8-32. Band Edge Emission Summary Data (LTE_B66_1C_20M)

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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	-23.53	-21.81	-21.55	-21.98	-19.02	-2.53
	1		-22.07	-20.17	-21.41	-22.65		-1.15
	2		-21.88	-20.15	-20.89	-20.99		-1.13
	3		-22.30	-20.46	-20.66	-20.45		-1.43
High	0	2180 to 2181 MHz	-23.06	-20.89	-21.93	-21.51		-1.87
	1		-21.01	-22.40	-20.74	-21.85		-1.72
	2		-20.54	-21.63	-22.57	-23.51		-1.52
	3		-21.18	-22.66	-22.33	-22.99		-2.16

Table 8-33. Band Edge Emission Summary Data (NR_n66_1C_10M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-21.73	-22.34	-22.00	-22.79	-19.02	-2.71
	1		-22.21	-22.10	-22.86	-22.25		-3.08
	2		-23.57	-21.74	-22.05	-21.99		-2.72
	3		-21.04	-22.05	-22.85	-20.78		-1.76
High	0	2180 to 2181 MHz	-22.66	-23.22	-21.77	-21.38		-2.36
	1		-22.51	-23.21	-22.57	-22.56		-3.49
	2		-22.53	-23.12	-23.05	-22.86		-3.51
	3		-22.56	-21.62	-21.77	-22.33		-2.60

Table 8-34. Band Edge Emission Summary Data (NR_n66_1C_15M)

Edge	Port	Measured Range	Max. Value (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	2109 to 2110 MHz	-23.58	-23.52	-23.46	-23.40	-19.02	-4.38
	1		-23.22	-24.46	-24.26	-22.66		-3.64
	2		-24.58	-25.66	-23.81	-23.71		-4.69
	3		-23.23	-22.92	-23.87	-22.42		-3.40
High	0	2180 to 2181 MHz	-23.31	-23.99	-24.54	-22.71		-3.69
	1		-24.13	-24.10	-23.60	-24.62		-4.58
	2		-24.94	-25.46	-24.49	-24.23		-5.21
	3		-23.54	-23.35	-24.09	-24.27		-4.33

Table 8-35. Band Edge Emission Summary Data (NR_n66_1C_20M)

Edge	Port	Measured Range	Max. Value (dBm)		Limit (dBm)	Worst Margin (dB)
			LTE_B66_2C_5M+5M	LTE_B66_4C_5M+5M+5M+20M		
			QPSK	QPSK		
Low	0	2109 to 2110 MHz	-23.11	-23.92	-19.02	-4.09
	1		-22.88	-24.75		-3.86
	2		-23.88	-25.32		-4.86
	3		-22.91	-24.78		-3.89
High	0	2180 to 2181 MHz	-22.42	-26.15		-3.40
	1		-22.50	-26.58		-3.48
	2		-24.39	-24.82		-5.37
	3		-22.62	-25.20		-3.60

Table 8-36. Band Edge Emission Summary Data (LTE_B66_Multi-carrier)

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Edge	Port	Measured Range	Max. Value (dBm)		Limit (dBm)	Worst Margin (dB)
			LTE_B66_2NC_5M+5M	LTE_B66_4NC_5M+5M+5M+20M		
			QPSK	QPSK		
Low	0	2109 to 2110 MHz	-28.42	-31.04	-19.02	-9.40
	1		-28.28	-31.13		-9.26
	2		-29.11	-31.99		-10.09
	3		-28.47	-31.42		-9.45
High	0	2180 to 2181 MHz	-27.38	-23.75		-4.73
	1		-27.85	-22.45		-3.43
	2		-29.26	-22.52		-3.50
	3		-27.96	-24.38		-5.36

Table 8-37. Band Edge Emission Summary Data (LTE_B66_Multi-carrier_Non-Contiguous)

Edge	Port	Measured Range	Max. Value (dBm)		Limit (dBm)	Worst Margin (dB)
			B(n)66_2C_LTE_10M+NR_10M	B(n)66_3C_LTE_5M+15M+NR_15M		
			QPSK	QPSK		
Low	0	2109 to 2110 MHz	-24.47	-24.46	-19.02	-5.44
	1		-23.24	-24.56		-4.22
	2		-24.54	-25.45		-5.52
	3		-24.13	-24.83		-5.11
High	0	2180 to 2181 MHz	-21.77	-25.50		-2.75
	1		-22.51	-24.97		-3.49
	2		-22.30	-25.17		-3.28
	3		-22.77	-25.88		-3.75

Table 8-38. Band Edge Emission Summary Data (LTE+NR_B(n)66_Multi-carrier)

