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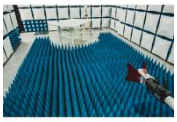

TEST REPORT
PART 27 MEASUREMENT REPORT

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

Date of Testing:
09/29/2022 - 10/26/2022
Test Site/Location:
Element Lab., Suwon,
Yongin-si, Gyeonggi-do, Korea
Test Report Serial No.:
8K22092802-00-R1.A3L

FCC ID:	**A3LRF4435D-71A**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Class II Permissive Change
Model:	RF4435d-71A
EUT Type:	RRU(RF4435d)
FCC Classification:	Licensed Non-Broadcast Station Transmitter
FCC Rule Part(s):	§27
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01

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

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

ACCREDITED
CERT #2041.04

Prepared by Jonathan Jang
Test Engineer

Reviewed by Charles.Shin
Technical Manager

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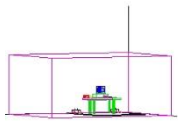
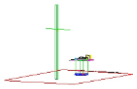


MEASUREMENT REPORT
FCC Part 27



Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
LTE_1C_5M	617 to 652	49.12	81.64	4M50G7D	QPSK
		49.25	84.12	4M54W7D	QAM
NR_1C_15M		53.80	239.89	14M2G7D	QPSK
		53.83	241.53	14M2W7D	QAM
NR_1C_20M		54.76	299.05	19M1G7D	QPSK
		54.87	306.96	19M1W7D	QAM
LTE_2C_5M+5M		52.15	163.97	9M46G7D	QPSK
		52.18	165.25	9M47W7D	QAM
NR_2C_5M+5M		52.18	165.32	9M46G7D	QPSK
		52.23	167.18	9M44W7D	QAM
NR_2C_15M+20M		54.73	296.98	33M8G7D	QPSK
		55.03	318.71	33M9W7D	QAM

Band 71 EUT Overview

Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
LTE_1C_10M	728 to 746	53.43	220.06	9M02G7D	QPSK
		53.48	222.65	9M05W7D	QAM
LTE_1C_15M		54.78	300.57	13M5G7D	QPSK
		54.81	302.79	13M6W7D	QAM
NR_1C_5M		50.56	113.66	4M53G7D	QPSK
		50.63	115.67	4M51W7D	QAM
NR_1C_10M		53.47	222.22	9M33G7D	QPSK
		53.49	223.53	9M34W7D	QAM
NR_1C_15M		55.00	316.19	14M2G7D	QPSK
		55.03	318.65	14M2W7D	QAM
LTE_2C_5M+5M		53.36	216.96	9M46G7D	QPSK
		53.44	220.61	9M48W7D	QAM
LTE_2C_5M+10M		54.97	314.02	14M2G7D	QPSK
		55.01	316.99	14M2W7D	QAM
NR_2C_5M+5M		53.47	222.53	9M45G7D	QPSK
		53.56	226.89	9M45W7D	QAM
NR_2C_5M+10M		55.08	322.07	14M4G7D	QPSK
		55.02	317.46	14M3W7D	QAM

Band 85 EUT Overview

Notes:

Total Power shown in the table above are the full conducted average output power that will appear on the Grant of Authorization.

1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
8K22092802-00.A3L	10/31/2022	Initial Issue
8K22092802-00-R1.A3L	11/02/2022	Revision due to updated test plot name

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 Element Test Location

These measurement tests were conducted at the Element Materials Technology Suwon. Ltd. facility located at (#1407) 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do 16954, Korea.

2.3 Test Facility / Accreditation

Measurements were performed at Element Materials Technology Suwon Lab located in Yongin-si, Gyeonggi, Korea.

- Element Materials Technology Suwon is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation(A2LA) with Certificate number 2041.04 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Materials Technology Suwon facility is accredited, designated, and recognized in accordance with the provision of Radio Wave Act and International Standard ISO/IEC 17025:2017 under the National Radio Research Agency.

  - Designation Number / CABID: KR0169
  - Test Firm Registration Number of FCC: 417945
  - Test Firm Registration Number of IC: 26168

3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung RRU(RF4435d) FCC ID: A3LRF4435D-71A**. 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.
A class II permissive change on the original filing is being pursued to firmware modifications to enable additional RAT and Channel Bandwidth without hardware modification.

3.2 Device Capabilities

This device supports the following conditional features and filter information:

EUT Type	RRU (RF4435d)	
Model Name	RF4435d-71A	
Test Device Serial No	DKN2011007	
Device Capabilities:	LTE, 5G NR	
Operating Band/Frequency Range:	Band / Tx (Downlink) / Rx (Uplink) B71(n71): 617 MHz to 652 MHz / 663 MHz to 698 MHz B85(n85): 728 MHz to 746 MHz / 698 MHz to 716 MHz	
Supported Modulation	QPSK, 16QAM, 64QAM, 256QAM	
Band 71 Supported Number of Carriers and Channel Bandwidth	5,10,15,20MHz bandwidth modes for LTE Band 71 and 5G NR Band n71 with up to 2CC aggregated of Max. operating Bandwidth 35 MHz	
Band 85 Supported Number of Carriers and Channel Bandwidth	5,10,15MHz bandwidth modes for LTE Band 85 and 5G NR Band n85 with up to 2CC aggregated of Max. operating Bandwidth 18 MHz	
Band 71 and Band 85 Dual band operation Supported Number of Carriers and Channel Bandwidth	B71(n71) and B85(n85) with up to 4CC aggregated of Max. operating Bandwidth 53 MHz	
Maximum Output Power	Band 71	Total 320W (80W/path x 4)
	Band 85	Total 320W (80W/path x 4)
	B71 + B85 Dual band operation	Total 320W (80W/path x 4)
Number of Antenna ports	4TX Configuration	
Supported Configurations	Single carrier, Multi-carrier, Dual band operation	
Input Voltage:	-48 VDC	
Antenna:	Antenna is not provided by manufacture	

3.3 Test Configuration

The setup is as follows:

a) The EUT ("RRU(RF4435d)") and a Data Unit (DU) are each powered by -48V DC power supply.
b) The DU is connected to a test laptop via an ethernet cable acting as backhaul.
c) DU connects to the EUT through a fiber optic cable.
d) 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.

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

* Abbreviations:
- 1C: 1 carrier
- 2C: Contiguous 2 carriers in multi-carrier operation
- 2NC: Non-contiguous 2 carriers in multi-carrier operation

Band 71(n71) Single and Multi Carrier Configuration	No. of Carriers	Total Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (W/path)
			Lowest	Middle	Highest	
LTE_1C_5M	1	5	619.5	634.5	649.5	20
LTE_2C_5M+5M	2	10 (5+5)	619.5+624.5	632.0+637.0	644.5+649.5	40
LTE_2NC_5M+5M			619.5 + 649.5			40
NR_1C_15M	1	15	624.5	634.5	644.5	60
NR_1C_20M	1	20	627.0	634.5	642.0	80
NR_2C_5M+5M	2	10 (5+5)	619.5+624.5	632.0+637.0	644.5+649.5	40
NR_2NC_5M+5M			619.5 + 649.5			40
NR_2C_15M+20M	2	35 (15+20)	624.0 + 642.0			80

Band 85(n85) Single and Multi Carrier Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (W/path)
			Lowest	Middle	Highest	
LTE_1C_10M	1	10	733.0	737.0	741.0	53
LTE_1C_15M	1	15	735.5	737.0	738.5	80
LTE_2C_5M+5M	2	10 (5+5)	730.5+735.5	734.5+739.5	738.5+743.5	53.32
LTE_2NC_5M+5M			730.5 + 743.5			53.32
LTE_2C_5M+10M	2	15 (5+10)	730.5+738.0	732.0+739.5	733.5+741.0	80
LTE_2NC_5M+10M			730.5 + 741.0			80
NR_1C_5M	1	5	730.5	737.0	743.5	26.66
NR_1C_10M	1	10	733.0	737.0	741.0	53.32
NR_1C_15M	1	15	735.5	737.0	738.5	80
NR_2C_5M+5M	2	10 (5+5)	730.5+735.5	734.5+739.5	738.5+743.5	53.32
NR_2NC_5M+5M			730.5 + 743.5			53.32
NR_2C_5M+10M	2	15 (5+10)	730.5+738.0	732.0+739.5	733.5+741.0	80
NR_2NC_5M+10M			730.5 + 741.0			80

Dual band Operation	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)	Rated Power (W/path)
			Middle	
n71 _1C_5M + n85_1C_5M	2	10 (5+5)	619.5 + 743.5	46.66
n71_2C_15M+20M + n85_2C_5M+10M	4	50 (15+20+5+10)	624.0 + 642.0 + 733.5+741.0	80

3.4 EMI Suppression Device(s)/Modifications

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

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 842590 D01 v01r01 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

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

4.2 Measurement Software

Test item	Name	Version
Conducted Measurement	Node B automation	1.0

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.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.37
Radiated Disturbance (<1GHz)	3.94
Radiated Disturbance (>1GHz)	4.75
Radiated Disturbance (>18GHz)	4.84

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	FSW43	Signal Analyzer	07/05/2022	Annual	07/04/2023	101250
Rohde & Schwarz	ESW	EMI Test Receiver	07/04/2022	Annual	07/03/2023	101761
AC POWER KOREA	ACPD-60150	DC Power Supply	01/18/2022	Annual	01/17/2023	DC-1
SUKSAN TECHNOLOGY	SE-CT-10	Temperature Chamber	07/05/2022	Annual	07/04/2023	191021
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	03/02/2022	Annual	03/01/2023	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	07/13/2021	Biennial	07/12/2023	9162-217
Sunol sciences	DRH-118	Horn Antenna	07/14/2021	Biennial	07/13/2023	A102416-1
Schwarzbeck	BBHA 9170	Horn Antenna	01/27/2022	Biennial	01/26/2024	1037
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0289
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0290
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0292
Reachline	250W18NN-40	Attenuator	01/19/2022	Annual	01/18/2023	PK0293

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.

7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 4M50G7D

Occupied Bandwidth = 4.50 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 4M54W7D

Occupied Bandwidth = 4.54 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

8.0 TEST RESULTS

8.1 Summary

Company Name: SAMSUNG Electronics Co., Ltd.

FCC ID: A3LRF4435D-71A

FCC Classification: Licensed Non-Broadcast Station Transmitter

Mode(s): LTE and 5G NR

FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
§ 2.1046	Conducted Average Output Power	N/A	CONDUCTED	PASS	Annex 1
§ 2.1049	Occupied Bandwidth	N/A		PASS	Section 8.2
§ 2.1046, § 27.50(c)	Equivalent Radiated Power (Power Spectral Density)	< 1000 W/MHz		PASS	Section 8.3 (Note 4)
§ 2.1046, § 27.50	Peak-to-average ratio	N/A		PASS	Section 8.4
§ 2.1051, § 27.53(g)	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(g)	Spurious and Harmonic Emissions at Antenna Terminal			PASS	Section 8.6
§ 2.1055 § 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block		N/A	(Note 5)
§ 2.1055, § 27.53(g)	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) The maximum antenna gain is determined at the time of licensing depending on the geographical location of the base station.

5) This is a variant report for channel bandwidth and modulation enabled by software without hardware change. The test item does not affect those operation. And it was performed in original report.

