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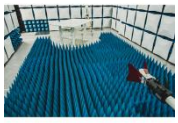

MEASUREMENT REPORT
Part 27

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

Date of Testing:
08/04/2021 - 08/24/2021
Test Site/Location:
PCTEST KOREA Lab. Yongin-si, Gyeonggi-do, Korea
Test Report Serial No.:
8K21061101.A3L

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

Application Type:	Certification
Model:	RF4435d-71A
EUT Type:	RRU (RF4435d)
FCC Rule Part(s):	§2, §27
FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)
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 RSS-Gen. 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.

Prepared by

Reviewed by

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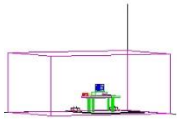
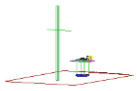


MEASUREMENT REPORT
FCC Part 27



Mode	Band	FCC Rule Part	Tx Frequency (MHz)	Total Power		Emission Designator	Modulation
				Max. Power (W)	Max. Power (dBm)		
B71 LTE 1C 10M	71	27	617 - 652	171.4	52.34	9M01G7D	QPSK
			617 - 652	174.2	52.41	9M02W7D	16QAM
			617 - 652	173.4	52.39	9M03W7D	64QAM
			617 - 652	171.0	52.33	9M03W7D	256QAM
B71 LTE 1C 15M	71	27	617 - 652	252.9	54.03	13M5G7D	QPSK
			617 - 652	249.5	53.97	13M5W7D	16QAM
			617 - 652	252.3	54.02	13M6W7D	64QAM
			617 - 652	247.2	53.93	13M5W7D	256QAM
B71 LTE 1C 20M	71	27	617 - 652	300.6	54.78	18M0G7D	QPSK
			617 - 652	299.9	54.77	18M0W7D	16QAM
			617 - 652	296.5	54.72	18M0W7D	64QAM
			617 - 652	293.1	54.67	18M0W7D	256QAM
B71 LTE 2C 10M+10M	71	27	617 - 652	321.4	55.07	18M9G7D	QPSK
			617 - 652	310.5	54.92	19M0W7D	16QAM
			617 - 652	315.5	54.99	19M0W7D	64QAM
			617 - 652	253.5	54.04	18M9W7D	256QAM
B71 LTE 2C 15M+20M	71	27	617 - 652	301.3	54.79	33M1G7D	QPSK
			617 - 652	304.8	54.84	33M1W7D	16QAM
			617 - 652	302.0	54.80	33M1W7D	64QAM
			617 - 652	297.2	54.73	33M1W7D	256QAM
B85 LTE 1C 5M	85	27	728 - 746	108.6	50.36	4M51G7D	QPSK
			728 - 746	108.1	50.34	4M50W7D	16QAM
			728 - 746	107.2	50.30	4M53W7D	64QAM
			728 - 746	108.9	50.37	4M52W7D	256QAM
B85 NB-IoT(SA) 1C	85	27	728 - 746	22.6	43.55	197KG7D	QPSK
B85 NB-IoT(SA) 2C	85	27	728 - 746	22.1	43.45	384KG7D	QPSK

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 INTRODUCTION

1.1 Scope

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

1.2 PCTEST KOREA Test Location

These measurement tests were conducted at the PCTEST KOREA CO., LTD. facility located at (#1407) 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do 16954, Korea.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST KOREA Lab located in Yongin-si, Gyeonggi, Korea.

- PCTEST KOREA is an ISO 17025:2005 accredited test facility under the National Institute of Standards and Technology (NIST) with Certificate number 600143-0 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for IC and Innovation, Science, and Economic Development Canada rules.

- PCTEST KOREA 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

2.0 PRODUCT INFORMATION

2.1 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.

This device supports the following conditional features:

EUT Type:	RRU (RF4435d)
Model Name:	RF4435d-71A
Test Device Serial No.:	S617601147
Device Capabilities:	LTE FDD, NB-IoT standalone
Operating Band/Frequency Range:	Band / Tx (Downlink) / Rx (Uplink) B71: 617 MHz to 652 MHz / 663 MHz to 698 MHz B85: 728 MHz to 746 MHz / 698 MHz to 716 MHz
Supported Number of Carriers:	Max. 2 carriers for LTE in band 71 Max. 1 carrier for LTE and Max. 2 carriers for NB-IoT standalone in band 85
Supported Modulation:	LTE: QPSK(E-TM 1.1), 16QAM(E-TM 3.2), 64QAM(E-TM 3.1), 256QAM(E-TM 3.1a) NB-IoT standalone: QPSK(N-TM)
Supported Channel Bandwidth:	10MHz, 15MHz, and 20MHz for LTE in band 71 5MHz for LTE and 200kHz for NB-IoT standalone in band 85
Maximum Output Power	80W/path x 4 paths in band 71 30W/path x 4 paths in band 85
Number of Antenna ports	4
Supported Configurations:	Single carrier, Multi-carrier, Dual band operation
Input Voltage:	-48 VDC
Antenna:	The applicant does not provide an antenna.

2.2 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, KDB 971168 D01 v03r01 and KDB 662911 D01 v02r01. See Section 7.0 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:

- B71: Band 71
- B85: Band 85
- 1C: 1 carrier
- NB-IoT(SA): NB-IoT standalone operation
- Conti: Contiguous carriers in multi-carrier operation
- Non-conti: Non-contiguous carriers in multi-carrier operation

B71: 617 MHz to 652 MHz

Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (per a path)
			Lowest	Middle	Highest	
B71 LTE 1C 10M	1	10	622.0	634.5	647.0	40W (46dBm)
B71 LTE 1C 15M	1	15	624.5	634.5	644.5	60W (47.78dBm)
B71 LTE 1C 20M	1	20	627.0	634.5	642.0	80W (49dBm)
B71 LTE 2C 10M+10M Conti	2	10+10	622.0 + 632.0	629.5 + 639.5	637.0 + 647.0	80W (49dBm) (40W+40W)
B71 LTE 2C 10M+10M Non-Conti	2	10+10	622.0 + 647.0			80W (49dBm) (40W+40W)
B71 LTE 2C 15M+20M Conti	2	15+20	624.5 + 642.0			80W (49dBm) (34.29W+45.71W)

B85: 728 MHz to 746 MHz

Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (per a path)
			Lowest	Middle	Highest	
B85 LTE 1C 5M	1	5	730.5	737.0	743.5	26.66W (44.26dBm)
B85 NB-IoT(SA) 1C	1	0.2	728.2	737.0	745.8	5W (37dBm)
B85 NB-IoT(SA) 2C Conti	2	0.2+0.2	728.2 + 728.4	736.9 + 737.1	745.6 + 745.8	5W (37dBm) (2.5W+2.5W)
B85 NB-IoT(SA) 2C Non-conti	2	0.2+0.2	728.2 + 745.8			5W (37dBm) (2.5W+2.5W)
B85 LTE 1C 5M + NB-IoT(SA) 1C Conti	2	5+0.2	730.5 + 733.1	736.9 + 739.5	743.2 + 745.8	30W (44.77dBm) (25W+5W)
B85 LTE 1C 5M + NB-IoT(SA) 1C	2	5+0.2	730.5 + 745.8			30W (44.77dBm) (25W+5W)

Non-conti						
B85 NB-IoT(SA) 1C + LTE 1C 5M Conti	2	0.2+5	728.2 + 730.8	734.4 + 737.0	740.9 + 743.5	30W (44.77dBm) (5W+25W)
B85 NB-IoT(SA) 1C + LTE 1C 5M Non-conti	2	0.2+5	728.2 + 743.5			30W (44.77dBm) (5W+25W)
B85 NB-IoT(SA) 1C + LTE 1C 5M + NB-IoT(SA) 1C Conti	3	0.2+5+0.2	728.2 + 730.8 + 733.4	734.4 + 737.0 + 739.6	740.6 + 743.2 + 745.8	30W (44.77dBm) (2.5W+25W+2.5W)
B85 NB-IoT(SA) 1C + LTE 1C 5M + NB-IoT(SA) 1C Non-conti	3	0.2+5+0.2	728.2 + 737.0 + 745.8			30W (44.77dBm) (2.5W+25W+2.5W)

Dual band opeation_B71 & B85

Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration		Rated Power (per path)
			B71	B85	
Dual Band_71-85 B71 LTE 2C 10M+10M & B85 NB-IoT(SA) 1C + LTE 1C 5M + NB-IoT(SA) 1C	5	10+10+ 5+0.2+0.2	622.0 + 647.0	728.2 + 737.0 + 745.8	55W (47.4dBm) (20W+20W+10W+2.5W+2.5W)
Dual Band _71-85 B71 LTE 2C 15M+20M & B85 NB-IoT(SA) 1C + LTE 1C 5M + NB-IoT(SA) 1C	5	15+20+ 0.2+5+0.2	624.5 + 642.0	728.2 + 737.0 + 745.8	80W (49dBm) 28.12W+37.5W+2.5W+9.37W+2.5W

2.3 EMI Suppression Device(s)/Modifications

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

3.0 DESCRIPTION OF TESTS

3.1 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 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

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
ANSI C63.26-2015 – Section 5.2.4.5

Peak-to-Average Power Ratio:

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

Band 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

3.2 Measurement Software

Test item	Name	Version
Conducted Measurement	Node B automation	1.0

4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacture	Model	Description	Cal Date	Cal interval	Cal Due	Serial Number
KEYSIGHT	N9020B	MXA Signal Analyzer	11/13/2020	Annual	11/12/2021	MY55470135
KEYSIGHT	N9030B	PXA Signal Analyzer	05/11/2021	Annual	05/10/2022	MY57142018
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer	02/22/2021	Annual	02/21/2022	101955
SUKSAN TECHNOLOGY	SE-CT-10	Temperature Chamber	09/17/2020	Annual	09/16/2021	191021
Rohde & Schwarz	TS-SFUNIT-Rx	Shielded Filter Unit	02/19/2021	Annual	02/18/2022	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	07/13/2021	Biennial	07/12/2023	9162-217
Sunol sciences	DRH-118	Horn Antenna	01/12/2021	Biennial	01/11/2023	A060215
RF ONE ELECTRONICS	RFH1840NA250-D	High Power Attenuator	07/07/2021	Annual	07/06/2022	PG0501
RF ONE ELECTRONICS	RFH1840NA250-D	High Power Attenuator	07/07/2021	Annual	07/06/2022	PG0502
WEINSCHEL	290-40-33	High Power Attenuator	07/06/2021	Annual	07/05/2022	CL4563
WEINSCHEL	290-40-33	High Power Attenuator	07/06/2021	Annual	07/05/2022	CL4564
KIKISUI	PWR1201ML	DC POWER SUPPLY	05/25/2021	Annual	05/24/2022	ZL000972

Table 5-1. Test Equipment

Notes:

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

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

3. All testing was perfromed before the calibration due date.

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 197KG7D

Occupied Bandwidth = 197.34 KHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Emission Designator = 13M47G7D

Occupied Bandwidth = 13.47 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 13M47W7D

Occupied Bandwidth = 13.47 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

7.0 TEST RESULTS

7.1 Summary

Company Name: SAMSUNG Electronics Co., Ltd.

