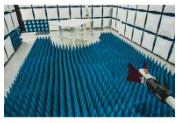
PCTEST KOREA CO., LTD.
(#1407) 13, Heungdeok 1-ro, Giheung-gu,
Yongin-si, Gyeonggi-do 16954, Korea
Tel. +82 31.660.7319 / Fax +82 31.660.7918
http://www.pctest.com



TEST REPORT
FCC Rule Part 27

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

Date of Testing:
11/08/2021 – 11/13/2021
Test Site/Location:
PCTEST KOREA Lab. Yongin-si,
Gyeonggi-do, Korea
Test Report Serial No.:
8K21110202.A3L

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

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

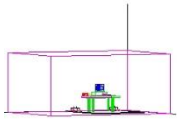
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in RSS-Gen. Test results reported herein relate only to the item(s) tested.

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.

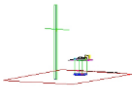
Prepared by Ian.Kim
Test Engineer

Reviewed by Charles.Shin
Technical Manager

TABLE OF CONTENTS



MEASUREMENT REPORT
FCC Part 27



Mode	FCC Rule Part	Tx Frequency (MHz)	Conducted output power		Emission Designator	Modulation
			Max. Power (dBm)	Max. Power (W)		
NR_n71_5M	27	617 - 652	49.00	79.41	4M53G7D	QPSK
			49.15	82.29	4M52W7D	16QAM
			49.18	82.72	4M51W7D	64QAM
			49.17	82.53	4M53W7D	256QAM
NR_n71_10M	27	617 - 652	52.09	161.82	9M30G7D	QPSK
			52.08	161.52	9M24W7D	16QAM
			52.03	159.71	9M29W7D	64QAM
			52.08	161.33	9M30W7D	256QAM

EUT Overview

1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
8K21110202.A3L	11/15/2021	Initial Issue

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 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.

2.3 Test Facility / Accreditation

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

3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung RRU (RF4435d) FCC ID: A3LRF4435D-71A.**
A class II permissive change on the original filing is being pursued to software modifications to add 5G NR radio technology without hardware modification.

This device supports the following conditional features:

EUT Type:	RRU (RF4435d)
Model Name:	RF4435d-71A
Test Device Serial No.:	S617601147
Device Capabilities:	5G NR
Operating Band/Frequency Range:	Band / Tx (Downlink) / Rx (Uplink) n71: / 617 MHz to 652 MHz / 663 MHz to 698 MHz
Supported Number of Carriers:	Max. 1 carrier
Supported Modulation:	QPSK, 16QAM, 64QAM, 256QAM
Supported Channel Bandwidth:	5MHz, 10MHz
Maximum Output Power	5MHz Bandwidth: 20W/path x 4 paths 10MHz Bandwidth: 40Wpath x 4 paths
Number of Antenna ports	4
Supported Configurations:	Single carrier
Input Voltage:	-48 VDC
Antenna Gain:	The antenna gain will be decision at the time of licensing.

3.2 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 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:
- n71: 5G NR n71
- 5M: 5MHz Bandwidth
- 10M: 10MHz Bandwidth

Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (W/path)
			Lowest	Middle	Highest	
NR_n71_5M	1	5	619.5	634.5	649.5	20
NR_n71_10M	1	10	622.0	634.5	647.0	40

3.3 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 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

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

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	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

6.0 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	10/22/2021	Annual	10/21/2022	MY55470135
Rohde & Schwarz	FSW43	Signal and Spectrum Analyzer	09/15/2021	Annual	09/14/2022	101250
SUKSAN TECHNOLOGY	SE-CT-10	Temperature Chamber	09/15/2021	Annual	09/14/2022	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
Reachline	250W18N-40FF	High Power Attenuator	03/17/2021	Annual	03/16/2022	PK0288
Reachline	250W18N-40FF	High Power Attenuator	03/17/2021	Annual	03/16/2022	PK0290
Reachline	250W18N-40FF	High Power Attenuator	03/17/2021	Annual	03/16/2022	PK0292
Reachline	250W18N-40FF	High Power Attenuator	03/17/2021	Annual	03/16/2022	PK0293
KIKISUI	PWR1201ML	DC POWER SUPPLY	05/25/2021	Annual	05/24/2022	ZL000972

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. 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.

7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 4M53G7D

Occupied Bandwidth = 4.53 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 9M30W7D

Occupied Bandwidth = 9.30 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 (TNB)

Mode(s): 5G NR

FCC Part Section(s)	Test Description	Test Condition	Test Result	Reference
§ 2.1049	Occupied Bandwidth	CONDUCTED	PASS	Section 8.2
§ 2.1046	Conducted Output Power		PASS	Section 8.3
§ 2.1046, § 27.50(c)	Peak-to-average power ratio		PASS	Section 8.4
§ 2.1051, § 27.53(g)	Band Edge Emissions at Antenna Terminal		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		PASS	Section 8.8
§ 2.1051, § 27.53(g)	Radiated unwanted emission	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 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.

8.2 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.