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 ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

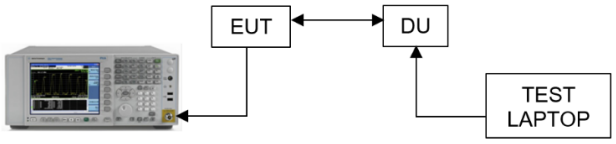


Figure 8-1. Test Instrument & Measurement Setup

Test Notes

None

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	4.49	4.45	4.50	4.51
	1	4.49	4.49	4.50	4.51
	2	4.49	4.50	**4.54**	4.50
	3	4.49	4.50	4.49	4.51
Middle	0	4.49	4.50	4.50	4.51
	1	4.49	4.45	4.51	4.49
	2	**4.50**	4.46	4.50	4.51
	3	4.48	4.48	4.50	4.51
High	0	4.49	4.47	4.52	4.49
	1	4.48	4.48	4.50	4.50
	2	4.49	4.48	4.49	4.50
	3	4.49	4.49	4.50	4.49

Table 8-2. Occupied Bandwidth Summary Data (LTE_B71_1C_5M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	14.16	14.17	14.14	14.14
	1	14.16	14.11	14.16	14.16
	2	14.11	14.16	14.17	**14.20**
	3	14.13	14.14	14.14	14.14
Middle	0	14.17	14.14	14.19	14.20
	1	**14.18**	14.15	14.13	14.16
	2	14.18	14.13	14.17	14.16
	3	14.16	14.14	14.15	14.14
High	0	14.16	14.12	14.11	14.14
	1	14.16	14.14	14.11	14.13
	2	14.15	14.17	14.14	14.16
	3	14.15	14.13	14.13	14.17

Table 8-3. Occupied Bandwidth Summary Data (NR_n71_1C_15M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	19.03	19.00	19.05	19.02
	1	19.04	19.03	19.03	19.01
	2	18.98	19.05	19.02	18.98
	3	19.00	19.06	19.01	19.02
Middle	0	18.99	19.05	19.02	19.01
	1	19.00	19.04	19.03	19.05
	2	**19.07**	19.04	19.01	19.00
	3	18.98	**19.07**	19.06	19.05
High	0	18.99	18.99	19.00	19.00
	1	19.02	19.01	19.04	19.02
	2	18.97	19.02	19.02	19.05
	3	19.04	19.05	19.03	19.02

Table 8-4. Occupied Bandwidth Summary Data (NR_n71_1C_20M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	8.99	9.00	8.98	9.00
	1	9.00	**9.05**	9.01	9.02
	2	**9.02**	9.02	9.03	9.00
	3	9.01	8.99	9.00	8.99
Middle	0	8.99	9.03	8.99	9.00
	1	9.00	9.01	9.04	8.98
	2	9.00	8.99	8.99	9.02
	3	9.00	8.98	9.00	9.01
High	0	9.02	8.98	9.01	9.00
	1	8.99	9.03	8.98	8.99
	2	9.01	9.05	8.99	8.98
	3	9.00	9.01	9.01	9.01

Table 8-5. Occupied Bandwidth Summary Data (LTE_B85_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**13.53**	13.50	13.45	13.45
	1	13.50	13.41	13.47	13.50
	2	13.52	13.55	13.43	13.48
	3	13.50	13.53	13.49	13.44
Middle	0	13.44	13.46	13.40	13.45
	1	13.51	13.46	13.46	13.48
	2	13.48	13.43	13.48	13.39
	3	13.44	**13.58**	13.48	13.40
High	0	13.46	13.49	13.49	13.52
	1	13.49	13.49	13.44	13.45
	2	13.42	13.44	13.48	13.47
	3	13.46	13.45	13.55	13.46

Table 8-6. Occupied Bandwidth Summary Data (LTE_B85_1C_15M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	4.49	4.47	4.49	**4.51**
	1	4.49	4.47	4.47	4.49
	2	4.49	4.46	4.48	4.51
	3	4.49	4.48	4.49	4.48
Middle	0	4.50	4.49	4.48	4.49
	1	4.48	4.46	4.49	4.48
	2	4.49	4.50	4.48	4.48
	3	**4.53**	4.49	4.47	4.49
High	0	4.50	4.49	4.50	4.48
	1	4.49	4.47	4.50	4.49
	2	4.48	4.47	4.49	4.50
	3	4.48	4.48	4.49	4.48

Table 8-7. Occupied Bandwidth Summary Data (NR_n85_1C_5M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	9.31	9.31	9.33	9.31
	1	9.31	9.28	9.30	9.32
	2	9.30	9.30	9.32	9.31
	3	9.30	9.31	9.32	9.33
Middle	0	9.32	9.31	9.31	9.30
	1	9.30	9.28	9.32	9.31
	2	**9.33**	9.29	9.32	9.32
	3	9.29	9.31	9.31	9.33
High	0	9.31	9.30	9.31	9.32
	1	9.30	9.29	9.32	**9.34**
	2	9.29	9.29	9.32	9.32
	3	9.31	9.28	9.31	9.28

Table 8-8. Occupied Bandwidth Summary Data (NR_n85_1C_10M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	14.15	14.11	14.17	14.16
	1	14.13	14.16	14.13	14.15
	2	14.15	14.16	14.17	14.13
	3	14.14	14.13	14.14	14.15
Middle	0	14.15	14.15	14.16	**14.18**
	1	14.14	14.14	14.16	14.15
	2	14.15	14.12	14.16	14.16
	3	14.12	14.15	14.15	14.15
High	0	14.15	14.16	14.15	14.13
	1	14.13	14.12	14.16	14.15
	2	14.14	14.14	14.17	14.15
	3	**14.18**	14.11	14.16	14.17

Table 8-9. Occupied Bandwidth Summary Data (NR_n85_1C_15M)

Channel	OBW (MHz)			
	Band	Configuration	QPSK	16QAM
Middle	71	LTE_2C_5M + 5M	**9.46**	**9.47**
		NR_2C_5M + 5M	**9.46**	**9.44**
		NR_2C_15M + 20M	**33.82**	**33.94**
	85	LTE_2C_5M+5M	**9.46**	**9.48**
		LTE_2C_5M+10M	**14.19**	**14.24**
		NR_2C_5M+5M	**9.45**	**9.45**
		NR_2C_5M+10M	**14.37**	**14.34**

Table 8-10. Occupied Bandwidth Summary Data (Multi Carrier)

Plot 8-1. Occupied Bandwidth Plot
(LTE_B71_1C_5M_QPSK - Mid Channel, Port 2)

Plot 8-2. Occupied Bandwidth Plot
(LTE_B71 _1C_5M_64QAM - Low Channel, Port 2)

Plot 8-3. Occupied Bandwidth Plot
(NR_n71_1C_15M_QPSK - Mid Channel, Port 1)

Plot 8-4. Occupied Bandwidth Plot
(NR_n71_1C_15M_256QAM - Low Channel, Port 2)

Plot 8-5. Occupied Bandwidth Plot
(NR_n71_1C_20M_QPSK - Mid Channel, Port 2)

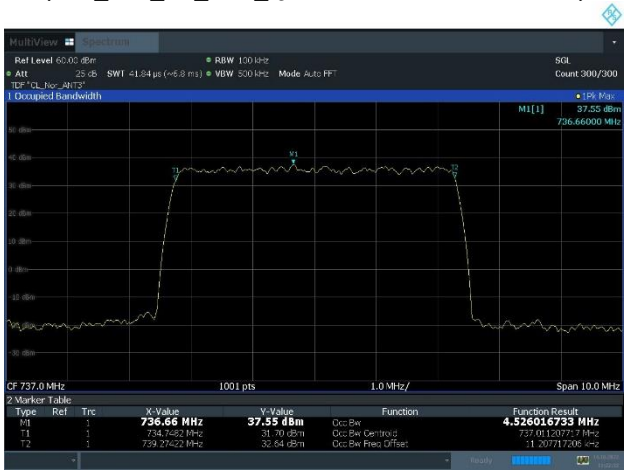
Plot 8-6. Occupied Bandwidth Plot
(NR_n71_1C_20M_16QAM - Mid Channel, Port 3)

Plot 8-7. Occupied Bandwidth Plot
(LTE_B85_1C_10M_QPSK – Low Channel, Port 2)

Plot 8-8. Occupied Bandwidth Plot
(LTE_B85_1C_10M_16QAM – Low Channel, Port 1)

Plot 8-9. Occupied Bandwidth Plot
(LTE_B85_1C_15M_QPSK – Low Channel, Port 0)

Plot 8-10. Occupied Bandwidth Plot
(LTE_B85_1C_15M_16QAM – Mid Channel, Port 3)



Plot 8-11. Occupied Bandwidth Plot
(NR_n85_1C_5M_QPSK – Mid Channel, Port 3)

Plot 8-12. Occupied Bandwidth Plot
(NR_n85_1C_10M_256QAM – Low Channel, Port 0)

Plot 8-13. Occupied Bandwidth Plot
(NR_n85_1C_10M_QPSK – Mid Channel, Port 2)

Plot 8-14. Occupied Bandwidth Plot
(NR_n85_1C_10M_256QAM – High Channel, Port 1)

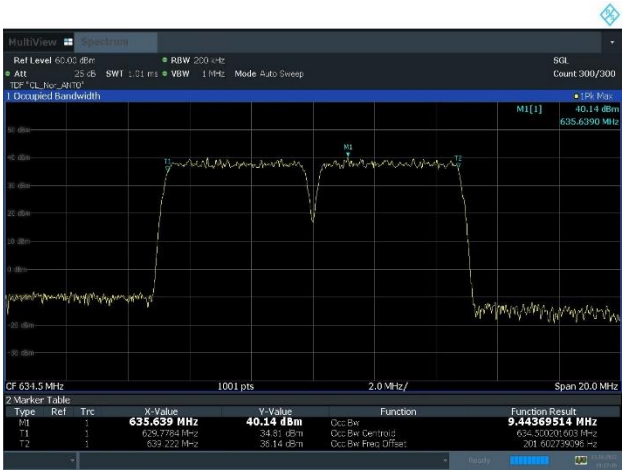
Plot 8-15. Occupied Bandwidth Plot
(NR_n85_1C_15M_QPSK – High Channel, Port 3)

Plot 8-16. Occupied Bandwidth Plot
(NR_n85_1C_15M_256QAM – Mid Channel, Port 0)

Plot 8-17. Occupied Bandwidth Plot
(LTE_B71_2C_5M+5M_QPSK – Mid Channel, Port 0)

Plot 8-18. Occupied Bandwidth Plot
(LTE_B71_2C_5M+5M_16QAM – Mid Channel, Port 0)

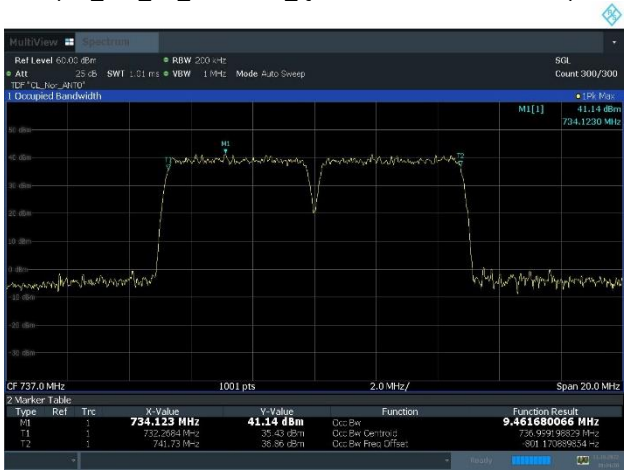
Plot 8-19. Occupied Bandwidth Plot
(NR_n71_2C_5M+5M_QPSK – Mid Channel, Port 0)



Plot 8-20. Occupied Bandwidth Plot
(NR_n71_2C_5M+5M_16QAM – Mid Channel, Port 0)

Plot 8-21. Occupied Bandwidth Plot
(NR_n71_2C_15M+20M_QPSK – Mid Channel, Port 0)

Plot 8-22. Occupied Bandwidth Plot
(NR_n71_2C_15M+20M_16QAM – Mid Channel, Port 0)



Plot 8-23. Occupied Bandwidth Plot
(LTE_B85_2C_5M+5M_QPSK – Mid Channel, Port 0)

Plot 8-24. Occupied Bandwidth Plot
(LTE_B85_2C_5M+5M_16QAM – Mid Channel, Port 0)

Plot 8-25. Occupied Bandwidth Plot
(LTE_B85_2C_5M+10M_QPSK – Mid Channel, Port 0)

Plot 8-26. Occupied Bandwidth Plot
(LTE_B85_2C_5M+10M_16QAM – Mid Channel, Port 0)

Plot 8-27. Occupied Bandwidth Plot
(NR_n85_2C_5M+5M_QPSK – Mid Channel, Port 0)

Plot 8-28. Occupied Bandwidth Plot
(NR_n85_2C_5M+5M_16QAM – Mid Channel, Port 0)

Plot 8-29. Occupied Bandwidth Plot
(NR_n85_2C_5M+10M_QPSK – Mid Channel, Port 0)

Plot 8-30. Occupied Bandwidth Plot
(NR_n85_2C_5M+10M_16QAM – Mid Channel, Port 0)

8.3 Equivalent Radiated Power (Power Spectral Density)

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 Procedure Used

KDB 971168 D01 v03r01 – Section 5.2
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4

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. Conducted average output power measurements are performed using the signal analyzer's "channel power mode" measurement capability for signals with continuous operation.
2. Set span to 2 × to 3 × the OBW.
3. Set RBW = 1 – 5% of the expected OBW
4. Set VBW ≥ 3 × RBW.
5. Set number of measurement points in sweep ≥ 2 × span / RBW.
6. Sweep time: auto-couple
7. Detector = power averaging (rms).
8. Set sweep trigger to "free run.".
9. The integration bandwidth was set equal to transmission bandwidth i.e. 20MHz for 2CC and 40MHz for 1CC measurements.
10. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
11. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges.