FCC ID: A3LRF4435D-71A

FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)

Mode(s): LTE and NB-IoT standalone

FCC Part Section(s)	Test Description	Test Condition	Test Result	Reference
§ 2.1049	Occupied Bandwidth	CONDUCTED	PASS	Section 7.2
§ 2.1046	Conducted Output Power		PASS	Section 7.3
§ 2.1046, § 27.50(c)	Peak-to-average power ratio		PASS	Section 7.5
§ 2.1051, § 27.53(g)	Band Edge Emissions at Antenna Terminal		PASS	Section 7.6
§ 2.1051, § 27.53(g)	Spurious and Harmonic Emissions at Antenna Terminal		PASS	Section 7.7
§ 2.1055, § 27.54	Frequency stability		PASS	Section 7.9
§ 2.1051, § 27.53(g)	Radiated unwanted emission	RADIATED	PASS	Section 7.8

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The correction table was used to account for the losses of the cables and attenuators used to test the EUT at all frequencies of interest.
3) The analyzer plots were all taken with a correction table loaded into the analyzer.
4) 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.
5) This unit was tested while powered by a 48V DC power source.

7.2 Occupied Bandwidth

§ 2.1049

Test Overview

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

Test Procedure Used

ANSI C63.26 - Section 5.4.4
KDB 971168 D01 v0301 - Section 4.3

Test Setting

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

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

Test Setup

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

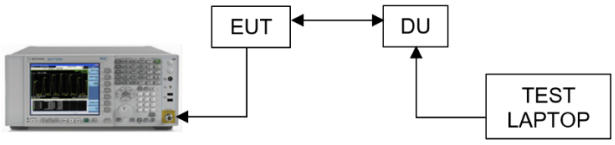


Figure 7-1. Test Instrument & Measurement Setup

Limit

The occupied bandwidth shall not exceed the equipment's channel bandwidth, which is declared by the manufacturer.

Test Notes

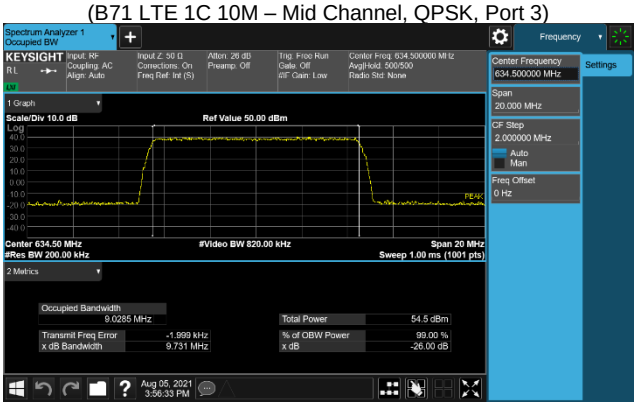
1. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

Ch.	Port #	Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	8.99	9.01	9.01	9.00
	1	9.00	9.00	9.01	9.00
	2	9.00	9.01	9.01	**9.03**
	3	8.99	9.00	8.98	9.00
Middle	0	9.00	8.99	9.01	9.01
	1	8.99	9.00	9.01	9.01
	2	9.00	8.99	9.00	8.98
	3	**9.01**	9.00	**9.03**	8.98
High	0	8.99	9.01	9.00	8.99
	1	8.98	9.00	9.00	9.00
	2	8.99	**9.02**	9.00	9.01
	3	8.99	9.00	9.03	8.99

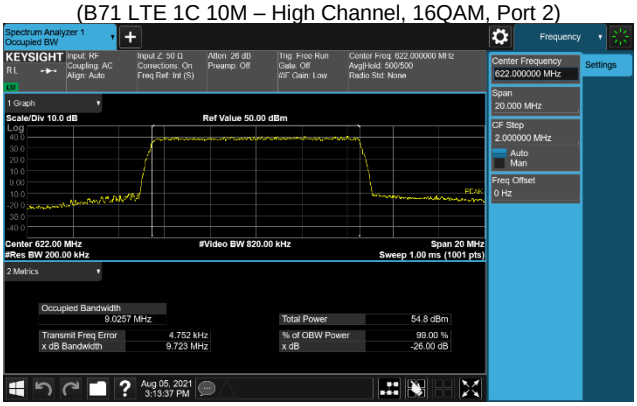
Table 7-2. Occupied Bandwidth Summary Data (B71 LTE 1C 10M)

Plot 7-1. Occupied Bandwidth Plot
(B71 LTE 1C 10M – Mid Channel, QPSK, Port 3)

Plot 7-2. Occupied Bandwidth Plot
(B71 LTE 1C 10M – High Channel, 16QAM, Port 2)



Plot 7-3. Occupied Bandwidth Plot
(B71 LTE 1C 10M – Mid Channel, 64QAM, Port 3)



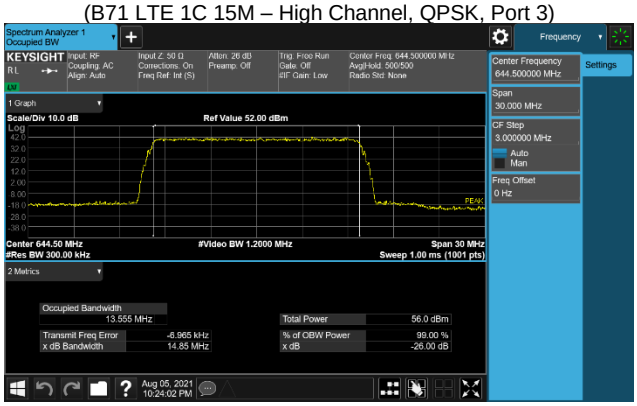
Plot 7-4. Occupied Bandwidth Plot
(B71 LTE 1C 10M – Low Channel, 256QAM, Port 2)

Ch.	Port #	Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	13.49	13.49	13.52	13.48
	1	13.49	13.51	13.52	13.51
	2	13.48	13.52	13.49	13.51
	3	13.50	13.52	13.50	13.50
Middle	0	13.52	13.54	13.50	13.50
	1	13.50	13.53	13.53	13.51
	2	13.50	13.50	13.50	13.48
	3	13.51	13.52	13.54	13.50
High	0	13.48	**13.54**	13.52	13.48
	1	13.50	13.51	13.49	**13.53**
	2	13.49	13.50	13.51	13.48
	3	**13.53**	13.50	**13.55**	13.48

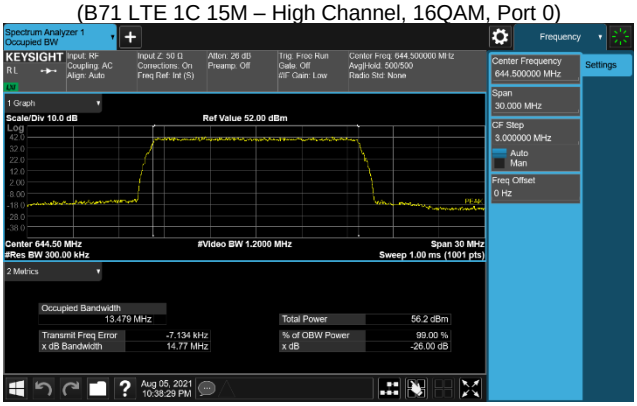
Table 7-3. Occupied Bandwidth Summary Data (B71 LTE 1C 15M)

Plot 7-5. Occupied Bandwidth Plot
(B71 LTE 1C 15M – High Channel, QPSK, Port 3)

Plot 7-6. Occupied Bandwidth Plot
(B71 LTE 1C 15M – High Channel, 16QAM, Port 0)



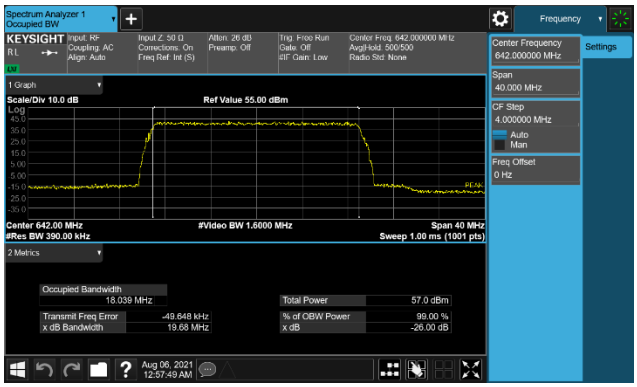
Plot 7-7. Occupied Bandwidth Plot
(B71 LTE 1C 15M – High Channel, 64QAM, Port 3)



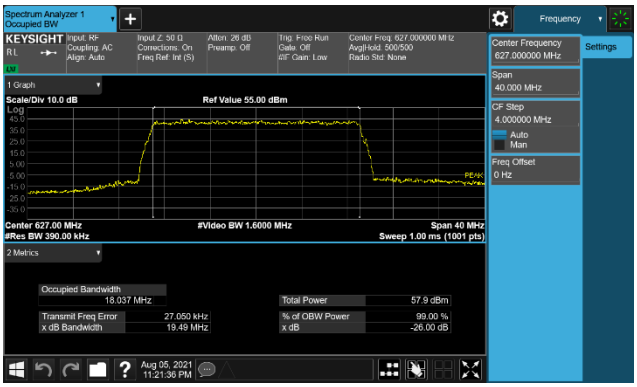
Plot 7-8. Occupied Bandwidth Plot
(B71 LTE 1C 15M – High Channel, 256QAM, Port 2)

Ch.	Port #	Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	18.03	18.02	17.96	17.98
	1	17.96	**18.04**	17.99	18.01
	2	17.98	17.97	17.98	18.01
	3	18.00	17.98	**18.00**	18.00
Middle	0	17.98	17.96	17.99	17.96
	1	17.99	18.02	17.99	**18.02**
	2	17.97	17.99	18.00	17.99
	3	17.98	18.01	17.97	18.00
High	0	18.02	17.95	17.98	17.99
	1	**18.04**	17.96	17.98	17.99
	2	17.95	18.02	18.00	17.99
	3	18.00	17.95	17.97	17.99

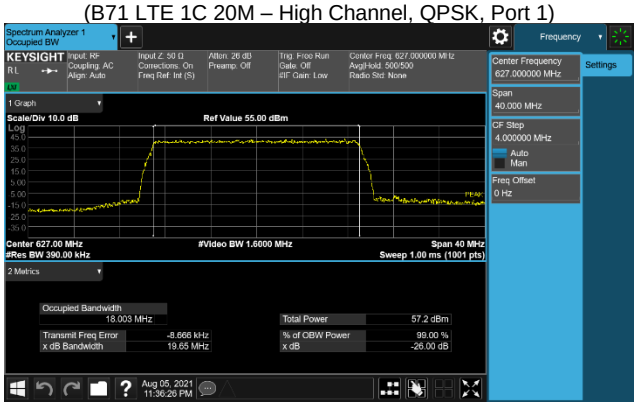
Table 7-4. Occupied Bandwidth Summary Data (B71 LTE 1C 20M)



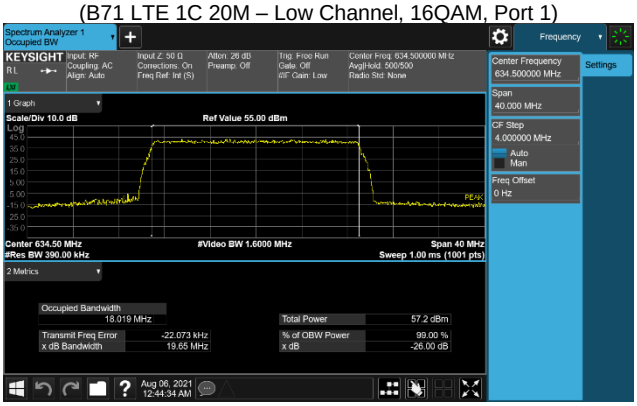
Plot 7-9. Occupied Bandwidth Plot
(B71 LTE 1C 20M – High Channel, QPSK, Port 1)