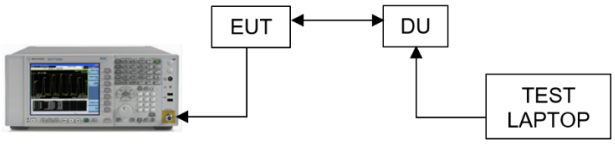


Figure 8-1. Test Instrument & Measurement Setup

Limit

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

Test Notes

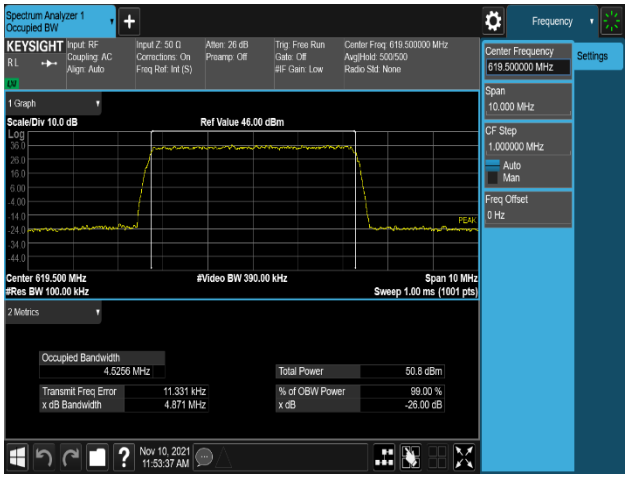
1. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	4.49	4.50	4.49	4.50
	1	4.50	**4.52**	4.50	4.50
	2	**4.53**	4.51	4.49	4.50
	3	4.50	4.50	4.49	4.50
Middle	0	4.50	4.50	**4.51**	4.50
	1	4.50	4.50	4.49	4.51
	2	4.49	4.50	4.50	4.49
	3	4.49	4.51	4.49	4.49
High	0	4.49	4.51	4.49	4.50
	1	4.49	4.51	4.48	4.50
	2	4.49	4.49	4.49	4.50
	3	4.49	4.50	4.49	**4.53**

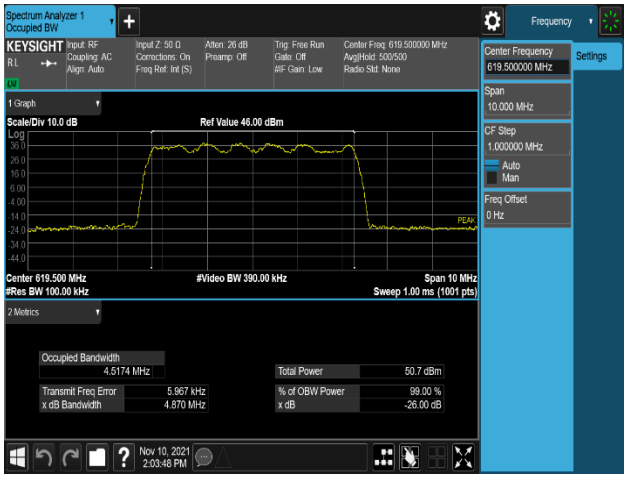
Table 8-2. Occupied Bandwidth Summary Data (NR_n71_5M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	9.27	**9.24**	9.27	9.29
	1	**9.30**	9.24	9.27	**9.30**
	2	9.29	9.22	9.28	9.28
	3	9.28	9.24	9.28	9.28
Middle	0	9.29	9.24	9.28	9.30
	1	9.29	9.24	**9.29**	9.30
	2	9.29	9.23	9.27	9.28
	3	9.29	9.23	9.28	9.30
High	0	9.27	9.22	9.27	9.30
	1	9.28	9.21	9.27	9.28
	2	9.28	9.22	9.27	9.29
	3	9.28	9.23	9.28	9.29

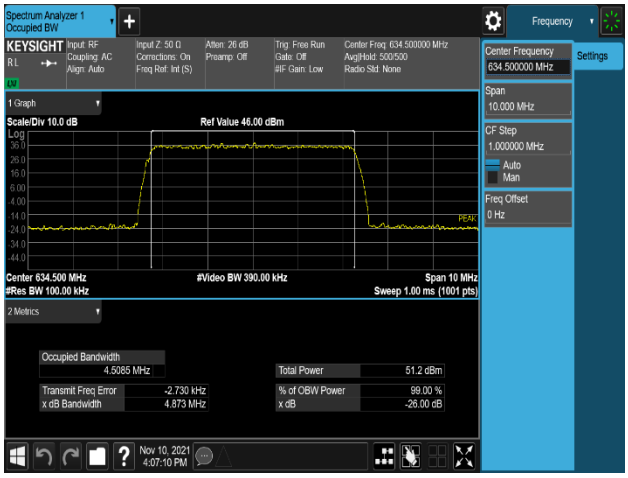
Table 8-3. Occupied Bandwidth Summary Data (NR_n71_10M)



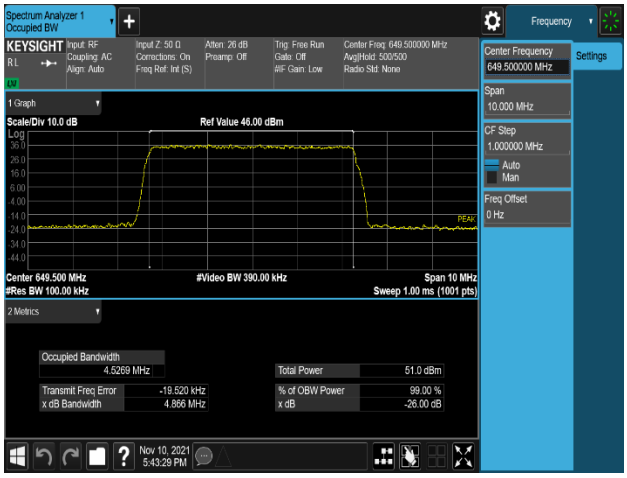
Plot 8-1. Occupied Bandwidth Plot
(LTE_n71_5M_QPSK - Low Channel, Port 2)



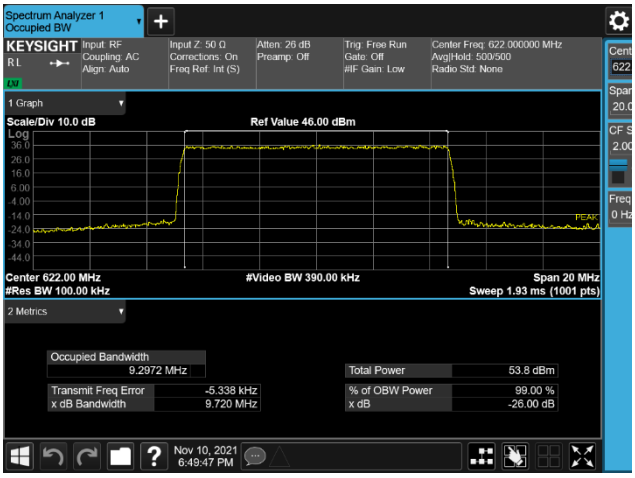
Plot 8-2. Occupied Bandwidth Plot
(LTE_n71_5M_16QAM - Low Channel, Port 1)