Test Setup

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

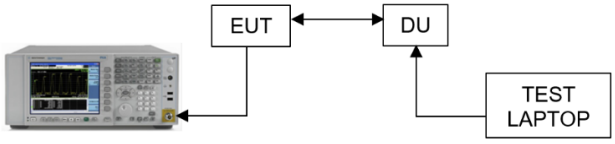


Figure 8-2. Test Instrument & Measurement Setup

Limit

N/A

Test Notes

1. 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).

2. 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.

3. Sample Calculation:
   Let us assume the following numbers:
   a) Total MIMO Conducted Power as 22417.45 milliWatts
   b)

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		22417.45	mW/MHz
Summed MIMO Conducted Power (dBm)	= 10 * log (22417.45) =	43.51	dBm/MHz

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	**16QAM**	64QAM	256QAM
Low	0	36.78	**37.18**	36.75	36.83
	1	36.67	**37.04**	36.85	36.63
	2	37.53	**37.87**	37.70	37.63
	3	37.32	**37.79**	37.45	37.34
Total MIMO PSD Power (mW/MHz)		20466.96	**22417.45**	21020.72	20636.34
Total MIMO PSD Power (dBm/MHz)		43.11	**43.51**	43.23	43.15
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	36.81	37.09	36.89	36.64
	1	36.81	37.10	36.92	36.80
	2	37.41	37.68	37.56	37.54
	3	37.41	37.66	37.53	37.54
Total MIMO PSD Power (mW/MHz)		20610.82	21941.26	21170.95	20750.37
Total MIMO PSD Power (dBm/MHz)		43.14	43.41	43.26	43.17
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	36.97	37.21	37.07	36.98
	1	36.90	37.15	37.11	36.97
	2	37.55	37.71	37.60	37.59
	3	37.49	37.68	37.56	37.43
Total MIMO PSD Power (mW/MHz)		21174.17	22211.57	21689.79	21240.88
Total MIMO PSD Power (dBm/MHz)		43.26	43.47	43.36	43.27

Table 8-11. Peak Power Spectral Density Table (LTE_B71_1C_5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	36.40	36.63	36.56	36.46
	1	36.62	36.47	36.63	36.34
	2	36.92	36.94	36.98	37.06
	3	36.93	37.10	37.25	37.41
Total MIMO PSD Power (mW/MHz)		18809.27	19110.37	19429.23	19320.82
Total MIMO PSD Power (dBm/MHz)		42.74	42.81	42.88	42.86
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	36.58	36.65	36.63	36.68
	1	36.58	36.65	36.64	36.56
	2	37.08	36.99	36.94	36.77
	3	37.41	37.48	37.49	37.48
Total MIMO PSD Power (mW/MHz)		19712.89	19845.54	19769.33	19535.77
Total MIMO PSD Power (dBm/MHz)		42.95	42.98	42.96	42.91
Channel	Port	QPSK	16QAM	64QAM	**256QAM**
High	0	36.79	36.88	36.68	**36.85**
	1	36.84	36.66	36.71	**36.80**
	2	36.97	37.02	37.11	**37.09**
	3	37.49	37.40	37.50	**37.62**
Total MIMO PSD Power (mW/MHz)		20193.73	20040.17	20107.84	**20525.80**
Total MIMO PSD Power (dBm/MHz)		43.05	43.02	43.03	**43.12**

Table 8-12. Peak Power Spectral Density Table (NR_n71_1C_15M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	36.21	36.19	36.14	36.06
	1	36.07	36.11	36.08	36.30
	2	36.69	36.64	36.56	36.67
	3	36.64	36.70	36.77	36.90
Total MIMO PSD Power (mW/MHz)		17503.83	17532.83	17448.91	17845.19
Total MIMO PSD Power (dBm/MHz)		42.43	42.44	42.42	42.52
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	36.24	36.17	36.24	36.40
	1	36.49	36.26	36.28	36.29
	2	36.69	36.63	36.72	36.79
	3	36.94	36.98	37.07	37.02
Total MIMO PSD Power (mW/MHz)		18273.53	17958.09	18245.71	18431.44
Total MIMO PSD Power (dBm/MHz)		42.62	42.54	42.61	42.66
Channel	Port	QPSK	16QAM	64QAM	**256QAM**
High	0	36.47	36.52	36.54	**36.57**
	1	36.37	36.50	36.44	**36.47**
	2	36.92	37.09	36.90	**36.94**
	3	37.07	37.14	37.25	**37.44**
Total MIMO PSD Power (mW/MHz)		18784.90	19247.18	19120.35	**19464.87**
Total MIMO PSD Power (dBm/MHz)		42.74	42.84	42.81	**42.89**

Table 8-13. Peak Power Spectral Density Table (NR_n71_1C_20M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	36.57	36.95	36.75	36.61
	1	36.58	37.13	36.54	36.50
	2	37.33	37.40	37.18	37.17
	3	37.27	37.57	37.33	37.26
Total MIMO PSD Power (mW/MHz)		19830.19	21328.86	19871.18	19581.28
Total MIMO PSD Power (dBm/MHz)		42.97	43.29	42.98	42.92
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	36.88	37.02	36.82	36.82
	1	36.66	36.91	36.57	36.71
	2	37.25	37.75	37.31	37.30
	3	37.40	37.80	37.51	37.70
Total MIMO PSD Power (mW/MHz)		20314.01	21926.30	20366.88	20755.28
Total MIMO PSD Power (dBm/MHz)		43.08	43.41	43.09	43.17
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
High	0	37.04	**37.28**	36.92	36.91
	1	36.60	**37.01**	36.61	36.66
	2	37.33	**37.64**	37.40	37.48
	3	37.56	**37.98**	37.76	37.69
Total MIMO PSD Power (mW/MHz)		20738.31	**22457.30**	20967.58	21016.02
Total MIMO PSD Power (dBm/MHz)		43.17	**43.51**	43.22	43.23

Table 8-14. Peak Power Spectral Density Table (LTE_B71_2C_5M+5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	36.89	36.69	36.94	36.78
	1	36.92	36.76	36.61	36.84
	2	37.31	37.43	37.48	37.45
	3	37.62	37.30	37.38	37.52
Total MIMO PSD Power (mW/MHz)		20970.58	20312.83	20592.26	20803.31
Total MIMO PSD Power (dBm/MHz)		43.22	43.08	43.14	43.18
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	36.89	37.01	36.94	36.89
	1	37.00	36.93	36.95	36.77
	2	37.45	37.49	37.80	37.74
	3	37.44	37.52	37.53	37.63
Total MIMO PSD Power (mW/MHz)		21003.70	21215.01	21585.60	21377.08
Total MIMO PSD Power (dBm/MHz)		43.22	43.27	43.34	43.30
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
High	0	36.99	**37.03**	37.09	37.10
	1	36.76	**36.81**	36.77	36.74
	2	37.45	**37.69**	37.53	37.48
	3	37.59	**37.82**	37.76	37.85
Total MIMO PSD Power (mW/MHz)		21042.97	**21772.25**	21502.92	21542.19
Total MIMO PSD Power (dBm/MHz)		43.23	**43.38**	43.32	43.33

Table 8-15. Peak Power Spectral Density Table (NR_n71_2C_5M+5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	**16QAM**	64QAM	256QAM
Middle	0	33.89	**34.17**	34.13	34.17
	1	34.00	**34.35**	34.38	34.14
	2	34.53	**34.61**	34.67	34.53
	3	34.66	**34.65**	34.89	34.89
Total MIMO PSD Power (mW/MHz)		10723.02	**11142.97**	11343.87	11127.45
Total MIMO PSD Power (dBm/MHz)		40.30	**40.47**	40.55	40.46

Table 8-16. Peak Power Spectral Density Table (NR_n71_2C_15M+20M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.32	38.69	38.61	38.56
	1	38.27	38.51	38.25	38.28
	2	38.43	38.84	38.35	38.58
	3	38.73	38.94	38.66	38.75
Total MIMO PSD Power (mW/MHz)		27937.08	29982.09	28128.75	28617.73
Total MIMO PSD Power (dBm/MHz)		44.46	44.77	44.49	44.57
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.42	39.02	38.59	38.64
	1	38.33	38.59	38.28	38.33
	2	38.54	38.67	38.41	38.50
	3	38.75	39.11	38.93	38.91
Total MIMO PSD Power (mW/MHz)		28401.84	30716.76	28708.00	28978.91
Total MIMO PSD Power (dBm/MHz)		44.53	44.87	44.58	44.62
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
High	0	38.53	**38.85**	38.55	38.67
	1	38.17	**38.56**	38.13	38.17
	2	38.47	**38.79**	38.43	38.34
	3	38.88	**39.25**	38.86	38.85
Total MIMO PSD Power (mW/MHz)		28447.51	**30833.84**	28320.30	28420.53
Total MIMO PSD Power (dBm/MHz)		44.54	**44.89**	44.52	44.54

Table 8-17. Peak Power Spectral Density Table (LTE_B85_1C_10M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.10	39.04	38.24	38.24
	1	38.30	38.64	38.22	38.17
	2	38.25	39.01	38.25	38.27
	3	38.28	38.80	38.26	38.31
Total MIMO PSD Power (mW/MHz)		26630.58	30875.54	26687.78	26720.22
Total MIMO PSD Power (dBm/MHz)		44.25	44.90	44.26	44.27
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.04	38.80	38.39	38.09
	1	38.27	38.49	38.20	38.00
	2	38.27	39.04	38.26	38.12
	3	38.29	38.73	38.43	38.44
Total MIMO PSD Power (mW/MHz)		26541.81	30130.22	27174.44	26219.93
Total MIMO PSD Power (dBm/MHz)		44.24	44.79	44.34	44.19
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
High	0	38.17	**38.95**	38.21	38.18
	1	37.99	**38.98**	38.16	38.20
	2	38.19	**38.81**	38.13	38.06
	3	38.32	**39.04**	38.34	38.31
Total MIMO PSD Power (mW/MHz)		26240.29	**31379.19**	26493.21	26357.28
Total MIMO PSD Power (dBm/MHz)		44.19	**44.97**	44.23	44.21

Table 8-18. Peak Power Spectral Density Table (LTE_B85_1C_15M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	**256QAM**
Low	0	38.03	38.44	38.39	**38.69**
	1	37.93	38.52	38.66	**38.60**
	2	38.49	38.70	38.69	**38.88**
	3	38.35	38.72	38.77	**38.75**
Total MIMO PSD Power (mW/MHz)		26464.29	28954.88	29177.15	**29866.16**
Total MIMO PSD Power (dBm/MHz)		44.23	44.62	44.65	**44.75**
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.73	38.65	38.59	38.77
	1	38.59	38.54	38.55	38.45
	2	38.66	38.81	38.71	38.66
	3	38.76	38.80	38.86	38.85
Total MIMO PSD Power (mW/MHz)		29553.55	29662.25	29510.63	29550.73
Total MIMO PSD Power (dBm/MHz)		44.71	44.72	44.70	44.71
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.80	38.68	38.83	38.68
	1	38.35	38.44	38.17	38.22
	2	38.80	38.86	38.69	38.79
	3	38.69	38.84	38.70	38.74
Total MIMO PSD Power (mW/MHz)		29406.72	29708.64	29008.97	29066.50
Total MIMO PSD Power (dBm/MHz)		44.68	44.73	44.63	44.63

Table 8-19. Peak Power Spectral Density Table (NR_n85_1C_5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	**64QAM**	256QAM
Low	0	38.24	38.39	**38.60**	38.50
	1	38.05	38.28	**38.29**	38.02
	2	38.66	38.67	**38.50**	38.52
	3	38.54	38.60	**38.59**	38.77
Total MIMO PSD Power (mW/MHz)		27540.80	28238.60	**28296.80**	28063.85
Total MIMO PSD Power (dBm/MHz)		44.40	44.51	**44.52**	44.48
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.23	38.32	38.36	38.45
	1	38.16	38.10	38.21	38.28
	2	38.58	38.48	38.46	38.50
	3	38.79	38.75	38.68	38.66
Total MIMO PSD Power (mW/MHz)		27978.50	27794.45	27870.64	28152.78
Total MIMO PSD Power (dBm/MHz)		44.47	44.44	44.45	44.50
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.27	38.27	38.31	38.34
	1	38.07	37.87	38.03	38.03
	2	38.47	38.48	38.42	38.61
	3	38.67	38.62	38.87	38.71
Total MIMO PSD Power (mW/MHz)		27519.18	27162.52	27789.00	27867.95
Total MIMO PSD Power (dBm/MHz)		44.40	44.34	44.44	44.45