Plot 7-10. Occupied Bandwidth Plot
(B71 LTE 1C 20M – Low Channel, 16QAM, Port 1)



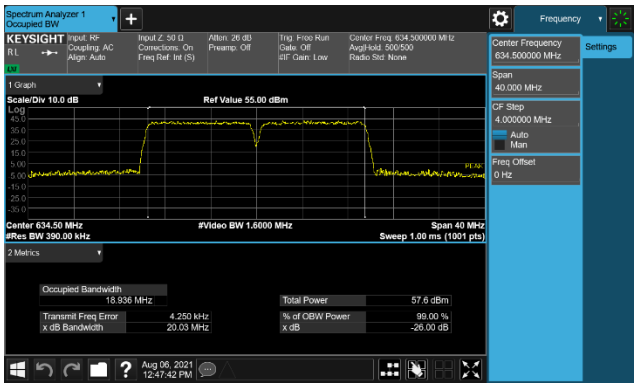
Plot 7-11. Occupied Bandwidth Plot
(B71 LTE 1C 20M – Low Channel, 64QAM, Port 3)



Plot 7-12. Occupied Bandwidth Plot
(B71 LTE 1C 20M – Mid Channel, 256QAM, Port 1)

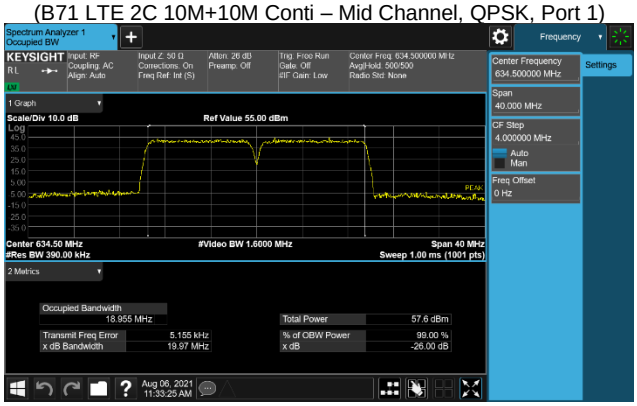
Ch.	Port #	Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	18.93	18.93	18.92	18.92
	1	18.92	18.92	18.93	18.91
	2	18.89	18.94	18.93	18.94
	3	18.94	18.91	18.93	18.91
Middle	0	18.92	18.91	18.94	18.90
	1	**18.94**	**18.96**	**18.95**	18.92
	2	18.94	18.93	18.94	**18.94**
	3	18.91	18.93	18.92	18.94
High	0	18.94	18.91	18.92	18.90
	1	18.91	18.90	18.93	18.91
	2	18.93	18.91	18.95	18.90
	3	18.92	18.95	18.92	18.92

Table 7-5. Occupied Bandwidth Summary Data (B71 LTE 2C 10M+10M Conti)

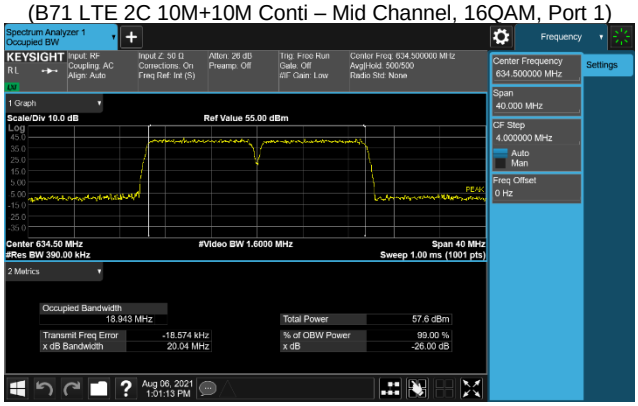


Plot 7-13. Occupied Bandwidth Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, QPSK, Port 1)

Plot 7-14. Occupied Bandwidth Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, 16QAM, Port 1)



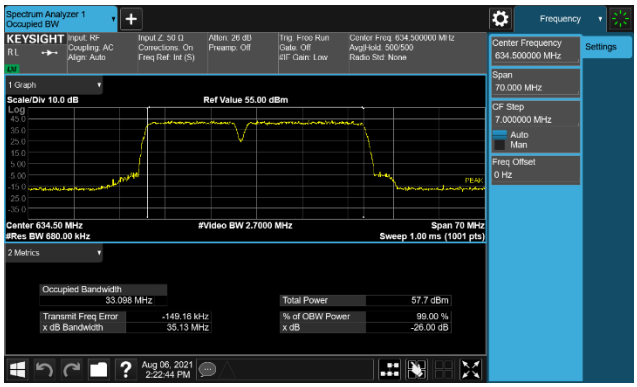
Plot 7-15. Occupied Bandwidth Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, 64QAM, Port 1)



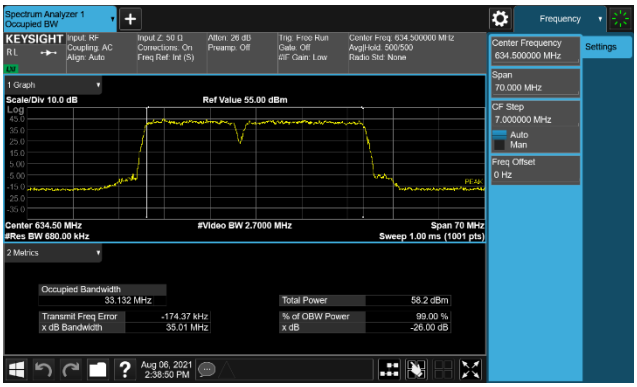
Plot 7-16. Occupied Bandwidth Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, 256QAM, Port 2)

Port #	Occupied Bandwidth (MHz)			
	QPSK	16QAM	64QAM	256QAM
0	**33.10**	33.12	33.12	33.08
1	33.06	33.09	33.13	**33.12**
2	33.09	**33.13**	**33.14**	33.05
3	33.07	33.11	33.10	33.09

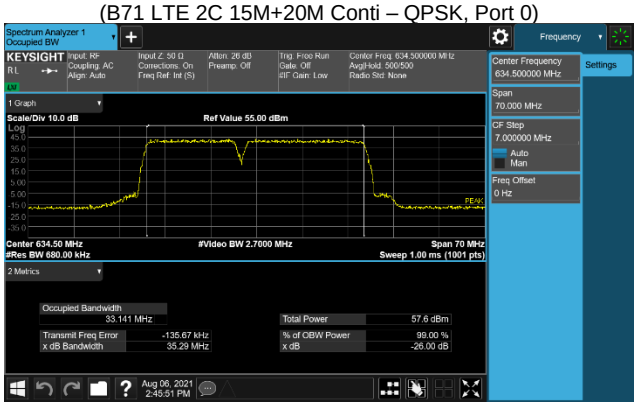
Table 7-6. Occupied Bandwidth Summary Data (B71 LTE 2C 15M+20M Conti)



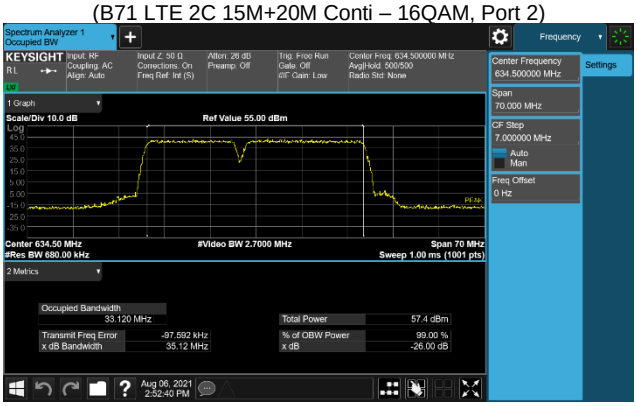
Plot 7-17. Occupied Bandwidth Plot
(B71 LTE 2C 15M+20M Conti – QPSK, Port 0)



Plot 7-18. Occupied Bandwidth Plot
(B71 LTE 2C 15M+20M Conti – 16QAM, Port 2)



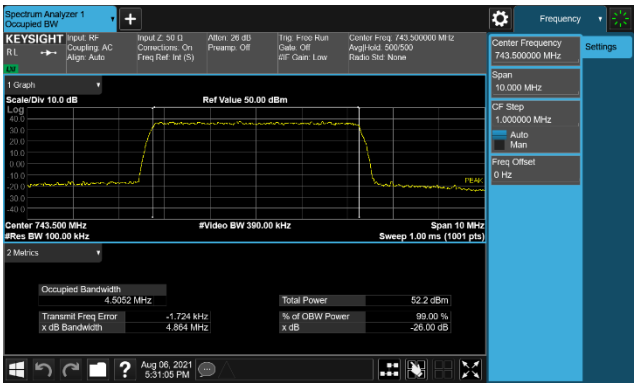
Plot 7-19. Occupied Bandwidth Plot
(B71 LTE 2C 15M+20M Conti – 64QAM, Port 2)



Plot 7-20. Occupied Bandwidth Plot
(B71 LTE 2C 15M+20M Conti – 256QAM, Port 1)

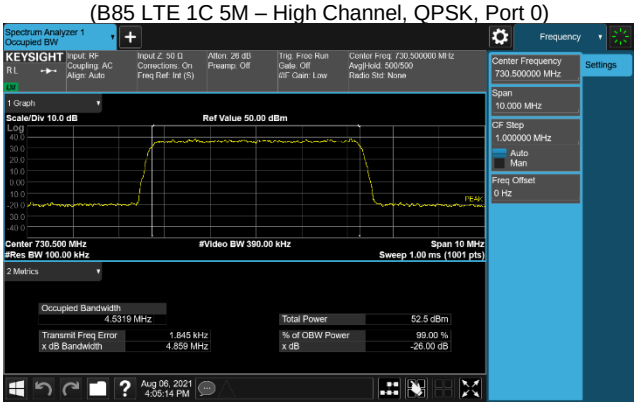
Ch.	Port #	Occupied Bandwidth (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	4.50	4.50	**4.53**	4.51
	1	4.50	4.49	4.53	4.51
	2	4.50	4.50	4.51	4.51
	3	4.50	4.49	4.51	4.51
Middle	0	4.49	4.49	4.51	4.52
	1	4.50	4.49	4.53	4.51
	2	4.49	4.49	4.51	4.51
	3	4.49	4.50	4.50	**4.52**
High	0	**4.51**	**4.50**	4.52	4.51
	1	4.50	4.50	4.51	4.51
	2	4.50	4.48	4.50	4.51
	3	4.50	4.50	4.51	4.51

Table 7-7. Occupied Bandwidth Summary Data (B85 LTE 1C 5M)