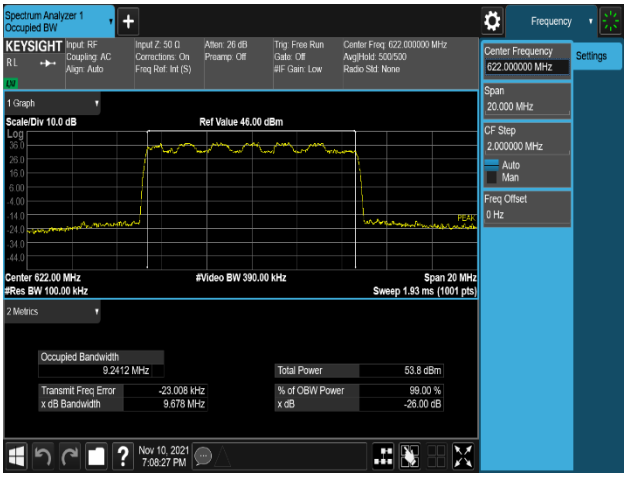
Plot 8-3. Occupied Bandwidth Plot
(LTE_n71_5M_64QAM - Mid Channel, Port 0)



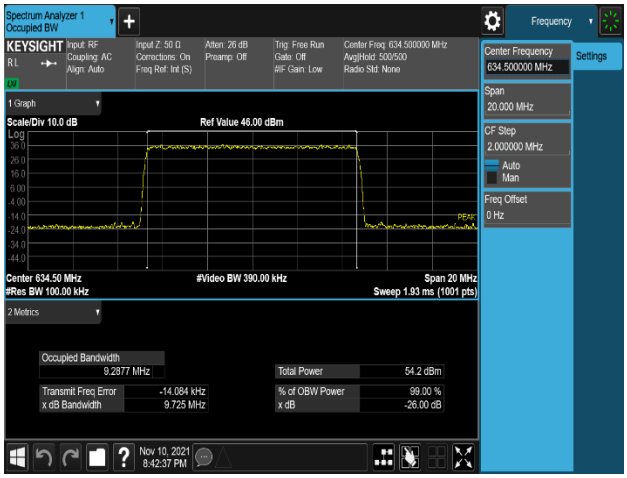
Plot 8-4. Occupied Bandwidth Plot
(LTE_n71_5M_256AQAM - High Channel, Port 3)



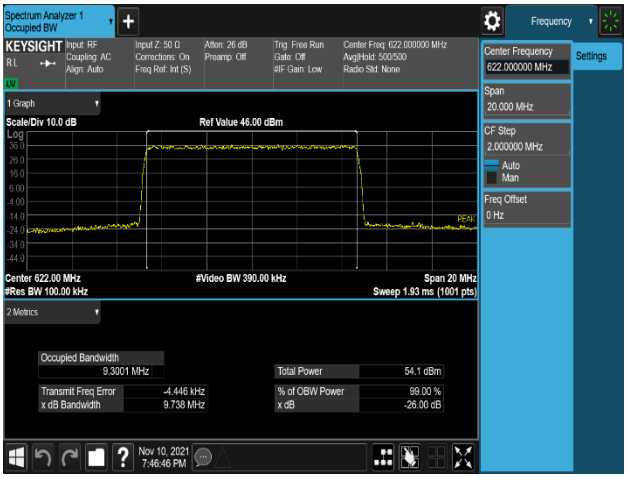
Plot 8-5. Occupied Bandwidth Plot
(LTE_n71_10M_QPSK - Low Channel, Port 1)



Plot 8-6. Occupied Bandwidth Plot
(LTE_n71_10M_16QAM - Low Channel, Port 0)



Plot 8-7. Occupied Bandwidth Plot
(LTE_n71_10M_64QAM - Mid Channel, Port 1)



Plot 8-8. Occupied Bandwidth Plot
(LTE_n71_10M_256QAM - Low Channel, Port 1)

8.3 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.

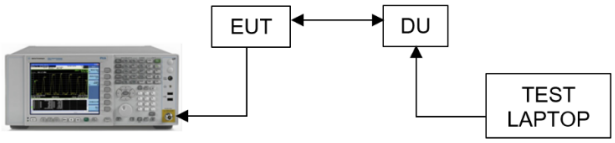


Figure 8-2. Test Instrument & Measurement Setup

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 79409.54 milliWatts

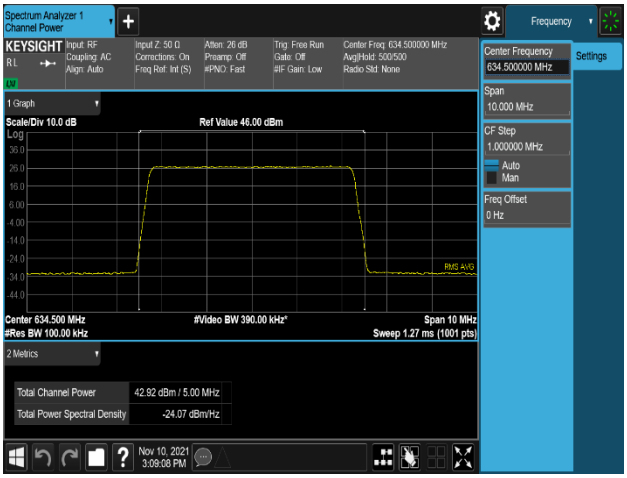
Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		79409.54	mW
Summed MIMO Conducted Power (dBm)	= 10 * log (79409.54) =	49.00	dBm