Table 8-20. Peak Power Spectral Density Table (NR_n85_1C_10M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.03	38.08	38.06	38.06
	1	38.24	38.04	38.14	38.11
	2	38.13	38.16	38.13	38.19
	3	38.20	38.34	38.36	38.37
Total MIMO PSD Power (mW/MHz)		26129.61	26164.58	26269.81	26331.20
Total MIMO PSD Power (dBm/MHz)		44.17	44.18	44.19	44.20
Channel	Port	QPSK	16QAM	**64QAM**	256QAM
Middle	0	38.12	38.20	**38.18**	38.13
	1	38.11	38.17	**38.14**	37.90
	2	38.17	38.23	**38.26**	38.30
	3	38.38	38.48	**38.53**	38.29
Total MIMO PSD Power (mW/MHz)		26405.75	26868.05	**26920.24**	26173.36
Total MIMO PSD Power (dBm/MHz)		44.22	44.29	**44.30**	44.18
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.07	38.16	38.13	38.19
	1	37.69	37.94	37.98	37.97
	2	38.20	38.16	38.21	38.30
	3	38.31	38.47	38.33	38.45
Total MIMO PSD Power (mW/MHz)		25670.34	26346.45	26211.74	26617.13
Total MIMO PSD Power (dBm/MHz)		44.09	44.21	44.18	44.25

Table 8-21. Peak Power Spectral Density Table (NR_n85_1C_15M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.12	38.74	38.49	38.35
	1	37.91	38.52	38.30	38.18
	2	38.57	38.62	38.34	38.52
	3	38.38	38.86	38.48	38.36
Total MIMO PSD Power (mW/MHz)		26747.52	29562.93	27694.32	27382.71
Total MIMO PSD Power (dBm/MHz)		44.27	44.71	44.42	44.37
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.38	38.64	38.49	38.47
	1	38.04	38.52	38.25	38.12
	2	38.54	38.76	38.42	38.32
	3	38.73	38.90	38.78	38.84
Total MIMO PSD Power (mW/MHz)		27863.93	29702.23	28247.78	27965.07
Total MIMO PSD Power (dBm/MHz)		44.45	44.73	44.51	44.47
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
High	0	38.46	**38.78**	38.53	38.58
	1	38.20	**38.50**	38.19	38.09
	2	38.40	**38.79**	38.45	38.45
	3	38.75	**39.02**	38.75	38.88
Total MIMO PSD Power (mW/MHz)		28038.74	**30178.66**	28217.63	28377.99
Total MIMO PSD Power (dBm/MHz)		44.48	**44.80**	44.51	44.53

Table 8-22. Peak Power Spectral Density Table (LTE_B85_2C_5M+5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.24	38.55	38.39	38.30
	1	38.21	38.44	38.03	38.04
	2	38.34	38.63	38.27	38.25
	3	38.30	38.86	38.50	38.66
Total MIMO PSD Power (mW/MHz)		26874.45	29129.64	27049.45	27157.36
Total MIMO PSD Power (dBm/MHz)		44.29	44.64	44.32	44.34
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
Middle	0	38.25	**38.57**	38.44	38.28
	1	37.94	**38.60**	38.16	38.18
	2	38.16	**38.58**	38.17	38.13
	3	38.34	**38.80**	38.75	38.54
Total MIMO PSD Power (mW/MHz)		26276.19	**29235.70**	27589.08	26952.61
Total MIMO PSD Power (dBm/MHz)		44.20	**44.66**	44.41	44.31
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.37	38.57	38.33	38.51
	1	38.14	38.36	38.24	38.17
	2	38.24	38.47	38.20	38.17
	3	38.58	38.86	38.42	38.45
Total MIMO PSD Power (mW/MHz)		27266.11	28771.40	27032.94	27217.10
Total MIMO PSD Power (dBm/MHz)		44.36	44.59	44.32	44.35

Table 8-23. Peak Power Spectral Density Table (LTE_B85_2C_5M+10M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	38.42	38.47	38.42	38.70
	1	38.18	38.30	38.37	38.32
	2	38.62	38.71	38.55	38.60
	3	38.55	38.69	38.74	38.62
Total MIMO PSD Power (mW/MHz)		27966.05	28617.80	28464.06	28727.30
Total MIMO PSD Power (dBm/MHz)		44.47	44.57	44.54	44.58
Channel	Port	QPSK	**16QAM**	64QAM	256QAM
Middle	0	38.34	**38.71**	38.53	38.44
	1	38.16	**38.24**	38.22	38.20
	2	38.69	**38.80**	38.71	38.60
	3	38.91	**38.84**	38.88	38.74
Total MIMO PSD Power (mW/MHz)		28546.17	**29340.00**	28922.96	28315.31
Total MIMO PSD Power (dBm/MHz)		44.56	**44.67**	44.61	44.52
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.37	38.47	38.52	38.50
	1	38.15	38.27	38.10	38.24
	2	38.68	38.80	38.70	38.71
	3	38.77	38.88	38.68	38.73
Total MIMO PSD Power (mW/MHz)		28314.59	29057.59	28360.82	28642.20
Total MIMO PSD Power (dBm/MHz)		44.52	44.63	44.53	44.57

Table 8-24. Peak Power Spectral Density Table (NR_n85_2C_5M+5M)

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**38.24**	38.21	37.89	37.84
	1	**38.10**	37.86	37.56	37.74
	2	**38.35**	38.35	37.91	37.90
	3	**38.62**	38.36	38.11	38.24
Total MIMO PSD Power (mW/MHz)		**27241.52**	26425.58	24505.00	24858.29
Total MIMO PSD Power (dBm/MHz)		**44.35**	44.22	43.89	43.95
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	38.27	38.21	38.10	37.85
	1	38.01	38.07	37.52	37.53
	2	38.05	38.42	38.07	37.98
	3	38.16	38.58	38.15	38.23
Total MIMO PSD Power (mW/MHz)		25967.40	27195.58	25049.31	24691.08
Total MIMO PSD Power (dBm/MHz)		44.14	44.34	43.99	43.93
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	38.18	38.40	38.13	37.82
	1	37.99	37.92	37.54	37.76
	2	38.23	38.44	38.19	37.90
	3	38.49	38.19	38.17	38.05
Total MIMO PSD Power (mW/MHz)		26587.55	26686.78	25329.93	24572.35
Total MIMO PSD Power (dBm/MHz)		44.25	44.26	44.04	43.90

Table 8-25. Peak Power Spectral Density Table (NR_n85_2C_5M+10M)

Plot 8-31. Power Spectral Density Plot
(LTE_B71_1C_5M_16QAM - Low Channel, Port 0)

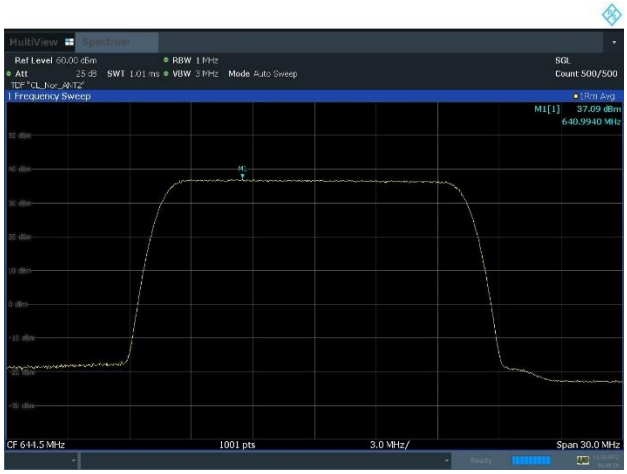
Plot 8-32. Power Spectral Density Plot
(LTE_B71_1C_5M_16QAM - Low Channel, Port 1)

Plot 8-33. Power Spectral Density Plot
(LTE_B71_1C_5M_16QAM - Low Channel, Port 2)

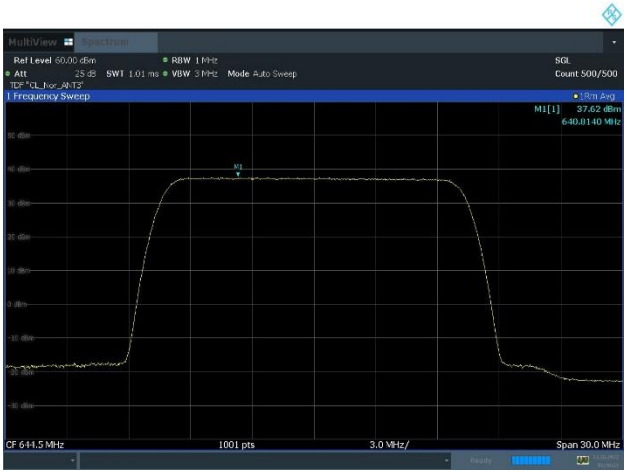
Plot 8-34. Power Spectral Density Plot
(LTE_B71_1C_5M_16QAM - Low Channel, Port 3)

Plot 8-35. Power Spectral Density Plot
(NR_n71_1C_15M_256QAM - High Channel, Port 0)

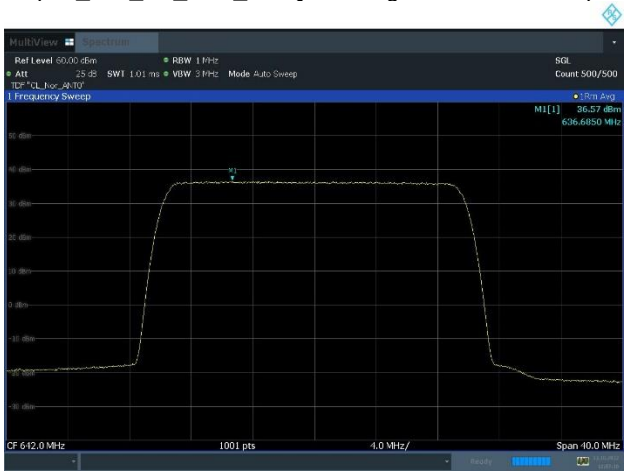
Plot 8-36. Power Spectral Density Plot
(NR_n71_1C_15M_256QAM - High Channel, Port 1)



Plot 8-37. Power Spectral Density Plot
(NR_n71_1C_15M_256QAM - High Channel, Port 2)

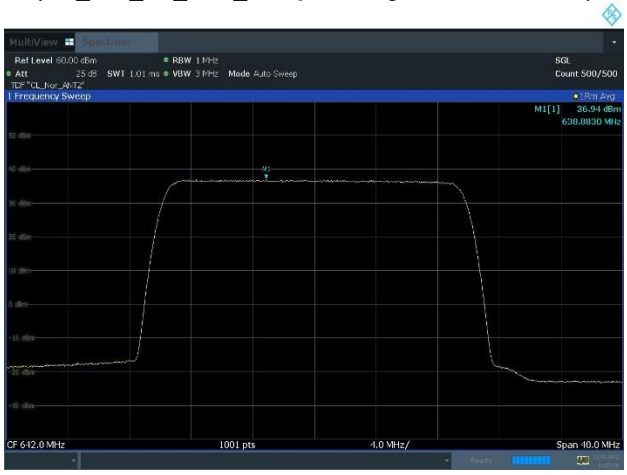


Plot 8-38. Power Spectral Density Plot
(NR_n71_1C_15M_256QAM - High Channel, Port 3)

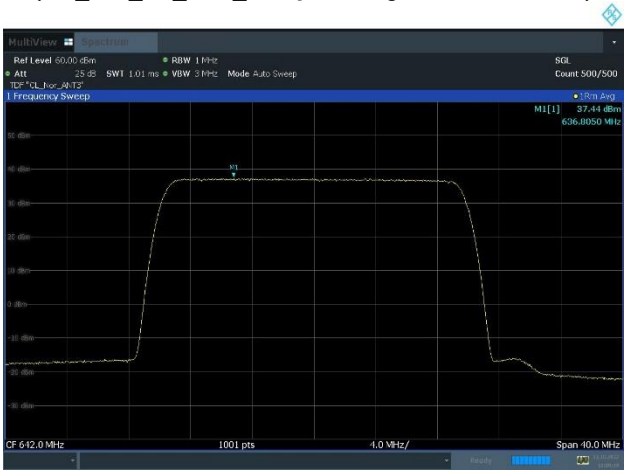


Plot 8-39. Power Spectral Density Plot
(NR_n71_1C_20M_256QAM - High Channel, Port 0)