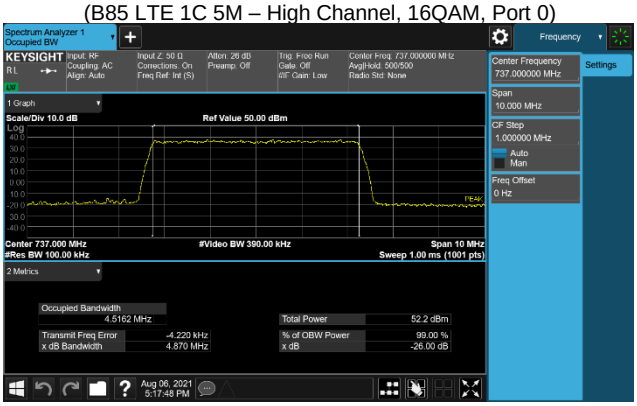


Plot 7-21. Occupied Bandwidth Plot
(B85 LTE 1C 5M – High Channel, QPSK, Port 0)

Plot 7-22. Occupied Bandwidth Plot
(B85 LTE 1C 5M – High Channel, 16QAM, Port 0)



Plot 7-23. Occupied Bandwidth Plot
(B85 LTE 1C 5M – Low Channel, 64QAM, Port 0)



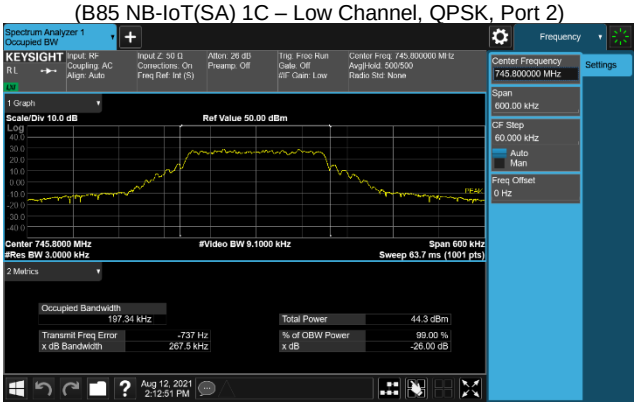
Plot 7-24. Occupied Bandwidth Plot
(B85 LTE 1C 5M – Mid Channel, 256QAM, Port 3)

Ch.	Port #	Occupied Bandwidth (kHz)
		QPSK
Low	0	196.26
	1	196.35
	2	**196.66**
	3	196.47
Middle	0	**196.78**
	1	196.30
	2	196.50
	3	196.40
High	0	**197.34**
	1	196.70
	2	196.40
	3	196.52

Table 7-8. Occupied Bandwidth Summary Data (B85 NB-IoT(SA) 1C)

Plot 7-25. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 1C – Low Channel, QPSK, Port 2)

Plot 7-26. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 1C – Mid Channel, QPSK, Port 0)



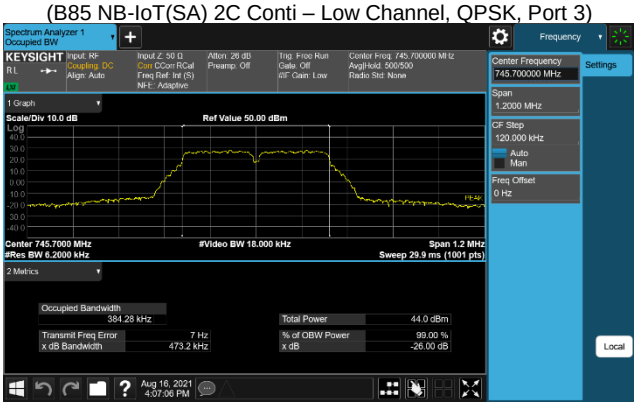
Plot 7-27. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 1C – High Channel, QPSK, Port 0)

Ch.	Port #	Occupied Bandwidth (kHz)
		QPSK
Low	0	384.12
	1	384.12
	2	384.08
	3	**384.31**
Middle	0	384.03
	1	384.15
	2	**384.33**
	3	384.28
High	0	384.07
	1	384.06
	2	384.18
	3	**384.28**

Table 7-9. Occupied Bandwidth Summary Data (B85 NB-IoT(SA) 2C Conti)

Plot 7-28. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 2C Conti – Low Channel, QPSK, Port 3)

Plot 7-29. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 2C Conti – Mid Channel, QPSK, Port 2)



Plot 7-30. Occupied Bandwidth Plot
(B85 NB-IoT(SA) 2C Conti – High Channel, QPSK, Port 3)

7.3 Conducted Output Power

§ 2.1046

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
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4.4.1

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 1CC and 40MHz for 2CC 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.

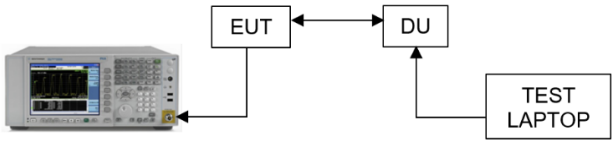


Figure 7-2. Test Instrument & Measurement Setup

Limit

N/A

Test Notes

1. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.
2. Consider the following factors for MIMO:
   The output power per each port is meausred 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 calcuations.
4. All transmit signals from different antennas are completely uncorrelated with eath other. So the maimum output power shall be calculated based on the aggregate power conducted across all antennas.
5. Sample Calculation:
   Let us assume the following numbers:
   a) Total MIMO Conducted Power as 21436.53 milliWatts/1MHz

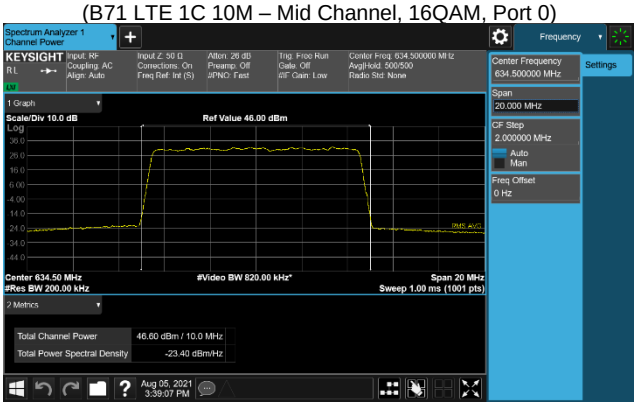
Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		21436.53	mW/1MHz
Summed MIMO Conducted Power (dBm)	= 10 * log (21436.53) =	43.31	dBm/1MHz

Ch.	Port #	Conducted Output Power (dBm)			
		QPSK	16QAM	64QAM	256QAM
Low	0	46.19	46.25	46.20	46.13
	1	46.11	46.09	46.10	45.98
	2	46.37	46.32	46.27	46.27
	3	46.14	46.13	46.02	46.05
Total MIMO Conducted Power (mW)		166889.06	166689.25	164783.74	163284.21
Total MIMO Conducted Power (dBm)		52.22	52.22	52.17	52.13
Middle	0	46.34	**46.39**	46.38	46.29
	1	46.25	**46.31**	46.30	46.22
	2	46.47	**46.60**	46.52	46.46
	3	46.21	**46.26**	46.26	46.28
Total MIMO Conducted Power (mW)		171366.21	**174283.16**	173250.37	171159.99
Total MIMO Conducted Power (dBm)		52.34	**52.41**	52.39	52.33
High	0	46.21	46.22	46.21	46.21
	1	46.13	46.08	46.04	46.03
	2	46.34	46.32	46.42	46.41
	3	46.07	46.13	46.09	46.10
Total MIMO Conducted Power (mW)		166313.70	166305.47	166459.52	166359.95
Total MIMO Conducted Power (dBm)		52.21	52.21	52.21	52.21

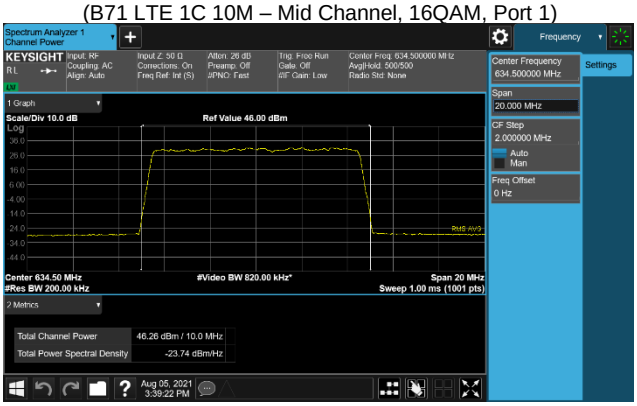
Table 7-10. Conducted Average Output Power Summary Data (B71 LTE 1C 10M)

Plot 7-31. Conducted Average Output Power Plot
(B71 LTE 1C 10M – Mid Channel, 16QAM, Port 0)

Plot 7-32. Conducted Average Output Power Plot
(B71 LTE 1C 10M – Mid Channel, 16QAM, Port 1)



Plot 7-33. Conducted Average Output Power Plot
(B71 LTE 1C 10M – Mid Channel, 16QAM, Port 2)



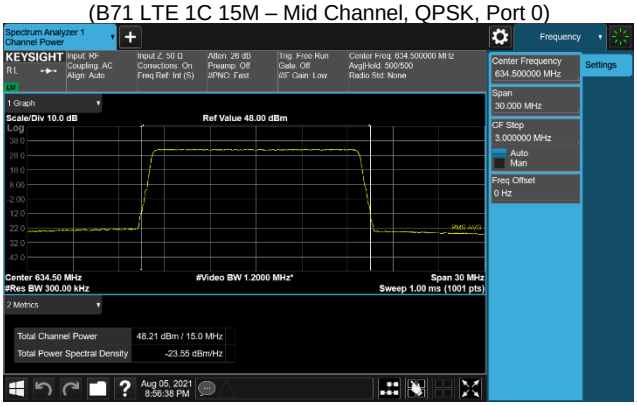
Plot 7-34. Conducted Average Output Power Plot
(B71 LTE 1C 10M – Mid Channel, 16QAM, Port 3)

Ch.	Port #	Conducted Output Power (dBm)			
		QPSK	16QAM	64QAM	256QAM
Low	0	47.88	47.93	47.92	47.96
	1	47.62	47.67	47.76	47.75
	2	47.88	47.95	47.89	47.86
	3	47.80	47.86	47.96	47.77
Total MIMO Conducted Power (mW)		240817.96	244033.60	245682.59	243018.85
Total MIMO Conducted Power (dBm)		53.82	53.87	53.90	53.86
Middle	0	**47.98**	48.00	48.05	48.00
	1	**47.95**	47.88	48.00	47.88
	2	**48.21**	48.09	48.08	48.00
	3	**47.90**	47.82	47.86	47.74
Total MIMO Conducted Power (mW)		**253060.47**	249422.95	252285.06	246996.89
Total MIMO Conducted Power (dBm)		**54.03**	53.97	54.02	53.93
High	0	47.89	47.76	47.85	47.85
	1	47.75	47.74	47.66	47.62
	2	47.66	47.73	47.73	47.72
	3	47.65	47.67	47.61	47.60
Total MIMO Conducted Power (mW)		237638.73	236904.29	236267.38	235463.45
Total MIMO Conducted Power (dBm)		53.76	53.75	53.73	53.72