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm)	0	42.59	42.62	42.68	42.64
	1	42.70	42.73	42.88	42.75
	2	42.78	42.76	42.86	42.79
	3	42.88	42.97	43.00	42.96
Total MIMO Conducted Power (mW)		75151.95	75726.13	77216.48	75982.35
Total MIMO Conducted Power (dBm)		48.76	48.79	48.88	48.81
Mid Channel	**Port**	**QPSK**	**16QAM**	**64QAM**	**256QAM**
Conducted Power (dBm)	0	**42.92**	**43.05**	**43.10**	**43.08**
	1	**42.92**	**43.10**	**43.11**	**43.08**
	2	**42.97**	**43.13**	**43.19**	**43.18**
	3	**43.10**	**43.25**	**43.22**	**43.24**
Total MIMO Conducted Power (mW)		**79409.54**	**82294.84**	**82716.13**	**82530.39**
Total MIMO Conducted Power (dBm)		**49.00**	**49.15**	**49.18**	**49.17**
High Channel	**Port**	**QPSK**	**16QAM**	**64QAM**	**256QAM**
Conducted Power (dBm)	0	42.84	42.94	42.95	42.94
	1	42.90	42.85	42.87	42.92
	2	42.90	42.82	42.89	42.82
	3	42.94	42.99	43.03	42.94
Total MIMO Conducted Power (mW)		77906.67	78003.40	78632.98	78088.73
Total MIMO Conducted Power (dBm)		48.92	48.92	48.96	48.93

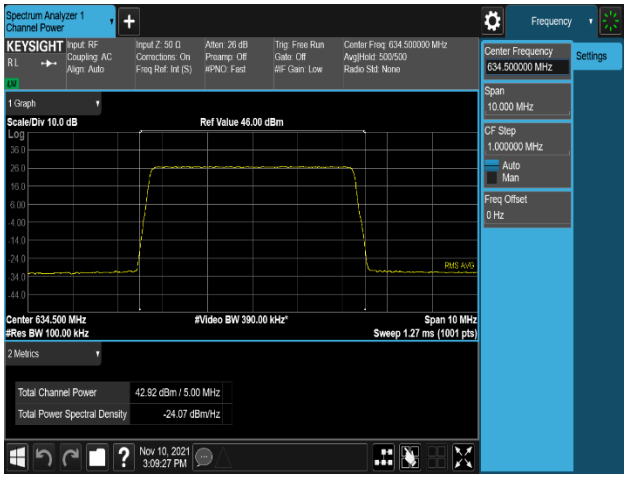
Table 8-4. Conducted Average Output Power Summary Data (NR_n71_5M)

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Power (dBm)	0	45.66	45.78	45.85	45.97
	1	45.81	45.87	45.77	45.81
	2	45.80	46.02	45.83	46.06
	3	45.91	46.08	46.06	46.11
Total MIMO Conducted Power (mW)		151932.62	157026.28	154863.41	158839.72
Total MIMO Conducted Power (dBm)		51.82	51.96	51.90	52.01
Mid Channel	**Port**	**QPSK**	**16QAM**	**64QAM**	**256QAM**
Conducted Power (dBm)	0	**45.89**	**45.92**	**45.82**	**45.90**
	1	**46.01**	**46.04**	**46.00**	**46.05**
	2	**46.10**	**46.02**	**45.97**	**46.05**
	3	**46.27**	**46.26**	**46.25**	**46.22**
Total MIMO Conducted Power (mW)		**161819.85**	**161524.51**	**159711.46**	**161327.28**
Total MIMO Conducted Power (dBm)		**52.09**	**52.08**	**52.03**	**52.08**
High Channel	**Port**	**QPSK**	**16QAM**	**64QAM**	**256QAM**
Conducted Power (dBm)	0	45.79	45.70	45.73	45.74
	1	45.81	45.87	45.86	45.85
	2	45.83	45.88	45.82	45.93
	3	45.97	46.01	45.93	45.90
Total MIMO Conducted Power (mW)		153857.22	154418.48	153327.51	154035.18
Total MIMO Conducted Power (dBm)		51.87	51.89	51.86	51.88

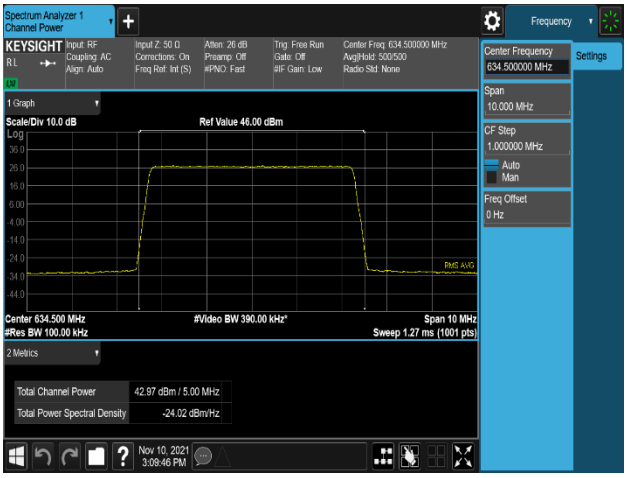
Table 8-5. Conducted Average Output Power Summary Data (NR_n71_10M)



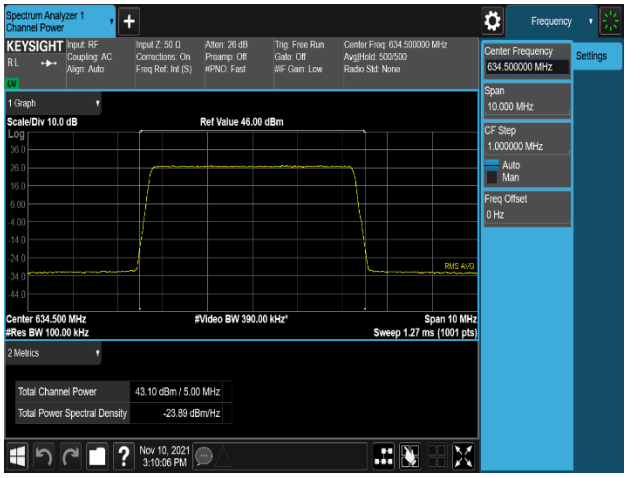
Plot 8-9. Conducted Average Output Power Plot
(NR_n71_5M_QPSK Mid Channel, Port 0)