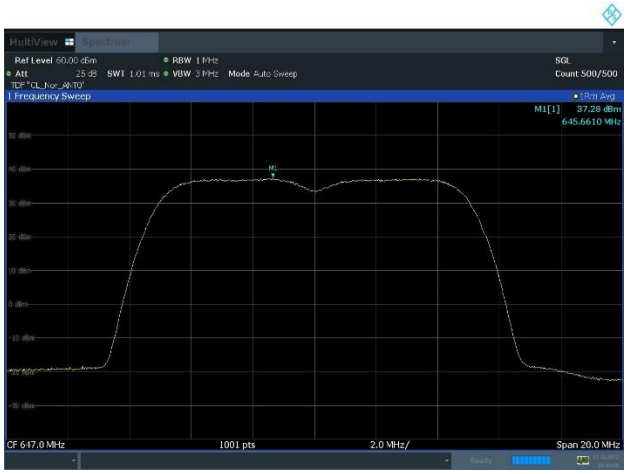
Plot 8-40. Power Spectral Density Plot
(NR_n71_1C_20M_256QAM - High Channel, Port 1)



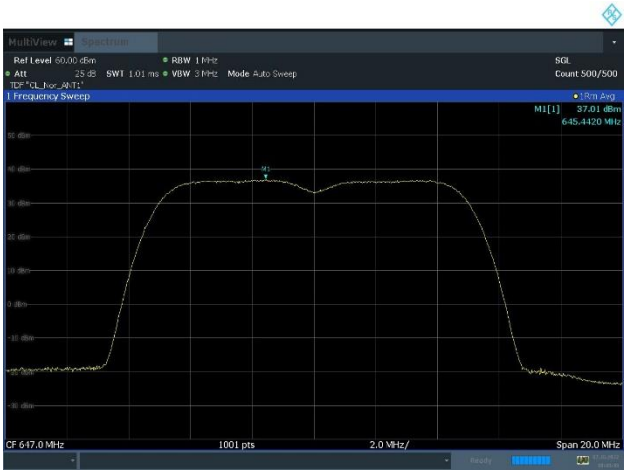
Plot 8-41. Power Spectral Density Plot
(NR_n71_1C_20M_256QAM - High Channel, Port 2)



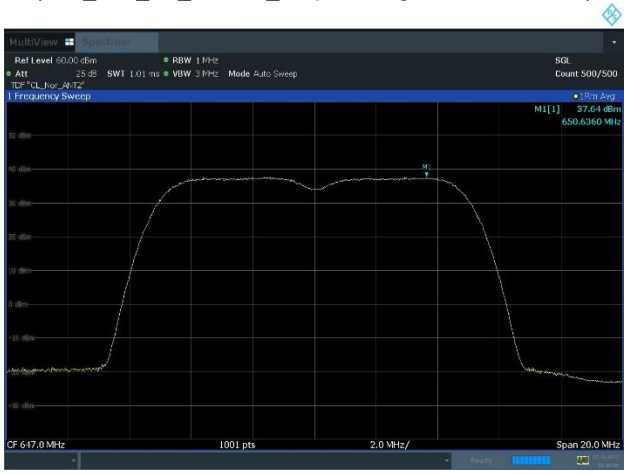
Plot 8-42. Power Spectral Density Plot
(NR_n71_1C_20M_256QAM - High Channel, Port 3)



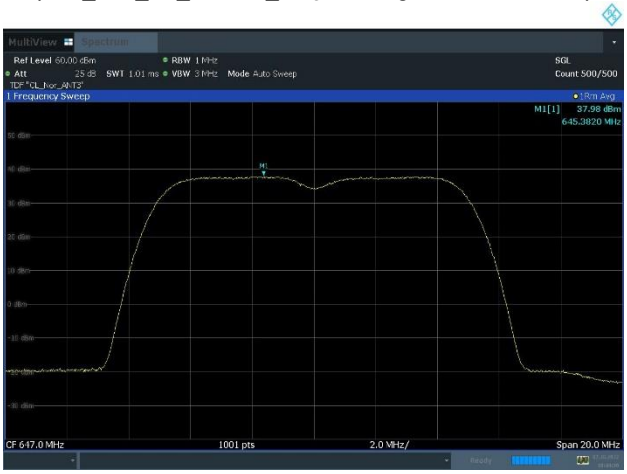
Plot 8-43. Power Spectral Density Plot
(LTE_B71_2C_5M+5M_16QAM - High Channel, Port 0)



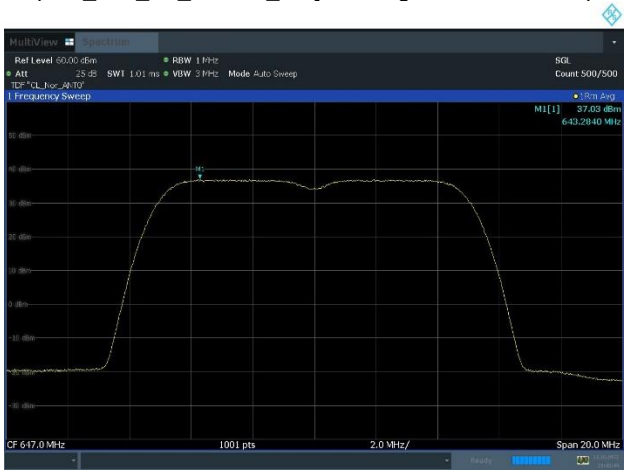
Plot 8-44. Power Spectral Density Plot
(LTE_B71_2C_5M+5M_16QAM - High Channel, Port 1)



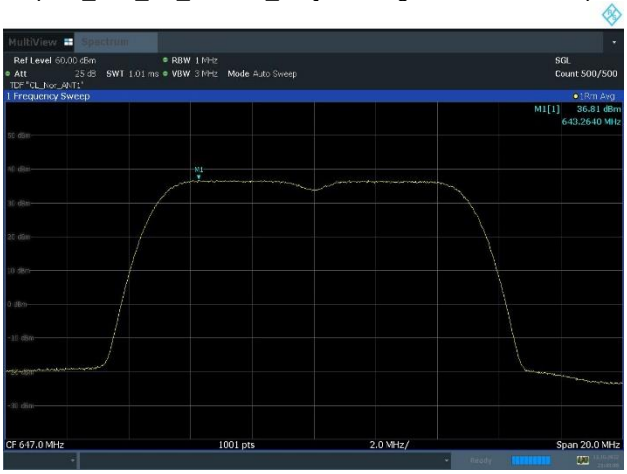
Plot 8-45. Power Spectral Density Plot
(LTE_B71_2C_5M+5M_16QAM - High Channel, Port 2)



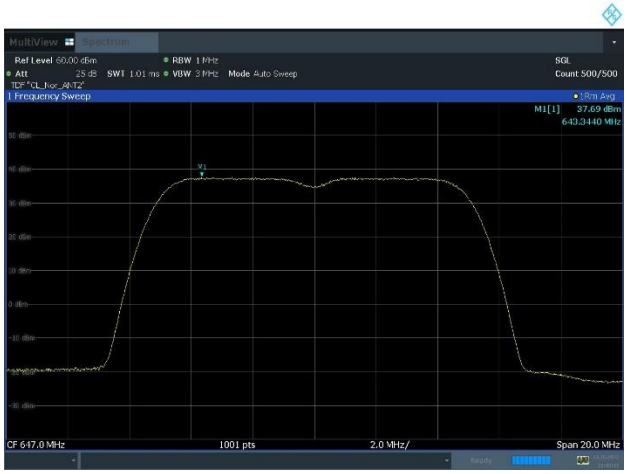
Plot 8-46. Power Spectral Density Plot
(LTE_B71_2C_5M+5M_16QAM - High Channel, Port 3)



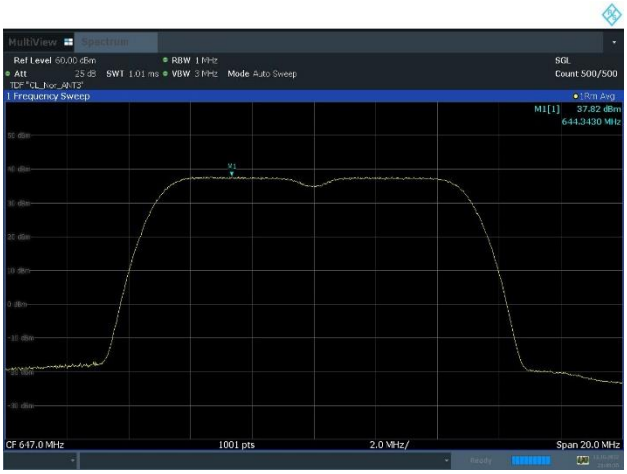
Plot 8-47. Power Spectral Density Plot
(NR_n71_2C_5M+5M_16QAM - High Channel, Port 0)



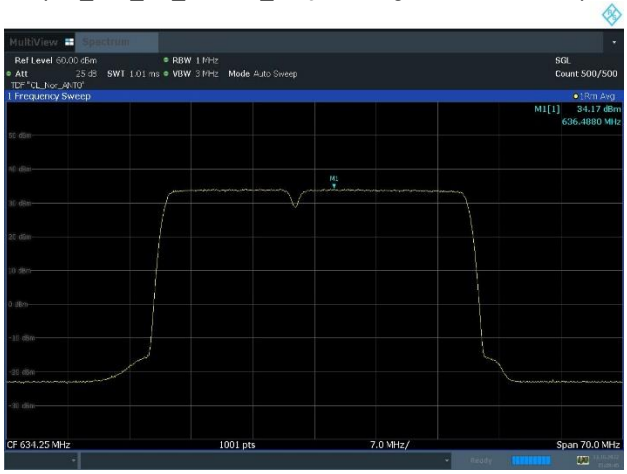
Plot 8-48. Power Spectral Density Plot
(NR_n71_2C_5M+5M_16QAM - High Channel, Port 1)



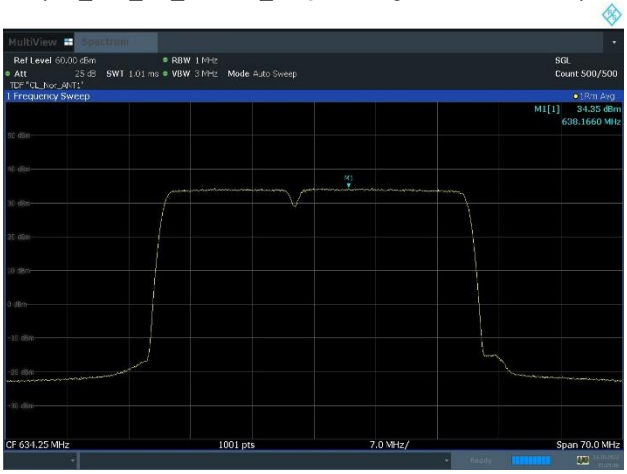
Plot 8-49. Power Spectral Density Plot
(NR_n71_2C_5M+5M_16QAM - High Channel, Port 2)



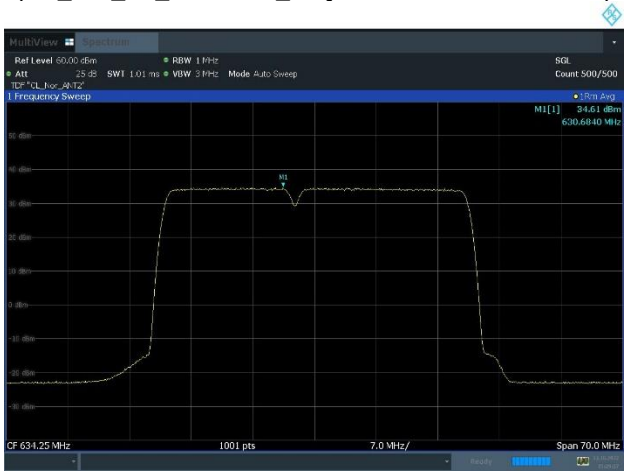
Plot 8-50. Power Spectral Density Plot
(NR_n71_2C_5M+5M_16QAM - High Channel, Port 3)



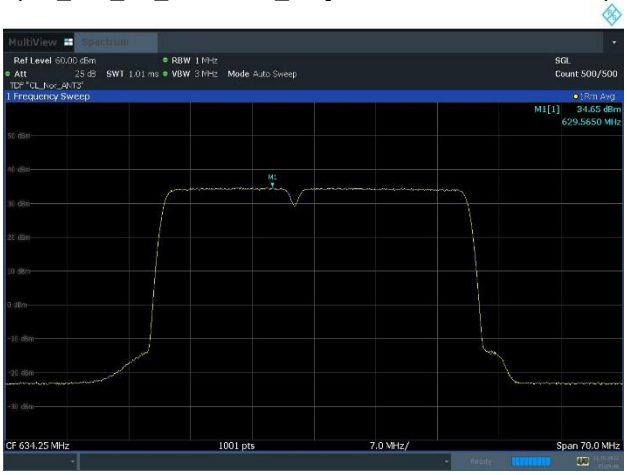
Plot 8-51. Power Spectral Density Plot
(NR_n71_2C_15M+20M_16QAM - Mid Channel, Port 0)