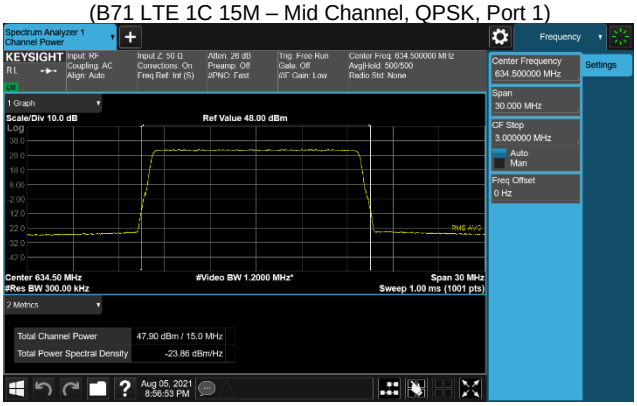
Table 7-11. Conducted Average Output Power Summary Data (B71 LTE 1C 15M)

Plot 7-35. Conducted Average Output Power Plot
(B71 LTE 1C 15M – Mid Channel, QPSK, Port 0)

Plot 7-36. Conducted Average Output Power Plot
(B71 LTE 1C 15M – Mid Channel, QPSK, Port 1)



Plot 7-37. Conducted Average Output Power Plot
(B71 LTE 1C 15M – Mid Channel, QPSK, Port 2)



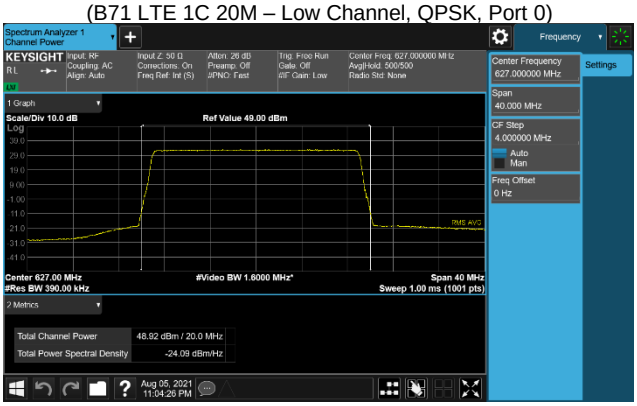
Plot 7-38. Conducted Average Output Power Plot
(B71 LTE 1C 15M – Mid Channel, QPSK, Port 3)

Ch.	Port #	Conducted Output Power (dBm)			
		QPSK	16QAM	64QAM	256QAM
Low	0	**48.75**	48.78	48.69	48.72
	1	**48.66**	48.70	48.68	48.57
	2	**48.92**	48.82	48.65	48.55
	3	**48.70**	48.71	48.62	48.47
Total MIMO Conducted Power (mW)		**300554.84**	300150.06	293811.38	288339.67
Total MIMO Conducted Power (dBm)		**54.78**	54.77	54.68	54.60
Middle	0	48.80	48.74	48.79	48.79
	1	48.68	48.69	48.77	48.72
	2	48.74	48.66	48.65	48.58
	3	48.63	48.46	48.59	48.52
Total MIMO Conducted Power (mW)		297410.88	292374.39	296578.28	293388.59
Total MIMO Conducted Power (dBm)		54.73	54.66	54.72	54.67
High	0	48.60	48.67	48.56	48.57
	1	48.51	48.59	48.48	48.52
	2	48.47	48.33	48.42	48.48
	3	48.36	48.20	48.41	48.36
Total MIMO Conducted Power (mW)		282257.43	280043.97	281093.75	282084.38
Total MIMO Conducted Power (dBm)		54.51	54.47	54.49	54.50

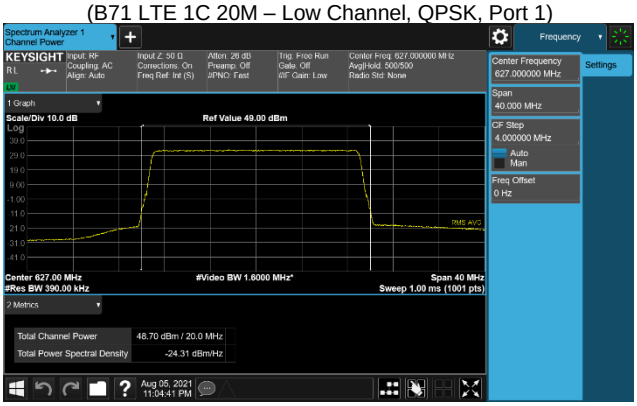
Table 7-12. Conducted Average Output Power Summary Data (B71 LTE 1C 20M)

Plot 7-39. Conducted Average Output Power Plot
(B71 LTE 1C 20M – Low Channel, QPSK, Port 0)

Plot 7-40. Conducted Average Output Power Plot
(B71 LTE 1C 20M – Low Channel, QPSK, Port 1)



Plot 7-41. Conducted Average Output Power Plot
(B71 LTE 1C 20M – Low Channel, QPSK, Port 2)



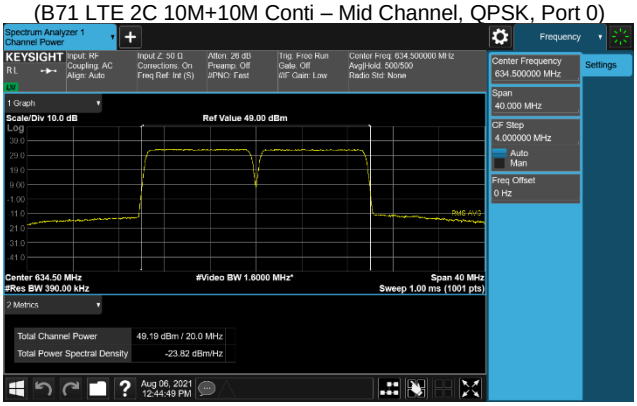
Plot 7-42. Conducted Average Output Power Plot
(B71 LTE 1C 20M – Low Channel, QPSK, Port 3)

Ch.	Port #	Conducted Output Power (dBm)			
		QPSK	16QAM	64QAM	256QAM
Low	0	49.05	48.87	48.97	49.08
	1	48.83	48.75	48.89	48.90
	2	49.01	49.03	49.03	49.11
	3	48.85	48.92	48.98	48.99
Total MIMO Conducted Power (mW)		313088.27	310046.20	315383.48	319254.86
Total MIMO Conducted Power (dBm)		54.96	54.91	54.99	55.04
Middle	0	**49.02**	48.99	49.04	49.03
	1	**48.94**	48.85	48.84	48.94
	2	**49.19**	48.91	48.95	48.98
	3	**49.06**	48.86	48.94	49.07
Total MIMO Conducted Power (mW)		**321665.35**	310702.98	313593.99	318117.76
Total MIMO Conducted Power (dBm)		**55.07**	54.92	54.96	55.03
High	0	49.00	48.92	48.93	49.00
	1	48.79	48.77	48.74	48.83
	2	49.02	48.88	48.87	48.90
	3	48.87	48.72	48.85	48.82
Total MIMO Conducted Power (mW)		312005.93	305059.82	306806.23	309649.01
Total MIMO Conducted Power (dBm)		54.94	54.84	54.87	54.91

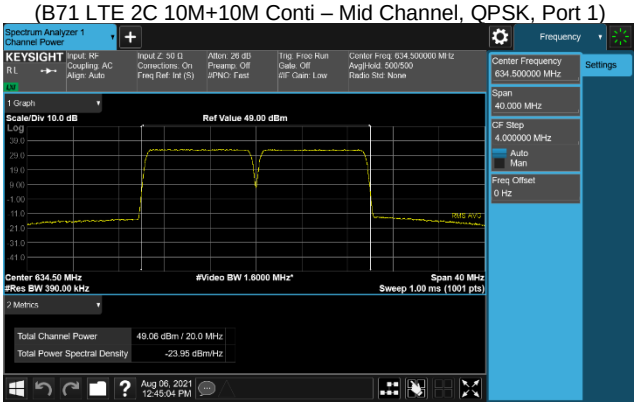
Table 7-13. Conducted Average Output Power Summary Data (B71 LTE 2C 10M+10M Conti)

Plot 7-43. Conducted Average Output Power Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, QPSK, Port 0)

Plot 7-44. Conducted Average Output Power Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, QPSK, Port 1)



Plot 7-45. Conducted Average Output Power Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, QPSK, Port 2)



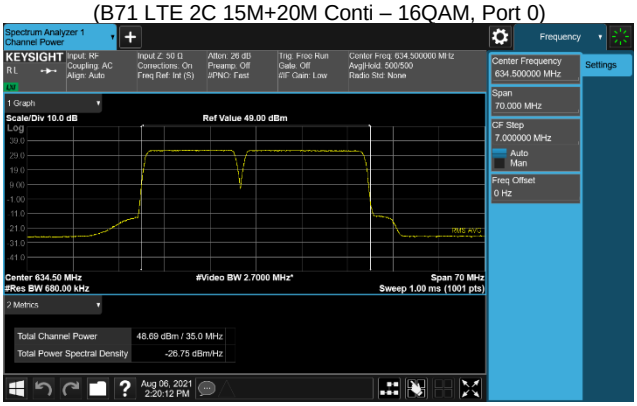
Plot 7-46. Conducted Average Output Power Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, QPSK, Port 3)

Port #	Conducted Output Power (dBm)			
	QPSK	16QAM	64QAM	256QAM
0	48.88	**48.88**	48.85	48.78
1	48.75	**48.74**	48.71	48.64
2	48.69	**48.81**	48.74	48.69
3	48.77	**48.86**	48.81	48.72
Total MIMO Conducted Power (mW)	301553.56	**305030.68**	301887.64	297056.86
Total MIMO Conducted Power (dBm)	54.79	**54.84**	54.80	54.73

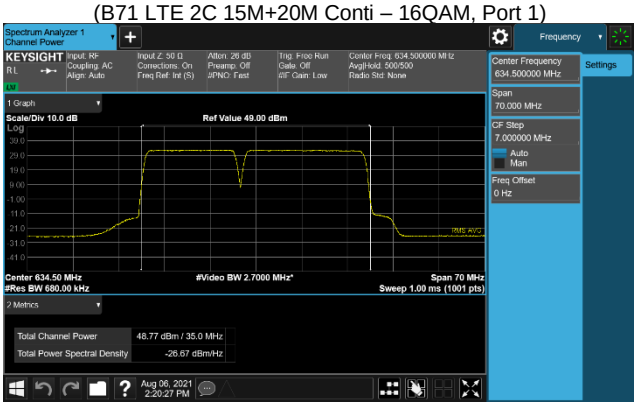
Table 7-14. Conducted Average Output Power Summary Data (B71 LTE 2C 15M+20M Conti)

Plot 7-47. Conducted Average Output Power Plot
(B71 LTE 2C 15M+20M Conti – 16QAM, Port 0)

Plot 7-48. Conducted Average Output Power Plot
(B71 LTE 2C 15M+20M Conti – 16QAM, Port 1)



Plot 7-49. Conducted Average Output Power Plot
(B71 LTE 2C 15M+20M Conti – 16QAM, Port 2)



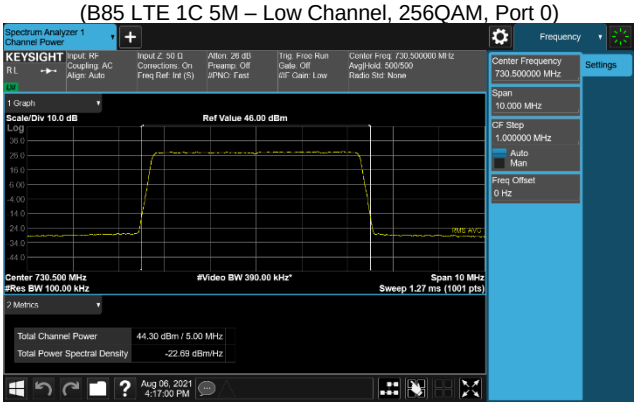
Plot 7-50. Conducted Average Output Power Plot
(B71 LTE 2C 15M+20M Conti – 16QAM, Port 3)