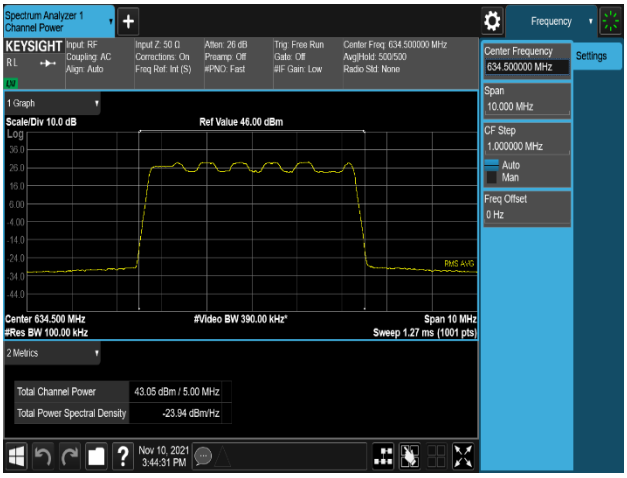
Plot 8-10. Conducted Average Output Power Plot
(NR_n71_5M_QPSK - Mid Channel, Port 1)



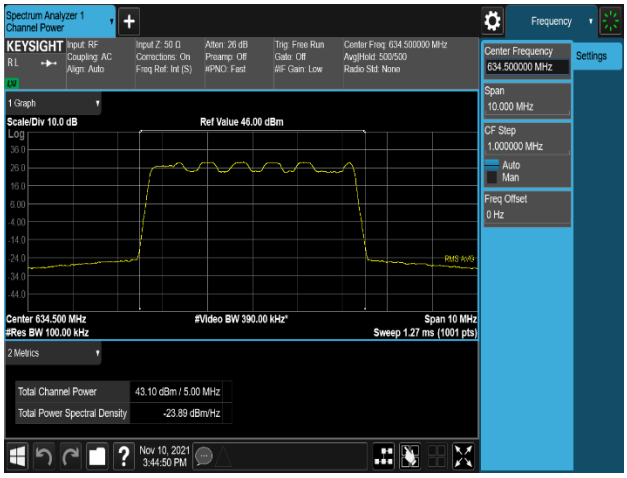
Plot 8-11. Conducted Average Output Power Plot
(NR_n71_5M_QPSK - Mid Channel, Port 2)



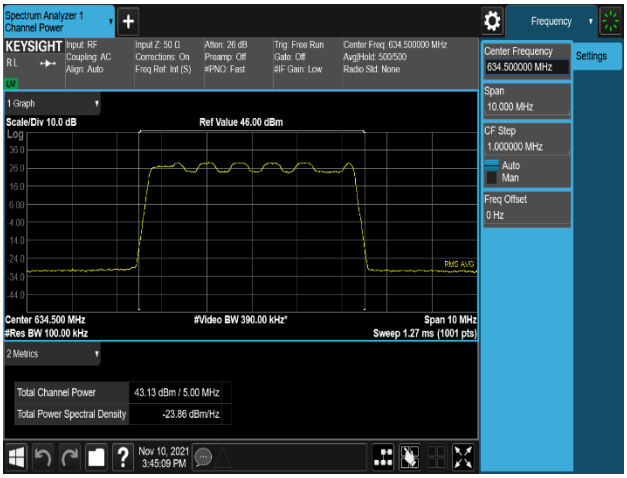
Plot 8-12. Conducted Average Output Power Plot
(NR_n71_5M_QPSK - Mid Channel, Port 3)



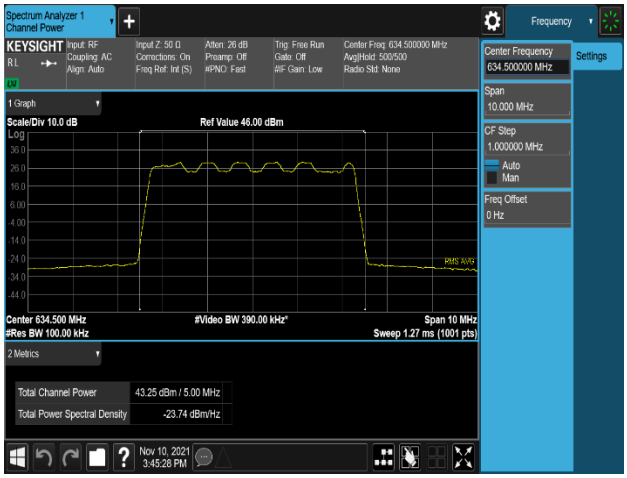
Plot 8-13. Conducted Average Output Power Plot
(NR_n71_5M_16QAM - Mid Channel, Port 0)



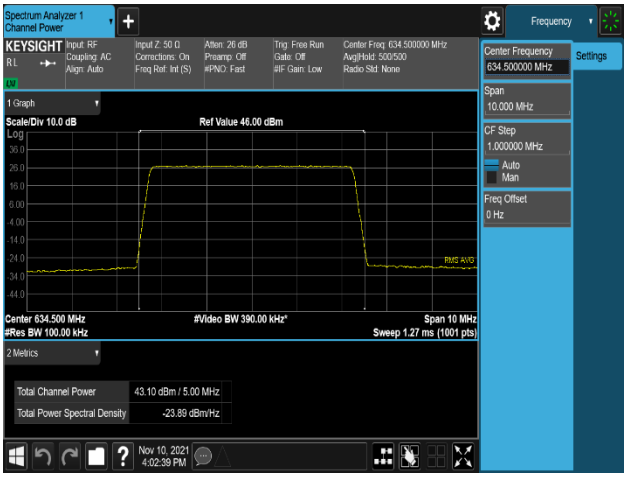
Plot 8-14. Conducted Average Output Power Plot
(NR_n71_5M_16QAM - Mid Channel, Port 1)