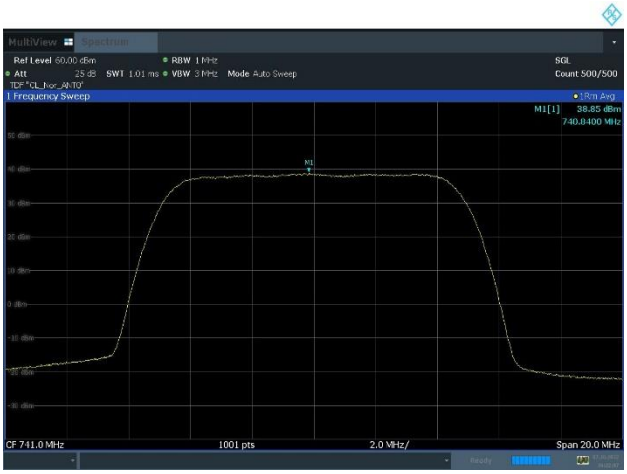
Plot 8-52. Power Spectral Density Plot
(NR_n71_2C_15M+20M_16QAM - Mid Channel, Port 1)



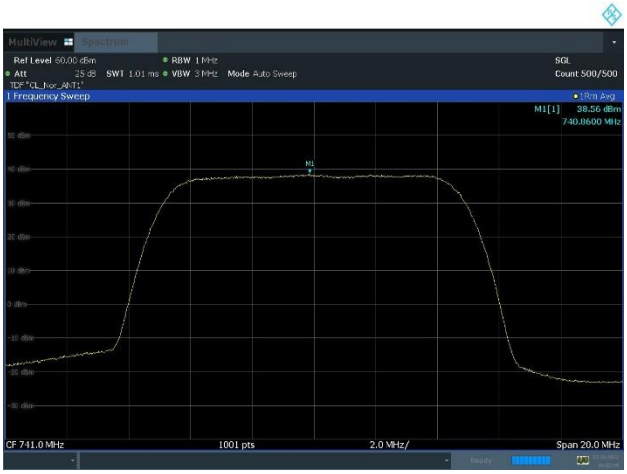
Plot 8-53. Power Spectral Density Plot
(NR_n71_2C_15M+20M_16QAM - Mid Channel, Port 2)



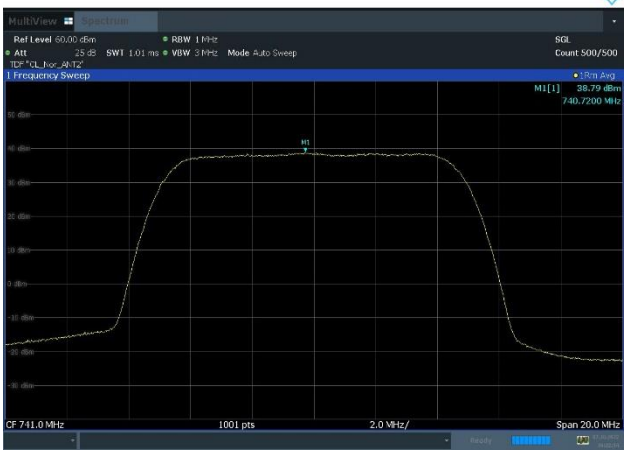
Plot 8-54. Power Spectral Density Plot
(NR_n71_2C_15M+20M_16QAM - Mid Channel, Port 3)



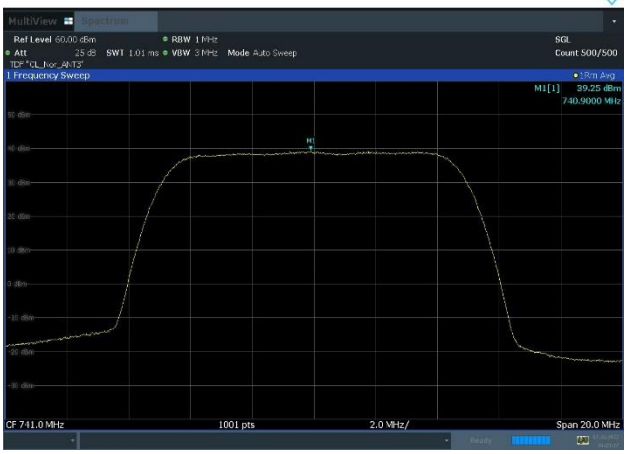
Plot 8-55. Power Spectral Density Plot
(LTE_B85_1C_10M_16QAM - High Channel, Port 0)



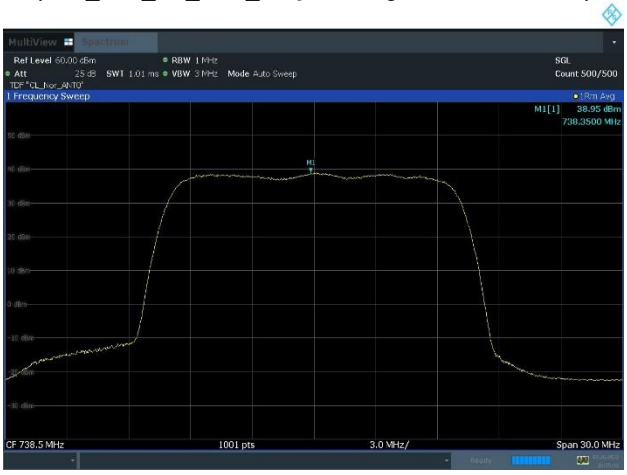
Plot 8-56. Power Spectral Density Plot
(LTE_B85_1C_10M_16QAM - High Channel, Port 1)



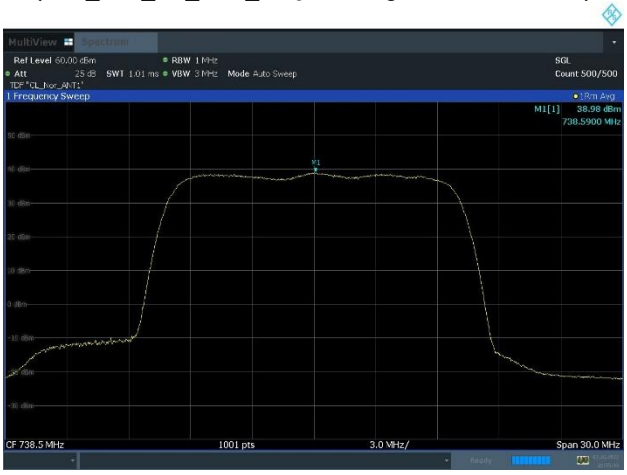
Plot 8-57. Power Spectral Density Plot
(LTE_B85_1C_10M_16QAM - High Channel, Port 2)



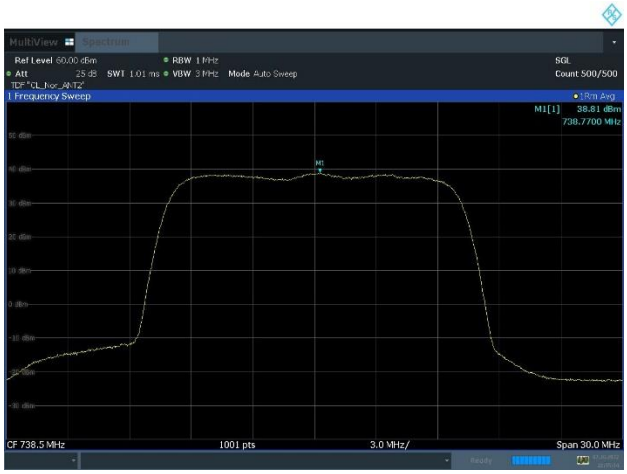
Plot 8-58. Power Spectral Density Plot
(LTE_B85_1C_10M_16QAM - High Channel, Port 3)



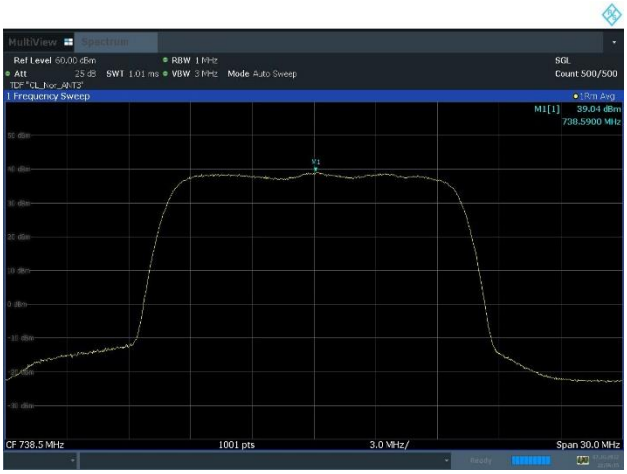
Plot 8-59. Power Spectral Density Plot
(LTE_B85_1C_15M_16QAM - High Channel, Port 0)



Plot 8-60. Power Spectral Density Plot
(LTE_B85_1C_15M_16QAM - High Channel, Port 1)



Plot 8-61. Power Spectral Density Plot
(LTE_B85_1C_15M_16QAM - High Channel, Port 2)



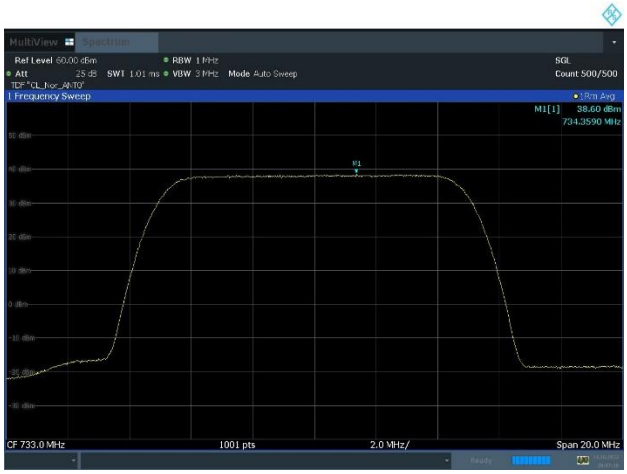
Plot 8-62. Power Spectral Density Plot
(LTE_B85_1C_15M_16QAM - High Channel, Port 3)

Plot 8-63. Power Spectral Density Plot
(NR_n85_1C_5M_256QAM - Low Channel, Port 0)

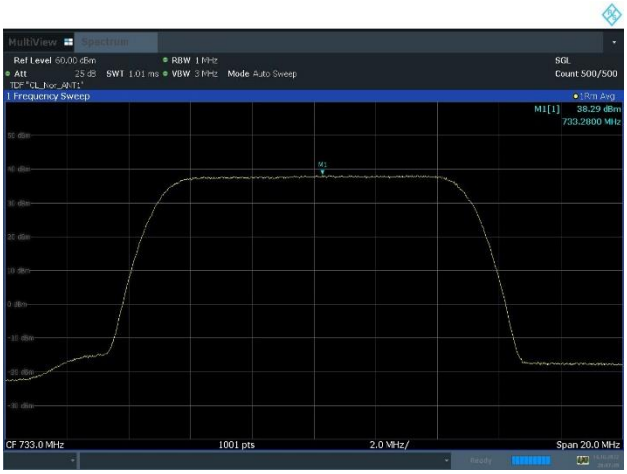
Plot 8-64. Power Spectral Density Plot
(NR_n85_1C_5M_256QAM - Low Channel, Port 1)

Plot 8-65. Power Spectral Density Plot
(NR_n85_1C_5M_256QAM - Low Channel, Port 2)

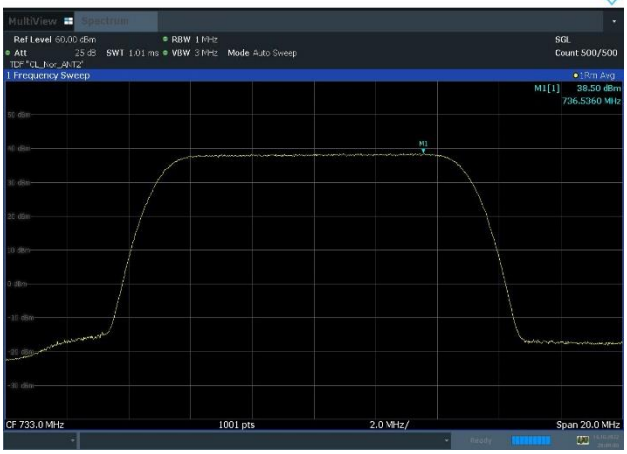
Plot 8-66. Power Spectral Density Plot
(NR_n85_1C_5M_256QAM - Low Channel, Port 3)