Ch.	Port #	Conducted Output Power (dBm)			
		QPSK	16QAM	64QAM	256QAM
Low	0	44.34	44.46	44.38	**44.43**
	1	44.23	44.23	44.26	**44.33**
	2	44.27	44.22	44.24	**44.30**
	3	44.22	44.27	44.25	**44.32**
Total MIMO Conducted Power (mW)		106803.55	107564.59	107237.63	**108790.05**
Total MIMO Conducted Power (dBm)		50.29	50.32	50.30	**50.37**
Middle	0	44.48	44.48	44.44	44.38
	1	44.28	44.32	44.18	44.22
	2	44.18	44.21	44.16	44.21
	3	44.25	44.27	44.23	44.23
Total MIMO Conducted Power (mW)		107635.10	108187.30	106525.50	106688.14
Total MIMO Conducted Power (dBm)		50.32	50.34	50.27	50.28
High	0	44.40	44.29	44.27	44.32
	1	44.34	44.28	44.34	44.25
	2	44.30	44.17	44.20	44.27
	3	44.31	44.38	44.25	44.27
Total MIMO Conducted Power (mW)		108599.42	107182.48	106804.39	107106.96
Total MIMO Conducted Power (dBm)		50.36	50.30	50.29	50.30

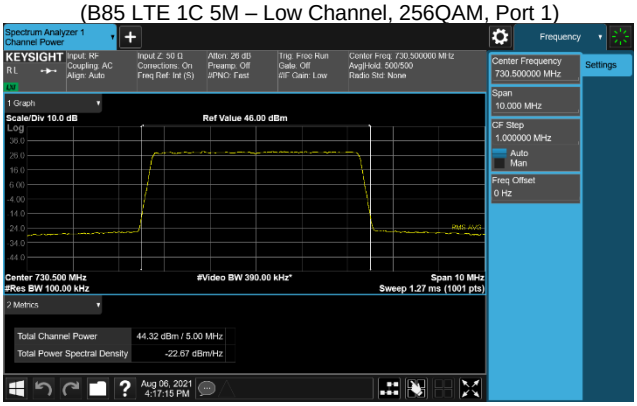
Table 7-15. Conducted Average Output Power Summary Data (B85 LTE 1C 5M)

Plot 7-51. Conducted Average Output Power Plot
(B85 LTE 1C 5M – Low Channel, 256QAM, Port 0)

Plot 7-52. Conducted Average Output Power Plot
(B85 LTE 1C 5M – Low Channel, 256QAM, Port 1)



Plot 7-53. Conducted Average Output Power Plot
(B85 LTE 1C 5M – Low Channel, 256QAM, Port 2)



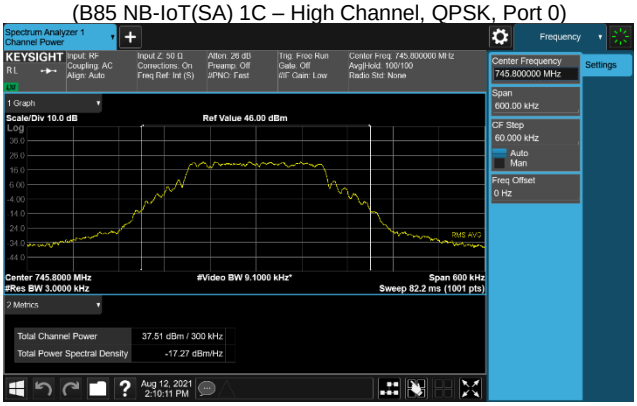
Plot 7-54. Conducted Average Output Power Plot
(B85 LTE 1C 5M – Low Channel, 256QAM, Port 3)

Port #	Conducted Output Power (dBm)		
	Low Channel	Middle Channel	High Channel
0	37.32	36.63	**37.71**
1	36.56	36.45	**37.16**
2	37.23	36.78	**37.51**
3	37.41	36.62	**37.71**
Total MIMO Conducted Power (mW)	20716.61	18374.56	**22640.36**
Total MIMO Conducted Power (dBm)	43.16	42.64	**43.55**

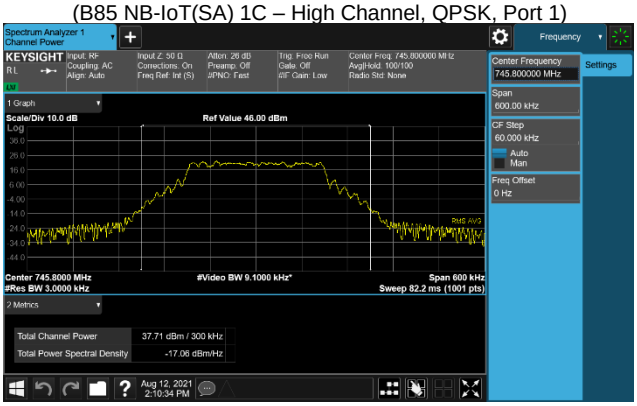
Table 7-16. Effective Radiated Power Summary Data (B85 NB-IoT(SA) 1C)

Plot 7-55. Effective Radiated Power Plot
(B85 NB-IoT(SA) 1C – High Channel, QPSK, Port 0)

Plot 7-56. Effective Radiated Power Plot
(B85 NB-IoT(SA) 1C – High Channel, QPSK, Port 1)



Plot 7-57. Effective Radiated Power Plot
(B85 NB-IoT(SA) 1C – High Channel, QPSK, Port 2)



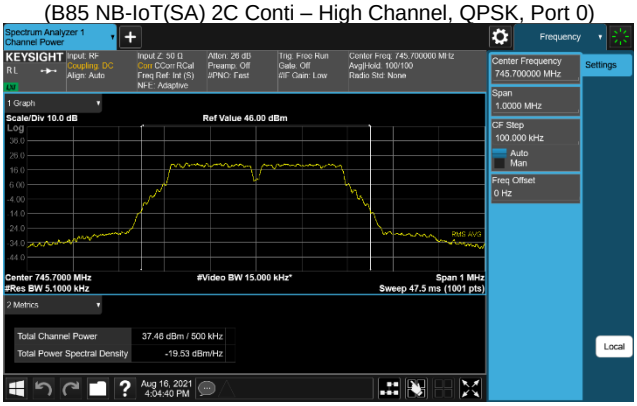
Plot 7-58. Effective Radiated Power Plot
(B85 NB-IoT(SA) 1C – High Channel, QPSK, Port 3)

Port #	Conducted Output Power (dBm)		
	Low Channel	Middle Channel	High Channel
0	37.40	36.62	**37.55**
1	36.72	36.49	**37.13**
2	37.26	36.65	**37.46**
3	37.26	36.54	**37.58**
Total MIMO Conducted Power (mW)	20836.52	18180.52	**22152.51**
Total MIMO Conducted Power (dBm)	43.19	42.60	**43.45**

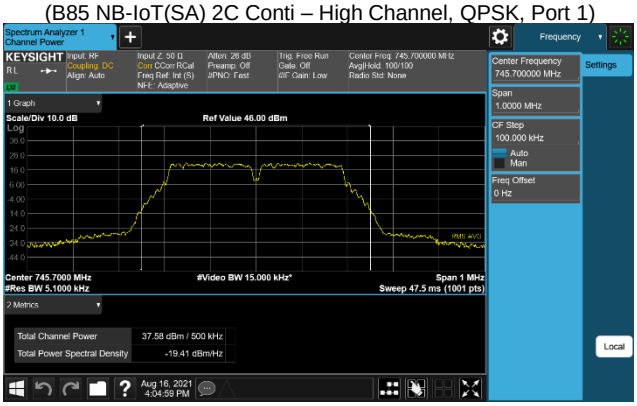
Table 7-17. Effective Radiated Power Summary Data (B85 NB-IoT(SA) 2C Conti)

Plot 7-59. Effective Radiated Power Plot
(B85 NB-IoT(SA) 2C Conti – High Channel, QPSK, Port 0)

Plot 7-60. Effective Radiated Power Plot
(B85 NB-IoT(SA) 2C Conti – High Channel, QPSK, Port 1)



Plot 7-61. Effective Radiated Power Plot
(B85 NB-IoT(SA) 2C Conti – High Channel, QPSK, Port 2)



Plot 7-62. Effective Radiated Power Plot
(B85 NB-IoT(SA) 2C Conti – High Channel, QPSK, Port 3)

7.4 Peak To Average Power Radio (PAPR)

§ 2.1046, § 27.50(c)

Test Overview

A 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

ANSI C63.26 - Section 5.2.3.4.
KDB 971168 D01 v0301 - Section 5.7

Test Setting

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer setting 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.

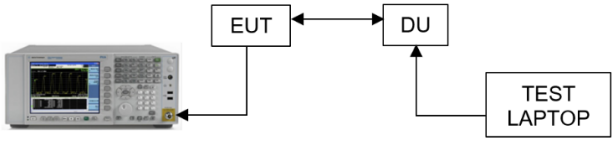


Figure 7-4. Test Instrument & Measurement Setup

Limit

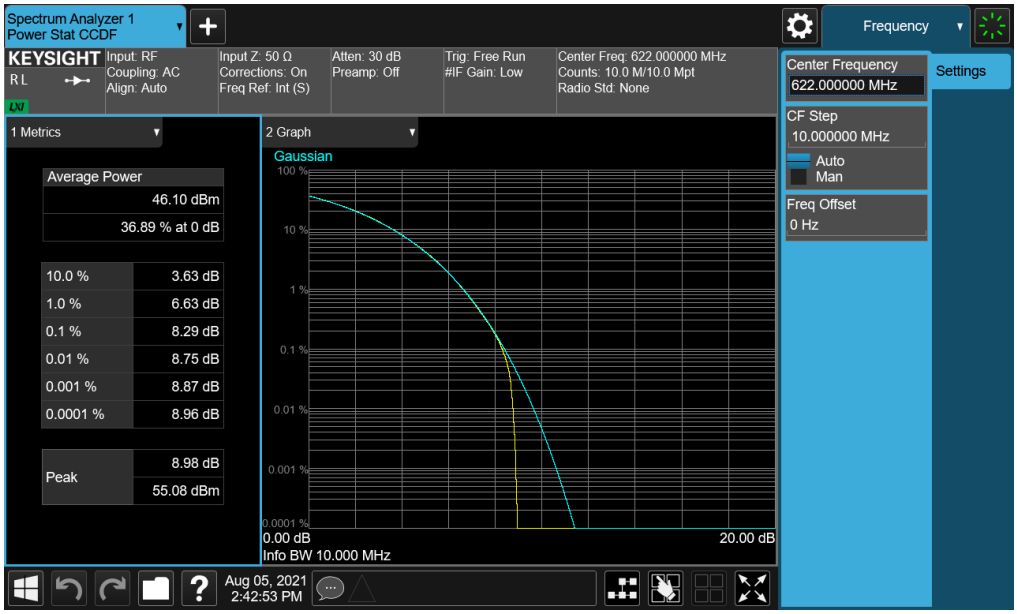
The peak-to-average power ratio (PAPR) limit shall not exceed 13 dB for more than 0.1% of the time.