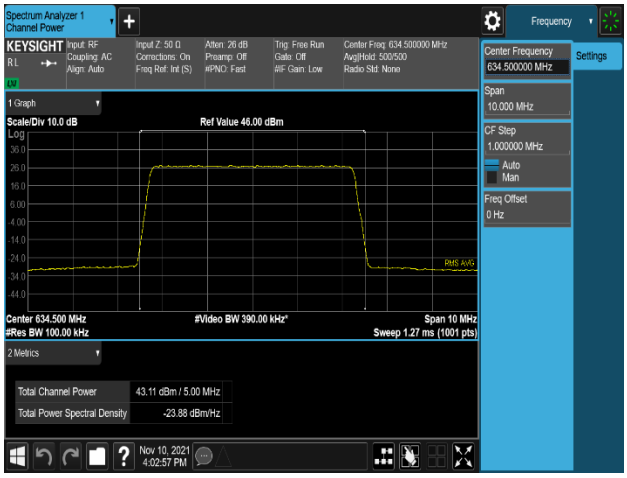
Plot 8-15. Conducted Average Output Power Plot
(NR_n71_5M_16QAM - Mid Channel, Port 2)



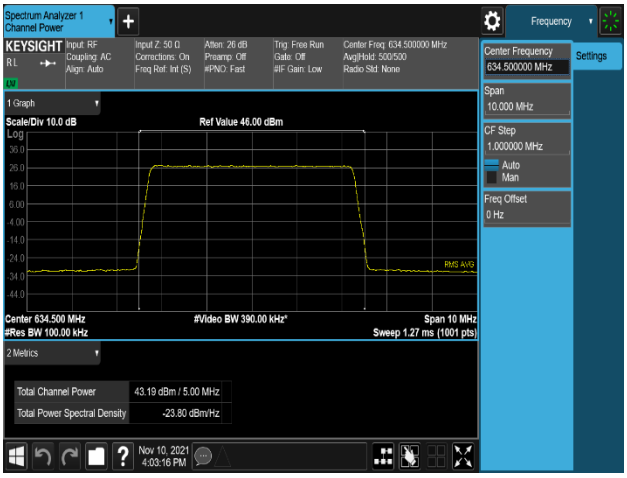
Plot 8-16. Conducted Average Output Power Plot
(NR_n71_5M_16QAM - Mid Channel, Port 3)



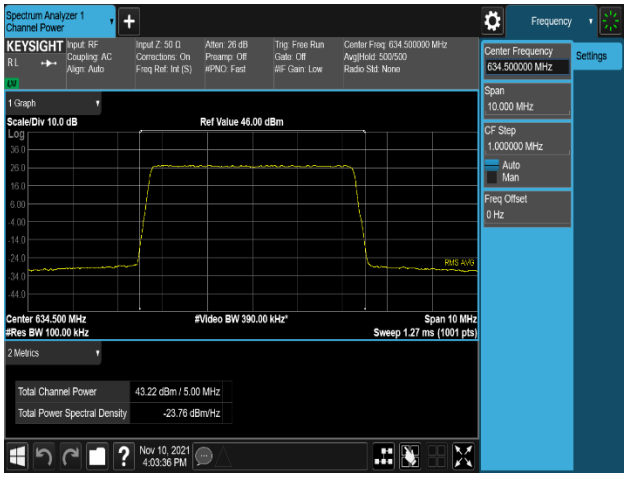
Plot 8-17. Conducted Average Output Power Plot
(NR_n71_5M_64QAM - Mid Channel, Port 0)



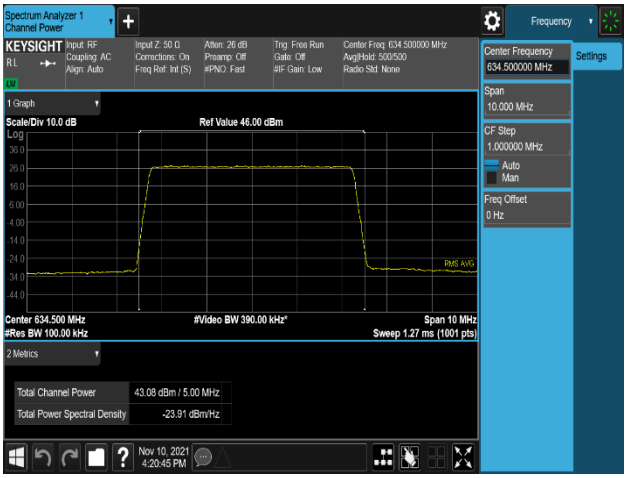
Plot 8-18. Conducted Average Output Power Plot
(NR_n71_5M_64QAM - Mid Channel, Port 1)



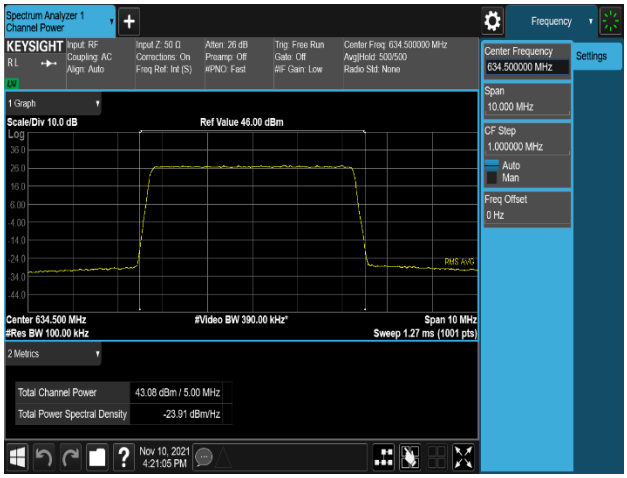
Plot 8-19. Conducted Average Output Power Plot
(NR_n71_5M_64QAM - Mid Channel, Port 2)