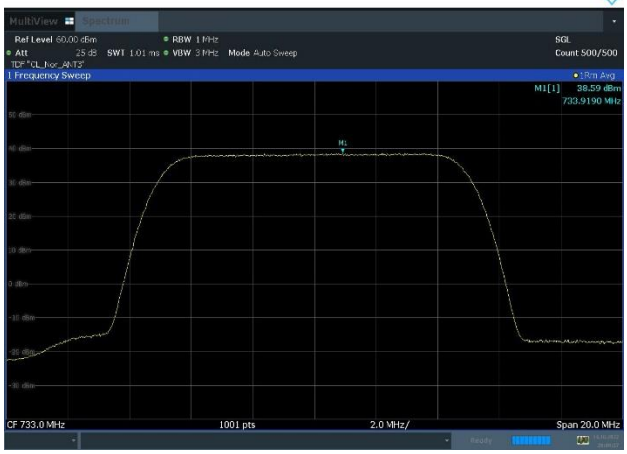
Plot 8-67. Power Spectral Density Plot
(NR_n85_1C_10M_64QAM - Low Channel, Port 0)



Plot 8-68. Power Spectral Density Plot
(NR_n85_1C_10M_64QAM - Low Channel, Port 1)



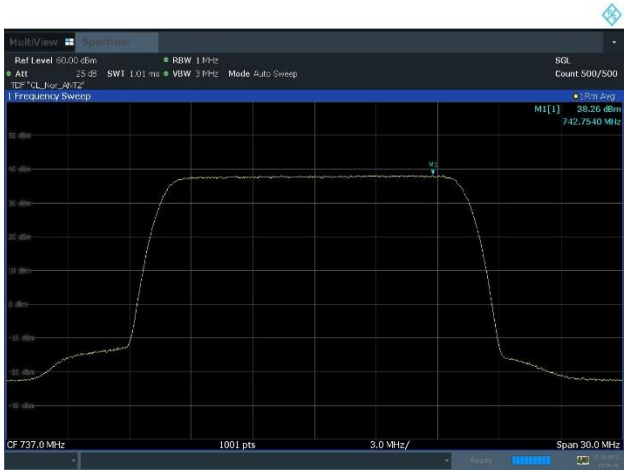
Plot 8-69. Power Spectral Density Plot
(NR_n85_1C_10M_64QAM - Low Channel, Port 2)



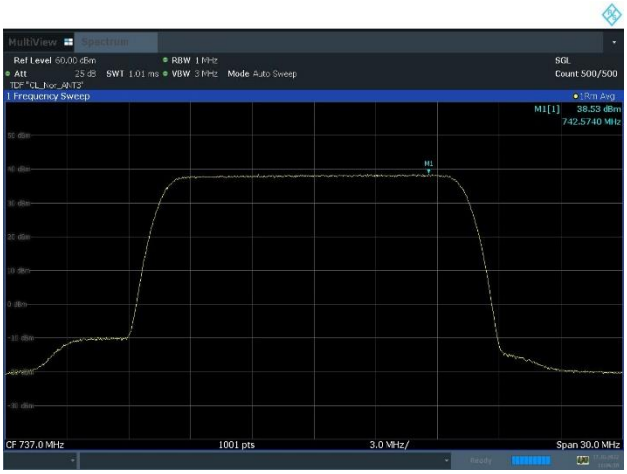
Plot 8-70. Power Spectral Density Plot
(NR_n85_1C_10M_64QAM - Low Channel, Port 3)

Plot 8-71. Power Spectral Density Plot
(NR_n85_1C_15M_64QAM - Mid Channel, Port 0)

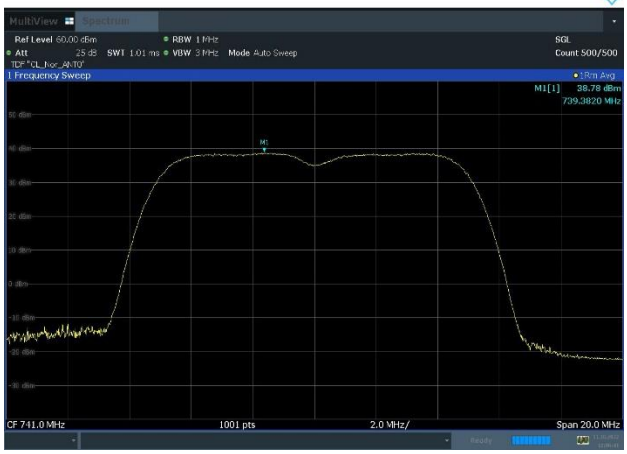
Plot 8-72. Power Spectral Density Plot
(NR_n85_1C_15M_64QAM - Mid Channel, Port 1)



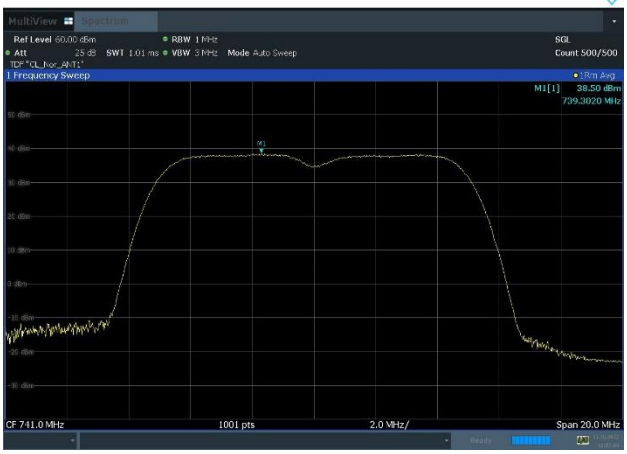
Plot 8-73. Power Spectral Density Plot
(NR_n85_1C_15M_64QAM - Mid Channel, Port 2)



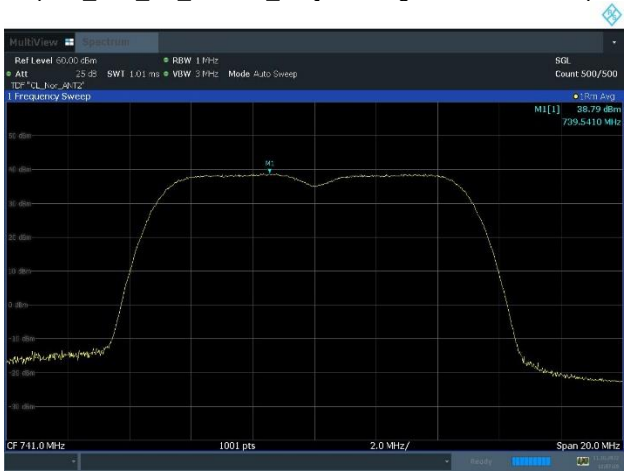
Plot 8-74. Power Spectral Density Plot
(NR_n85_1C_15M_64QAM - Mid Channel, Port 3)



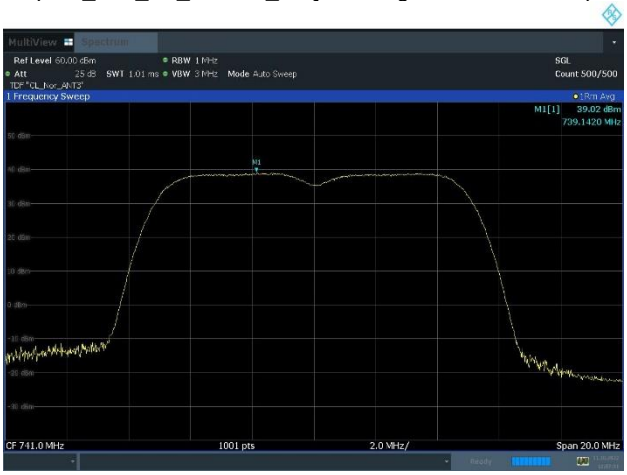
Plot 8-75. Power Spectral Density Plot
(LTE_B85_2C_5M+5M_16QAM - High Channel, Port 0)



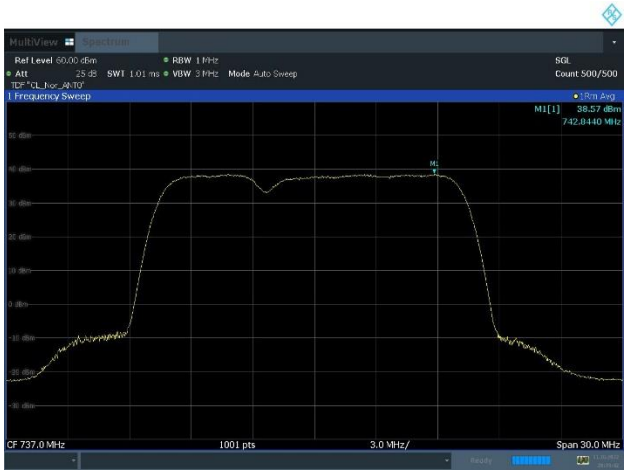
Plot 8-76. Power Spectral Density Plot
(LTE_B85_2C_5M+5M_16QAM - High Channel, Port 1)



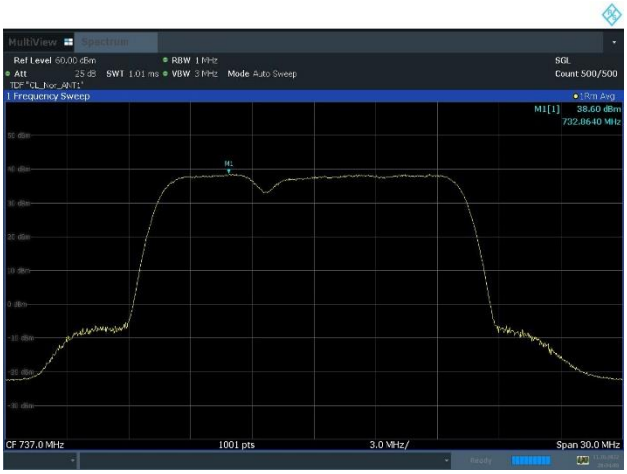
Plot 8-77. Power Spectral Density Plot
(LTE_B85_2C_5M+5M_16QAM - High Channel, Port 2)



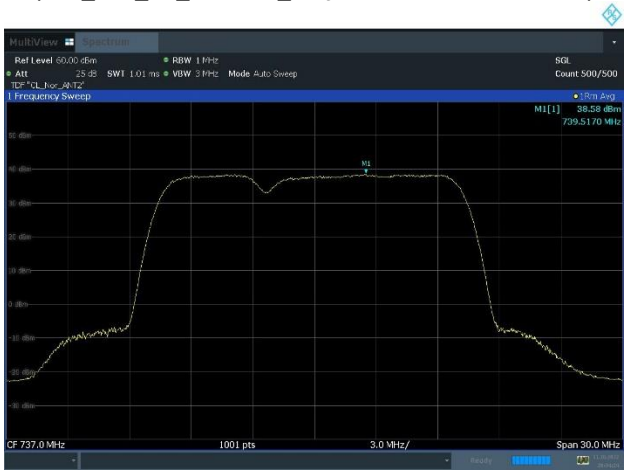
Plot 8-78. Power Spectral Density Plot
(LTE_B85_2C_5M+5M_16QAM - High Channel, Port 3)



Plot 8-79. Power Spectral Density Plot
(LTE_B85_2C_5M+10M_16QAM - Mid Channel, Port 0)

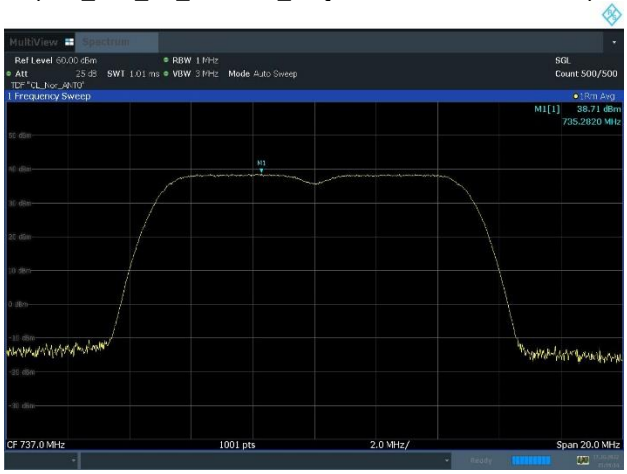


Plot 8-80. Power Spectral Density Plot
(LTE_B85_2C_5M+10M_16QAM – Mid Channel, Port 1)