Test Notes

1. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.22	8.24	8.22	8.24	< 13
	1	8.22	8.24	8.21	8.25	
	2	8.20	8.24	8.25	8.27	
	3	8.22	**8.29**	8.24	8.27	
Middle	0	8.20	8.22	8.21	8.27	< 13
	1	8.19	8.25	8.21	8.25	
	2	8.19	8.21	8.21	8.24	
	3	8.24	8.22	8.23	8.27	
High	0	8.20	8.21	8.20	8.21	< 13
	1	8.22	8.23	8.23	8.25	
	2	8.20	8.23	8.21	8.24	
	3	8.22	8.20	8.20	8.21	

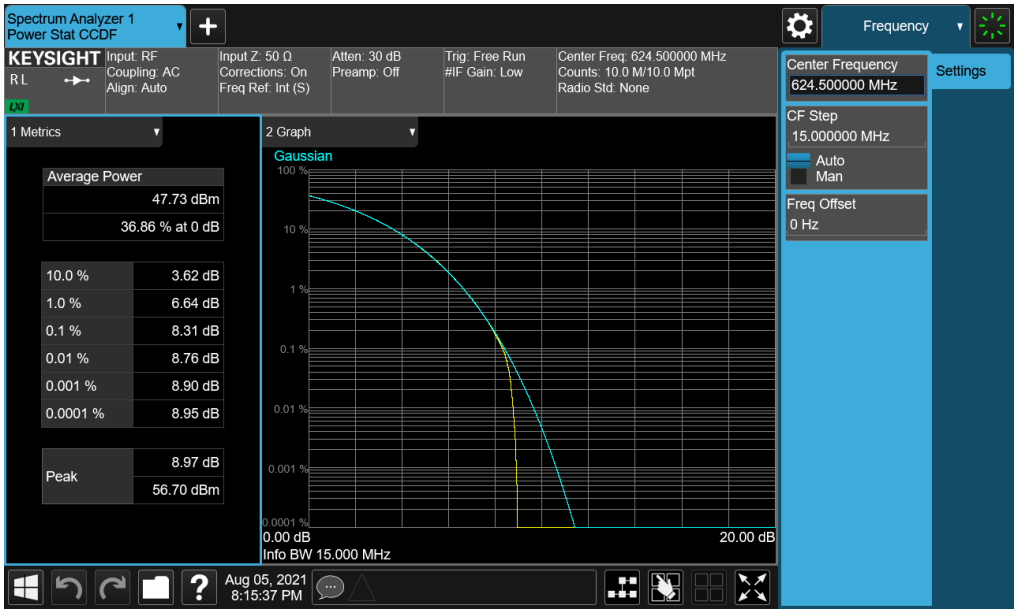
Table 7-18. Peak To Average Power Radio Summary Data (B71 LTE 1C 10M)



Plot 7-63. Peak To Average Power Radio Plot
(B71 LTE 1C 10M – Low Channel, 16QAM, Port 3)

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.23	8.26	8.18	8.21	< 13
	1	8.24	8.27	8.19	8.22	
	2	8.24	8.29	8.21	8.25	
	3	8.24	**8.31**	8.19	8.22	
Middle	0	8.23	8.27	8.19	8.22	< 13
	1	8.23	8.28	8.19	8.23	
	2	8.23	8.27	8.18	8.21	
	3	8.23	8.30	8.20	8.24	
High	0	8.23	8.26	8.15	8.20	< 13
	1	8.22	8.25	8.14	8.23	
	2	8.24	8.26	8.15	8.20	
	3	8.24	8.27	8.16	8.22	

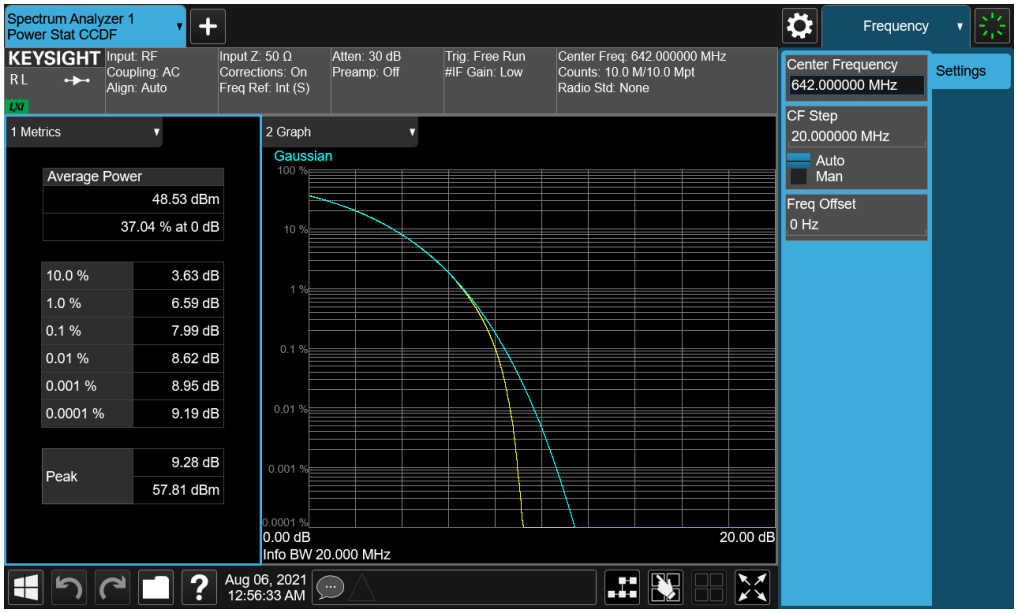
Table 7-19. Peak To Average Power Radio Summary Data (B71 LTE 1C 15M)



Plot 7-64. Peak To Average Power Radio Plot
(B71 LTE 1C 15M – Low Channel, 16QAM, Port 3)

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	7.86	7.85	7.85	7.84	< 13
	1	7.86	7.84	7.84	7.85	
	2	7.89	7.87	7.88	7.88	
	3	7.85	7.87	7.88	7.86	
Middle	0	7.85	7.84	7.82	7.85	< 13
	1	7.85	7.83	7.84	7.87	
	2	7.87	7.85	7.88	7.89	
	3	7.86	7.86	7.86	7.88	
High	0	**7.99**	7.92	7.96	7.96	< 13
	1	7.96	7.89	7.94	7.93	
	2	7.98	7.92	7.96	7.95	
	3	7.99	7.92	7.97	7.97	

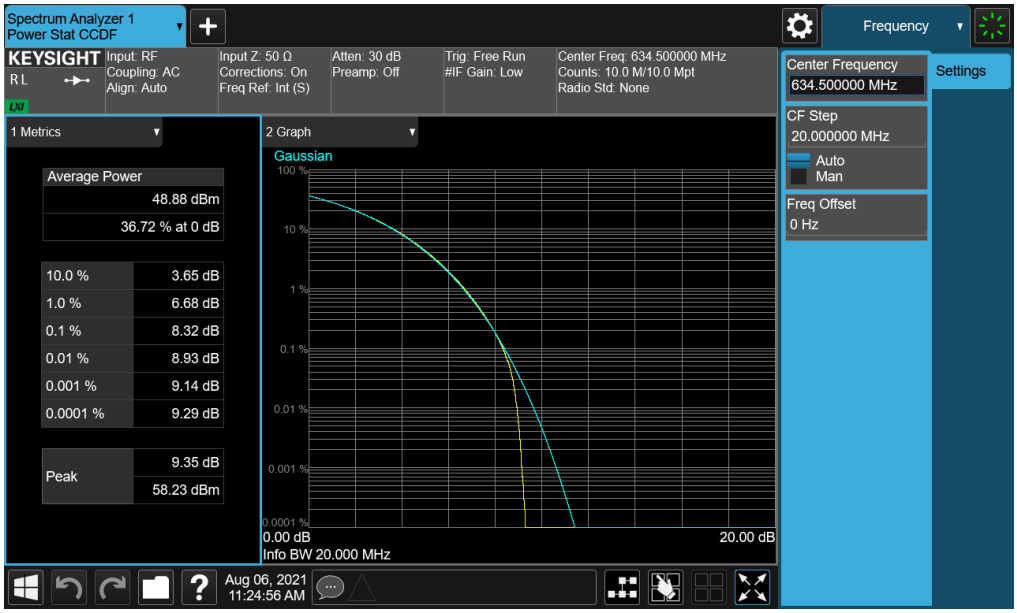
Table 7-20. Peak To Average Power Radio Summary Data (B71 LTE 1C 20M)



Plot 7-65. Peak To Average Power Radio Plot
(B71 LTE 1C 20M – High Channel, QPSK, Port 0)

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.24	8.24	8.23	8.26	< 13
	1	8.20	8.25	8.18	8.24	
	2	8.22	8.26	8.29	8.27	
	3	8.21	8.30	8.25	8.25	
Middle	0	8.23	8.32	8.23	8.26	< 13
	1	8.23	8.31	8.19	8.20	
	2	8.28	8.30	8.25	8.27	
	3	8.32	**8.34**	8.28	8.26	
High	0	8.26	8.26	8.25	8.24	< 13
	1	8.25	8.22	8.24	8.20	
	2	8.24	8.33	8.25	8.20	
	3	8.24	8.32	8.27	8.19	

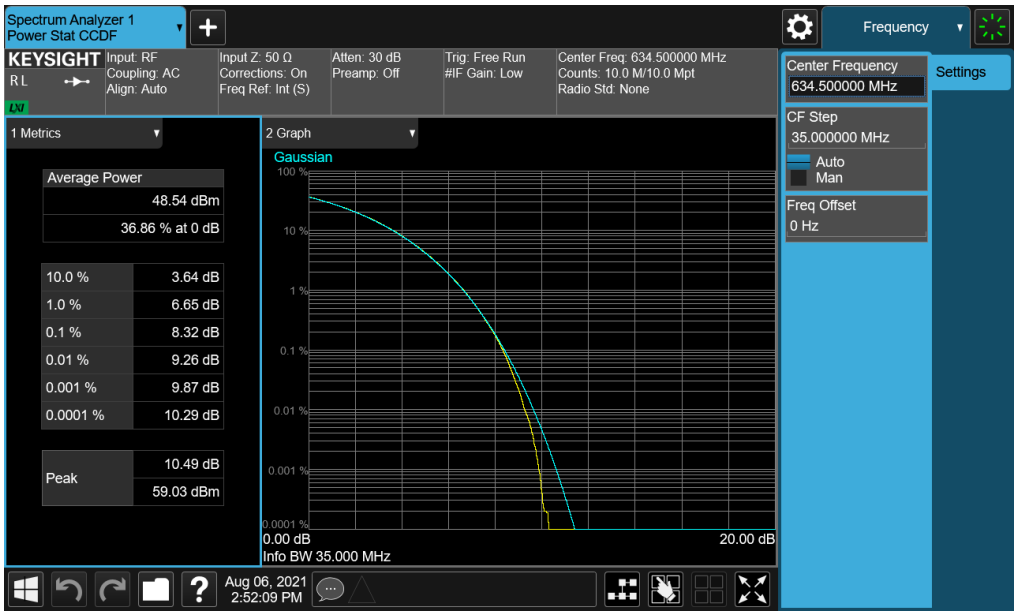
Table 7-21. Peak To Average Power Radio Summary Data (B71 LTE 2C 10M+10M Conti)