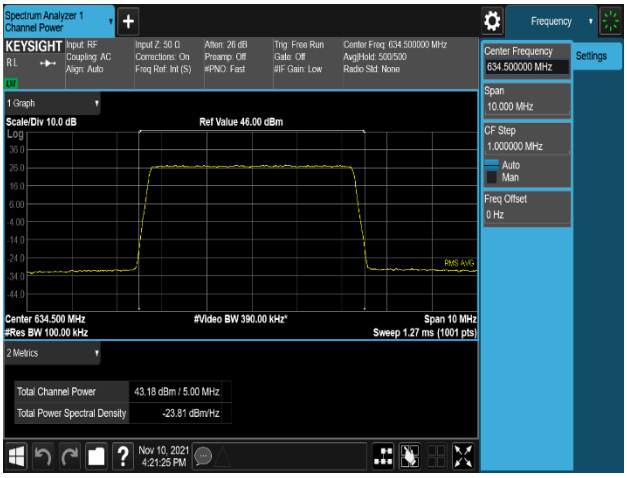
Plot 8-20. Conducted Average Output Power Plot
(NR_n71_5M_64QAM - Mid Channel, Port 3)



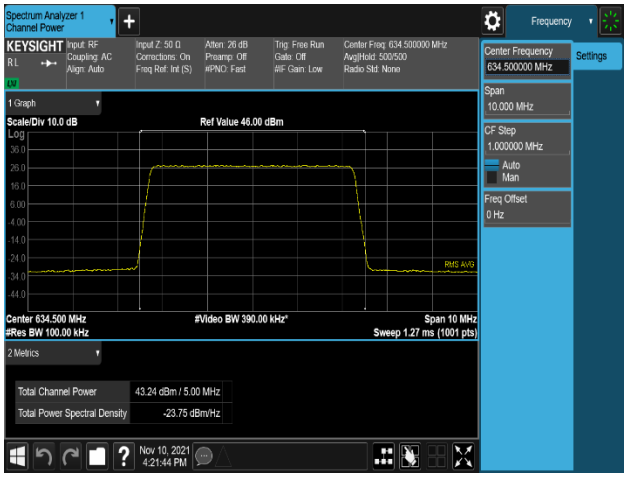
Plot 8-21. Conducted Average Output Power Plot
(NR_n71_5M_256QAM - Mid Channel, Port 0)



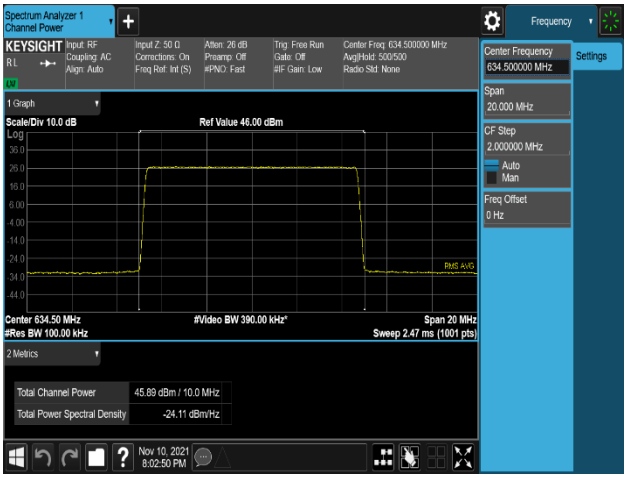
Plot 8-22. Conducted Average Output Power Plot
(NR_n71_5M_256QAM - Mid Channel, Port 1)



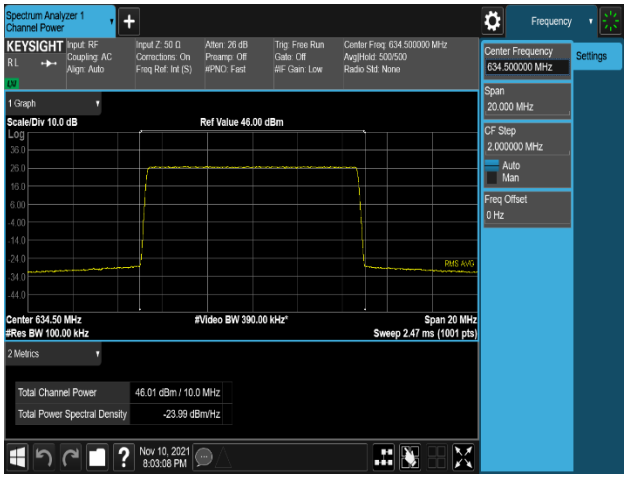
Plot 8-23. Conducted Average Output Power Plot
(NR_n71_5M_256QAM - Mid Channel, Port 2)



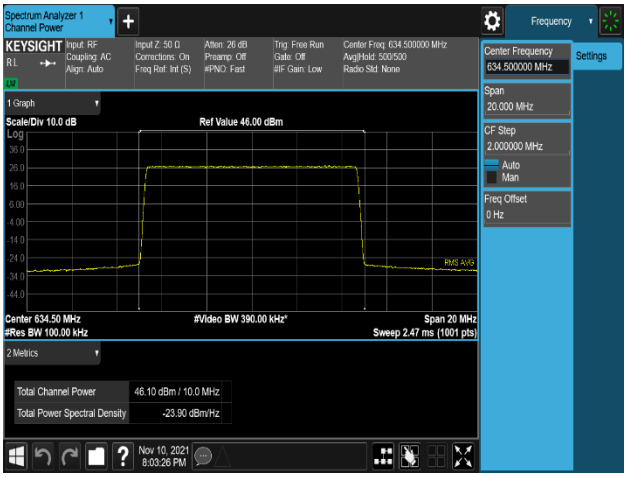
Plot 8-24. Conducted Average Output Power Plot
(NR_n71_5M_256QAM - Mid Channel, Port 3)