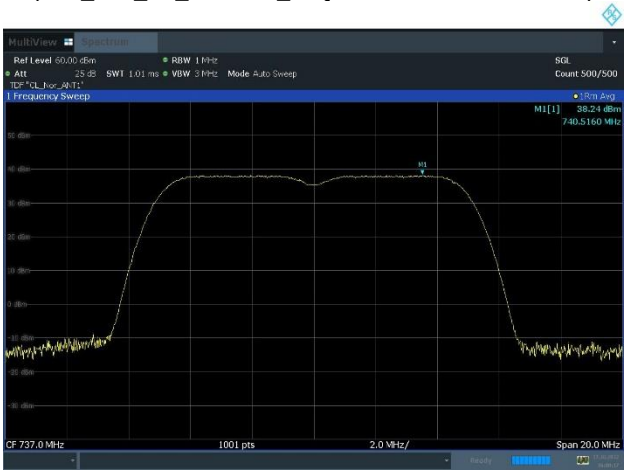


Plot 8-81. Power Spectral Density Plot
(LTE_B85_2C_5M+10M_16QAM - Mid Channel, Port 2)

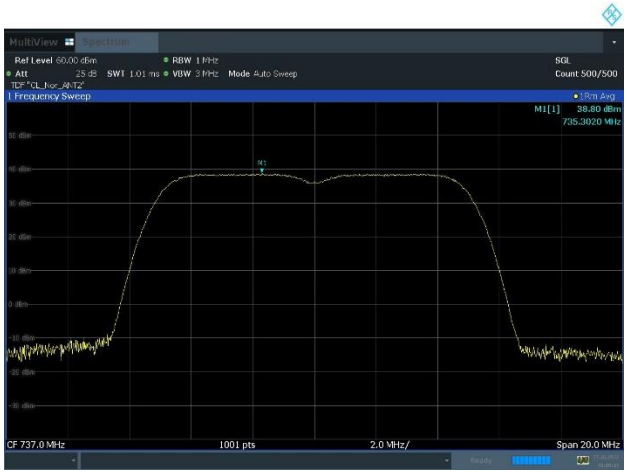
Plot 8-82. Power Spectral Density Plot
(LTE_B85_2C_5M+10M_16QAM - Mid Channel, Port 3)



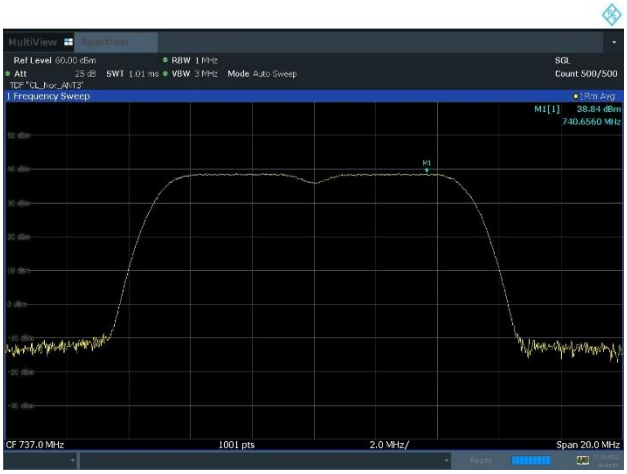
Plot 8-83. Power Spectral Density Plot
(NR_n85_2C_5M+5M_16QAM - Mid Channel, Port 0)



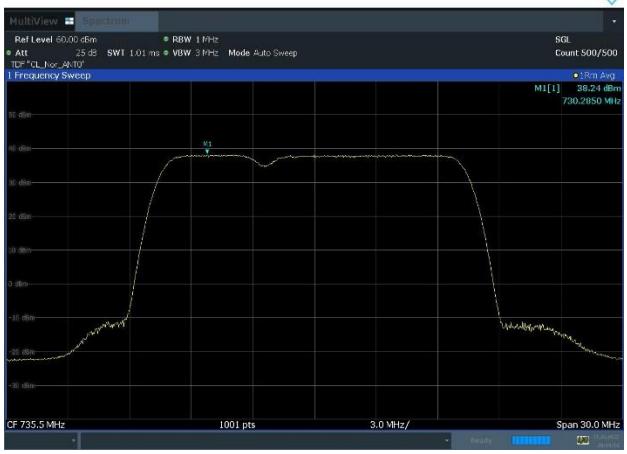
Plot 8-84. Power Spectral Density Plot
(NR_n85_2C_5M+5M_16QAM - Mid Channel, Port 1)



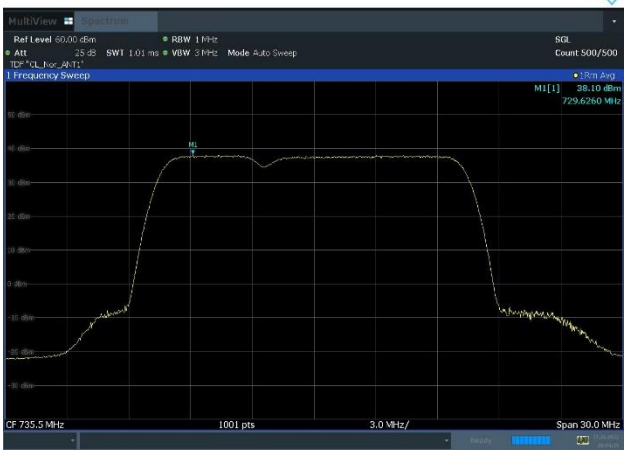
Plot 8-85. Power Spectral Density Plot
(NR_n85_2C_5M+5M_16QAM - Mid Channel, Port 2)



Plot 8-86. Power Spectral Density Plot
(NR_n85_2C_5M+5M_16QAM - Mid Channel, Port 3)



Plot 8-87. Power Spectral Density Plot
(NR_n85_2C_5M+10M_QPSK - Low Channel, Port 0)



Plot 8-88. Power Spectral Density Plot
(NR_n85_2C_5M+10M_QPSK - Low Channel, Port 1)

Plot 8-89. Power Spectral Density Plot
(NR_n85_2C_5M+10M_QPSK - Low Channel, Port 2)

Plot 8-90. Power Spectral Density Plot
(NR_n85_2C_5M+10M_QPSK - Low 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 ≥ 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

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

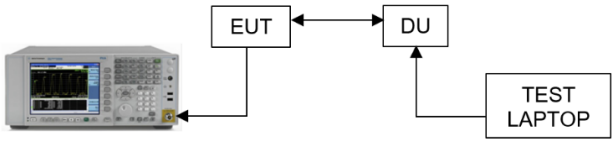


Figure 8-3. Test Instrument & Measurement Setup

Limit

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

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.32	8.30	8.26	8.30	≤ 13
	1	8.30	8.28	8.26	**8.32**	
	2	8.30	8.30	8.24	8.28	
	3	8.30	8.28	8.26	8.30	
Middle	0	**8.34**	8.30	8.24	8.32	
	1	8.32	8.30	8.26	8.28	
	2	8.30	8.30	8.24	8.30	
	3	8.34	8.30	8.26	8.28	
High	0	8.30	8.30	8.26	8.28	
	1	8.28	8.28	8.24	8.30	
	2	8.32	8.30	8.26	8.30	
	3	8.32	8.30	8.26	8.30	

Table 8-26. Peak To Average Power Ratio Summary Data (LTE_B71_1C_5M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.26	8.26	8.30	8.28	≤ 13
	1	**8.30**	8.22	8.24	8.26	
	2	8.28	8.24	8.28	8.26	
	3	8.28	**8.30**	8.30	8.28	
Middle	0	8.28	8.26	8.30	8.26	
	1	8.28	8.30	8.30	8.26	
	2	8.28	8.26	8.28	8.26	
	3	8.24	8.26	8.28	8.24	
High	0	8.26	8.22	8.28	8.24	
	1	8.30	8.22	8.28	8.22	
	2	8.28	8.20	8.24	8.22	
	3	8.24	8.22	8.26	8.20	

Table 8-27. Peak To Average Power Ratio Summary Data (NR_n71_1C_15M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	7.68	7.72	7.68	7.70	≤ 13
	1	7.72	7.74	7.74	7.74	
	2	7.70	7.74	7.68	7.72	
	3	7.68	7.72	7.70	7.70	
Middle	0	7.72	7.74	7.72	7.74	
	1	7.72	7.76	7.74	7.72	
	2	7.72	7.72	7.76	7.74	
	3	7.72	7.72	7.72	7.74	
High	0	**7.92**	7.96	7.92	**7.98**	
	1	7.90	7.92	7.92	7.94	
	2	7.90	7.96	7.90	7.94	
	3	7.90	7.92	7.90	7.94	

Table 8-28. Peak To Average Power Ratio Summary Data (NR_n71_1C_20M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.28	8.24	8.28	8.26	≤ 13
	1	8.24	8.20	8.26	8.20	
	2	8.26	8.22	8.26	8.24	
	3	8.26	8.22	8.30	**8.32**	
Middle	0	8.28	8.28	8.28	8.32	
	1	8.24	8.24	8.26	8.24	
	2	**8.30**	8.26	8.24	8.30	
	3	8.28	8.26	8.26	8.30	
High	0	8.30	8.28	8.26	8.30	
	1	8.26	8.24	8.26	8.22	
	2	8.30	8.26	8.22	8.30	
	3	8.26	8.24	8.26	8.26	

Table 8-29. Peak To Average Power Ratio Summary Data (LTE_B85_1C_10M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	7.64	7.68	7.68	7.70	≤ 13
	1	7.64	7.70	7.62	7.70	
	2	7.62	7.66	7.68	7.68	
	3	7.62	7.66	**7.74**	7.68	
Middle	0	7.62	7.66	7.62	7.68	
	1	**7.68**	7.66	7.62	7.70	
	2	7.60	7.64	7.64	7.64	
	3	7.58	7.66	7.62	7.60	
High	0	7.66	7.66	7.66	7.64	
	1	7.60	7.68	7.66	7.62	
	2	7.64	7.60	7.64	7.64	
	3	7.62	7.58	7.62	7.64	

Table 8-30. Peak To Average Power Ratio Summary Data (LTE_B85_1C_15M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.24	8.26	8.22	8.32	≤ 13
	1	8.24	8.26	8.28	8.22	
	2	8.26	8.28	8.26	**8.34**	
	3	8.24	8.26	8.26	8.22	
Middle	0	**8.30**	8.28	8.26	8.30	
	1	8.26	8.24	8.22	8.22	
	2	8.26	8.26	8.24	8.28	
	3	8.26	8.28	8.24	8.24	
High	0	8.28	8.28	8.22	8.30	
	1	8.26	8.24	8.26	8.30	
	2	8.28	8.24	8.22	8.28	
	3	8.28	8.26	8.30	8.30	

Table 8-31. Peak To Average Power Ratio Summary Data (NR_n85_1C_5M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.18	8.26	8.22	**8.28**	≤ 13
	1	8.14	8.22	8.20	8.24	
	2	8.20	8.24	8.20	8.26	
	3	8.14	8.24	8.20	8.26	
Middle	0	8.22	8.24	8.24	8.28	
	1	8.16	8.24	8.20	8.24	
	2	8.20	8.26	8.22	8.26	
	3	8.18	8.24	8.22	8.26	
High	0	8.22	8.24	8.24	8.28	
	1	8.20	8.24	8.24	8.26	
	2	**8.24**	8.24	8.26	8.28	
	3	8.24	8.24	8.24	8.26	

Table 8-32. Peak To Average Power Ratio Summary Data (NR_n85_1C_10M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	7.66	**7.72**	7.68	7.66	≤ 13
	1	**7.68**	7.62	7.60	7.58	
	2	7.68	7.64	7.66	7.64	
	3	7.66	7.64	7.60	7.60	
Middle	0	7.66	7.64	7.58	7.64	
	1	7.56	7.54	7.58	7.52	
	2	7.60	7.56	7.60	7.60	
	3	7.56	7.54	7.52	7.64	
High	0	7.68	7.60	7.60	7.64	
	1	7.56	7.50	7.52	7.50	
	2	7.64	7.60	7.56	7.58	
	3	7.60	7.52	7.56	7.56	

Table 8-33. Peak To Average Power Ratio Summary Data (NR_n85_1C_15M)

Channel		PAPR (dB)			
	Band	Configuration	QPSK	16QAM	Limit (dB)
Middle	71	LTE_2C_5M + 5M	8.56	8.48	≤ 13
		NR_2C_5M + 5M	8.44	8.48	
		NR_2C_15M + 20M	8.28	8.30	
	85	LTE_2C_5M+5M	8.48	8.42	
		LTE_2C_5M+10M	8.08	8.08	
		NR_2C_5M+5M	8.42	8.48	
		NR_2C_5M+10M	8.16	8.08	

Table 8-34. Peak To Average Power Ratio Summary Data (Multi Carrier)