Plot 7-66. Peak To Average Power Radio Plot
(B71 LTE 2C 10M+10M Conti – Mid Channel, 16QAM, Port 0)

Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
	QPSK	16QAM	64QAM	256QAM	
0	8.24	8.26	8.26	8.30	< 13
1	8.24	8.27	8.25	8.29	
2	8.27	8.29	8.27	8.31	
3	8.27	8.28	8.29	**8.32**	

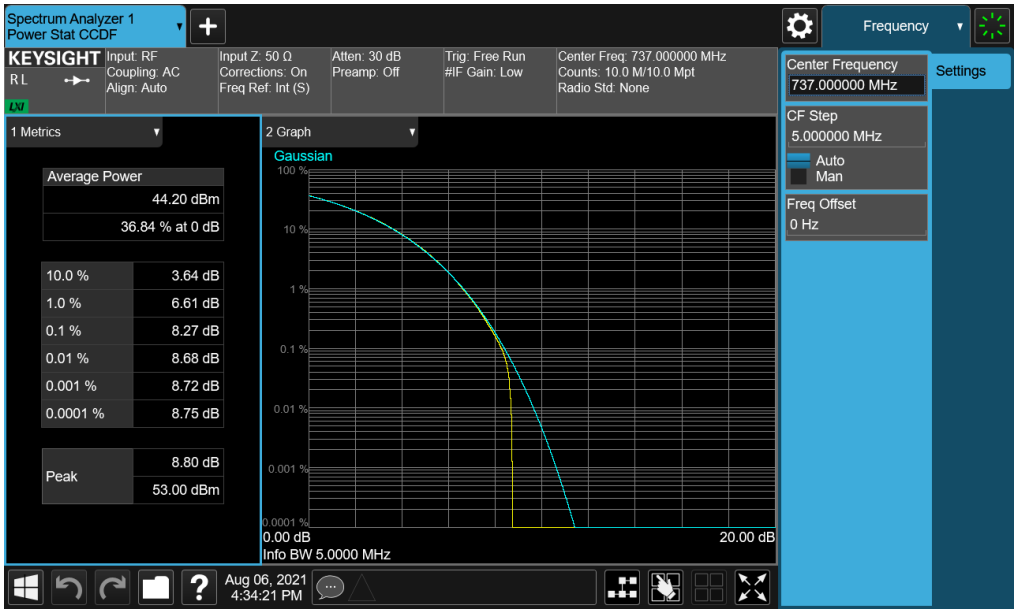
Table 7-22. Peak To Average Power Radio Summary Data (B71 LTE 2C 15M+20M Conti)



Plot 7-67. Peak To Average Power Radio Plot
(B71 LTE 2C 15M+20M Conti – 256QAM, Port 3)

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.23	8.21	8.19	8.25	< 13
	1	8.21	8.20	8.19	8.24	
	2	8.22	8.21	8.19	8.23	
	3	8.23	8.20	8.19	8.25	
Middle	0	8.26	8.19	8.18	8.27	< 13
	1	**8.27**	8.20	8.17	8.24	
	2	8.26	8.21	8.18	8.22	
	3	8.26	8.22	8.20	8.24	
High	0	8.23	8.21	8.19	8.23	< 13
	1	8.26	8.21	8.17	8.24	
	2	8.23	8.20	8.17	8.26	
	3	8.25	8.20	8.19	8.25	

Table 7-23. Peak To Average Power Radio Summary Data (B85 LTE 1C 5M)



Plot 7-68. Peak To Average Power Radio Plot
(B85 LTE 1C 5M – Mid Channel, QPSK, Port 1)

Ch.	Port #	The Peak-to-Average Ratio (PAR) (dB)	Limit (dB)
		QPSK	
Low	0	**8.65**	< 13
	1	8.62	
	2	8.60	
	3	8.57	
Middle	0	8.57	< 13
	1	8.56	
	2	8.58	
	3	8.55	
High	0	8.58	< 13
	1	8.61	
	2	8.63	
	3	8.63	

Table 7-24. Peak To Average Power Radio Summary Data (B85 NB-IoT(SA) 1C)

Plot 7-69. Peak To Average Power Radio Plot
(B85 NB-IoT(SA) 1C – Low Channel, QPSK, Port 0)

7.5 Band Edge Emissions at Antenna Terminal

§ 2.1051, § 27.53(g)

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

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: refer to below note.
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limit

The minimum permissible attenuation level of any spurious emission is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.
The power of any emission outside of the authorized operating frequency range cannot exeed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm - 10 log (4)] per KDB 662911 D01 v02r01 - section E)3) because the EUT operate as a 4 port MIMO transmitter.

Test Setup

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

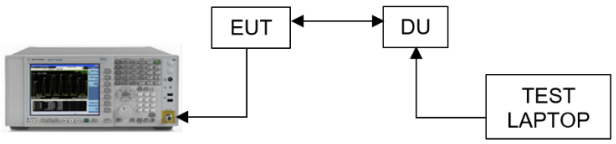


Figure 7-5. Test Instrument & Measurement Setup

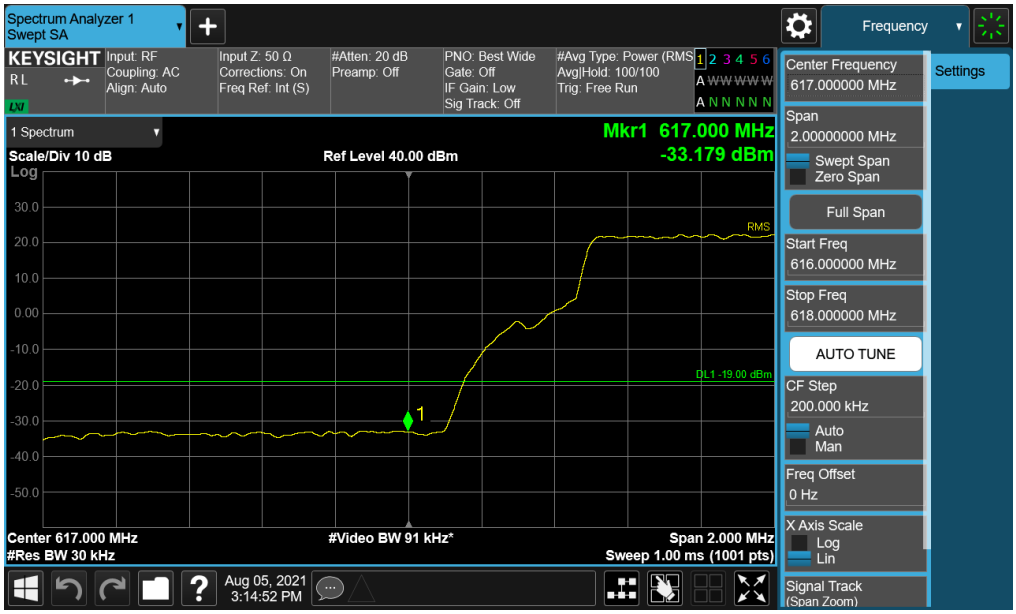
Test Notes

1. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
2. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

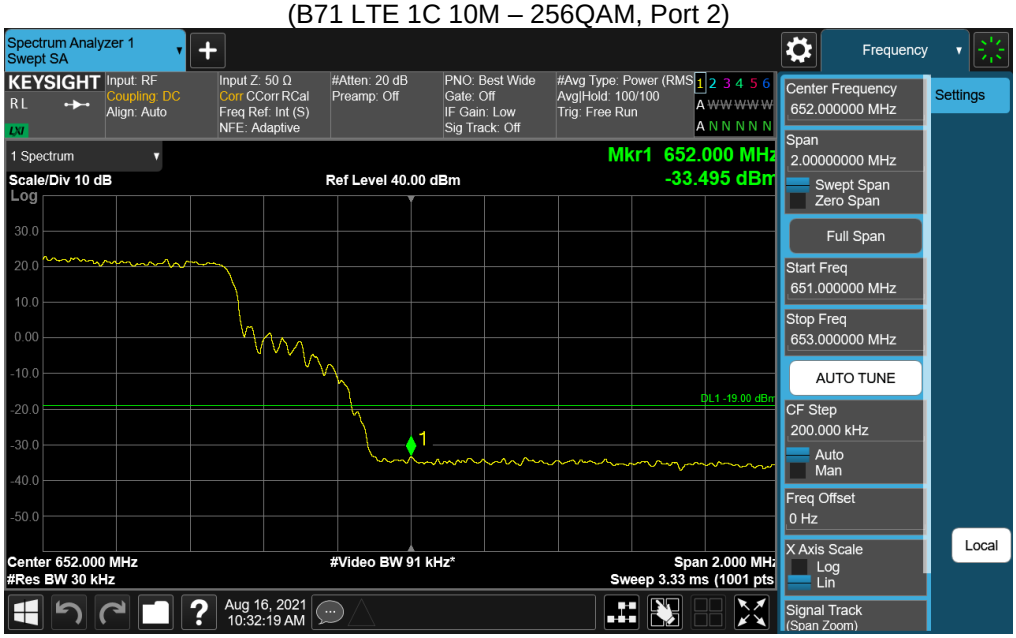
3. The integration method was performed using the spectrum analyzer's channel power, or band power functions.
   The spectrum analyzer marker was placed at one-half of the RBW away from the band edge.
   The integration value was set to the a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter

Ch.	Port #	Max. Value (dBm)				Limit (dBm)
		QPSK	16QAM	64QAM	256QAM	
Low	0	-35.89	-34.25	-36.01	-36.53	-19.0
	1	-35.33	-36.20	-37.25	-35.84	-19.0
	2	-35.52	-36.94	-35.79	**-33.18**	-19.0
	3	-35.45	-36.46	-37.06	-36.07	-19.0
High	0	-37.12	-34.73	-34.91	-35.12	-19.0
	1	-35.07	-35.61	-35.01	-36.10	-19.0
	2	-34.54	**-33.50**	-34.66	-34.80	-19.0
	3	-37.11	-36.15	-36.41	-35.30	-19.0

Table 7-25. Band Edge Emission Summary Data
(B71 LTE 1C 10M)



Plot 7-70. Lower Band Edge Emission Plot
(B71 LTE 1C 10M – 256QAM, Port 2)



Plot 7-71. Upper Band Edge Emission Plot
(B71 LTE 1C 10M – 16QAM, Port 2)

Ch.	Port #	Max. Value (dBm)				Limit (dBm)
		QPSK	16QAM	64QAM	256QAM	
Low	0	-34.10	-32.99	-32.94	-35.50	-19.0
	1	-34.06	**-32.45**	-33.55	-35.06	-19.0
	2	-35.07	-33.55	-34.41	-33.02	-19.0
	3	-33.22	-33.84	-33.28	-33.30	-19.0
High	0	-35.23	-35.94	-35.74	-35.33	-19.0
	1	-35.35	-34.44	-34.82	-34.55	-19.0
	2	-34.64	-36.44	**-33.87**	-35.43	-19.0
	3	-35.82	-35.16	-35.70	-34.98	-19.0

Table 7-26. Band Edge Emission Summary Data
(B71 LTE 1C 15M)