Edge	Port	Measured Range	Max. Value (dBm)		Limit (dBm)	Worst Margin (dB)
			B(n)66_2NC_LTE_10M+NR_10M	B(n)66_3NC_LTE_5M+15M+NR_15M		
			QPSK	QPSK		
Low	0	2109 to 2110 MHz	-26.24	-31.82	-19.02	-7.22
	1		-27.69	-31.71		-8.67
	2		-27.77	-33.15		-8.75
	3		-25.31	-30.67		-6.29
High	0	2180 to 2181 MHz	-24.99	-24.43		-5.41
	1		-24.57	-21.76		-2.74
	2		-25.70	-24.09		-5.07
	3		-25.90	-22.76		-3.74

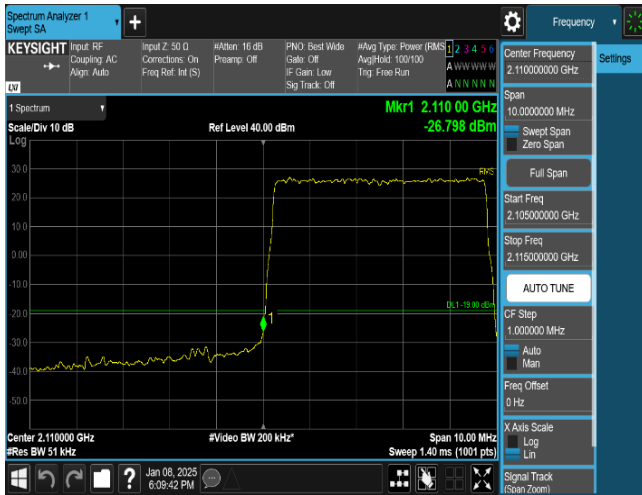
Table 8-39. Band Edge Emission Summary Data (LTE+NR_B(n)66_Multi-carrier_Non-Contiguous_4T)



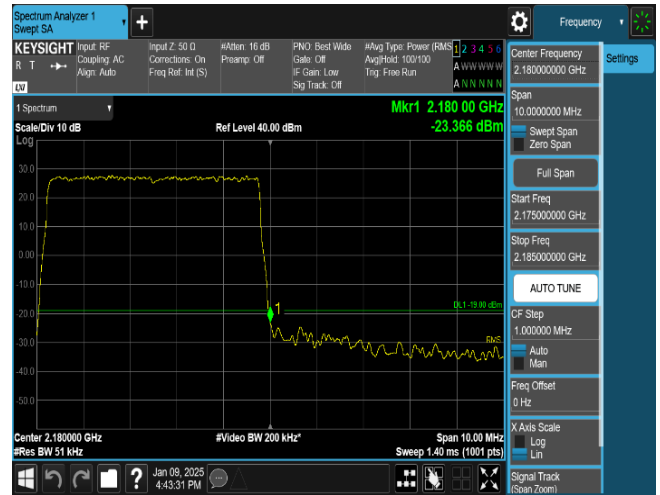
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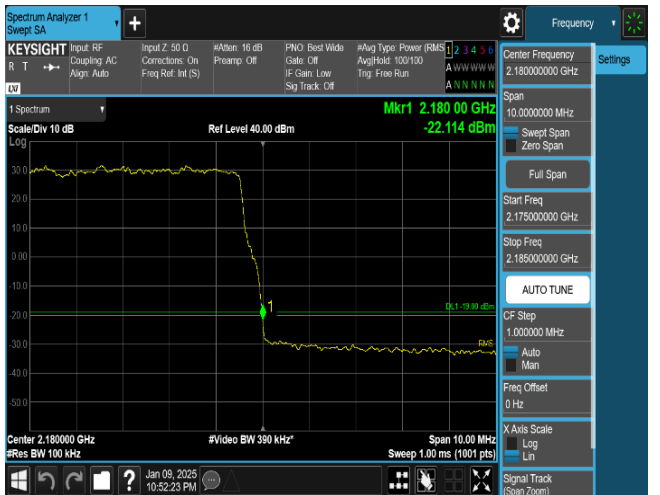
Plot 8-45. Band Edge Emission Summary Data Plot
(LTE_B66_1C_5M_QPSK - Low Edge, Port 2)



Plot 8-46. Band Edge Emission Summary Data Plot
(LTE_B66_1C_5M_64QAM - High Edge, Port 1)



Plot 8-47. Band Edge Emission Summary Data Plot
(LTE_B66_1C_10M_16QAM - Low Edge, Port 0)



Plot 8-48. Band Edge Emission Summary Data Plot
(LTE_B66_1C_10M_16QAM - High Edge, Port 1)



Plot 8-49. Band Edge Emission Summary Data Plot
(LTE_B66_1C_15M_64QAM - Low Edge, Port 3)



Plot 8-50. Band Edge Emission Summary Data Plot
(LTE_B66_1C_15M_256QAM - High Edge, Port 0)