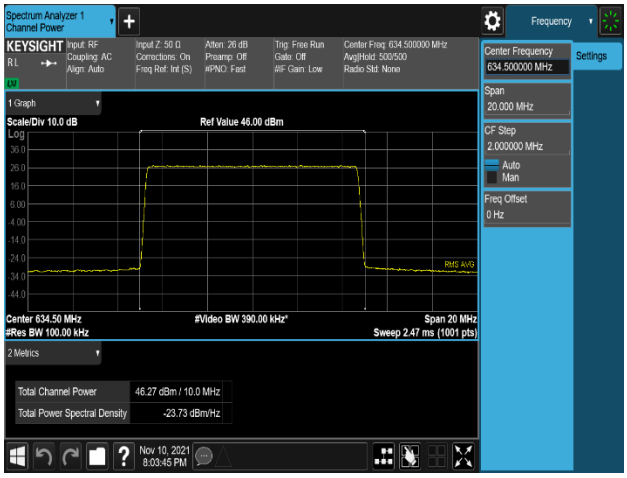
Plot 8-25. Conducted Average Output Power Plot
(NR_n71_10M_QPSK Mid Channel, Port 0)



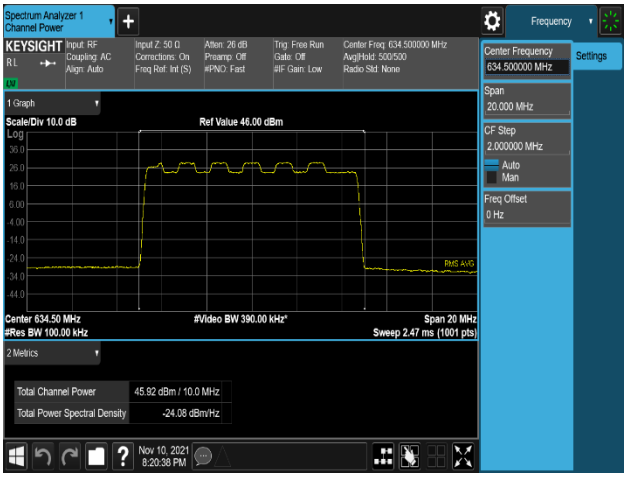
Plot 8-26. Conducted Average Output Power Plot
(NR_n71_10M_QPSK - Mid Channel, Port 1)



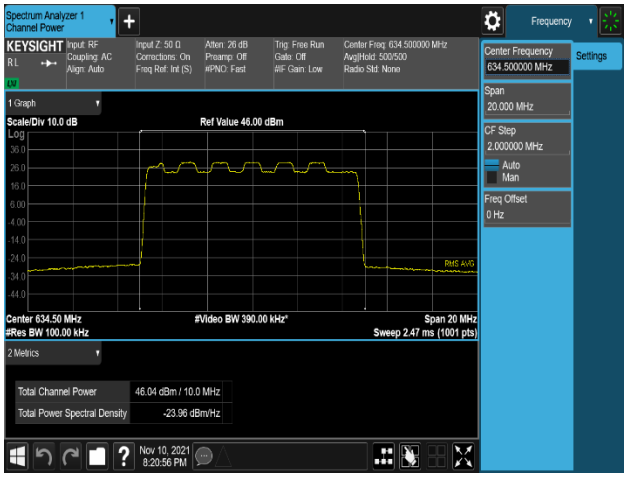
Plot 8-27. Conducted Average Output Power Plot
(NR_n71_10M_QPSK - Mid Channel, Port 2)



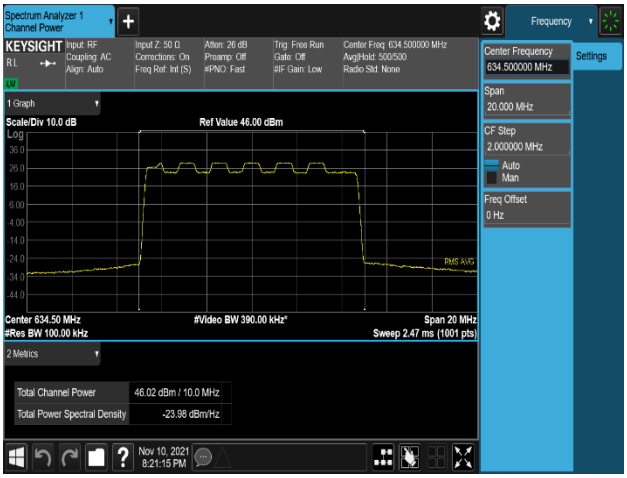
Plot 8-28. Conducted Average Output Power Plot
(NR_n71_10M_QPSK - Mid Channel, Port 3)



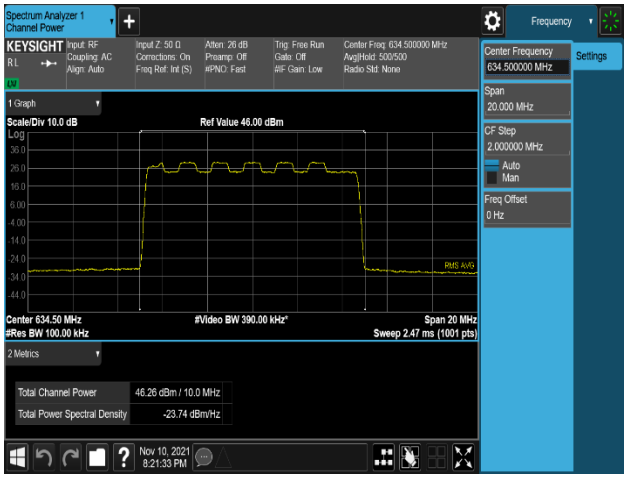
Plot 8-29. Conducted Average Output Power Plot
(NR_n71_10M_16QAM - Mid Channel, Port 0)



Plot 8-30. Conducted Average Output Power Plot
(NR_n71_10M_16QAM - Mid Channel, Port 1)

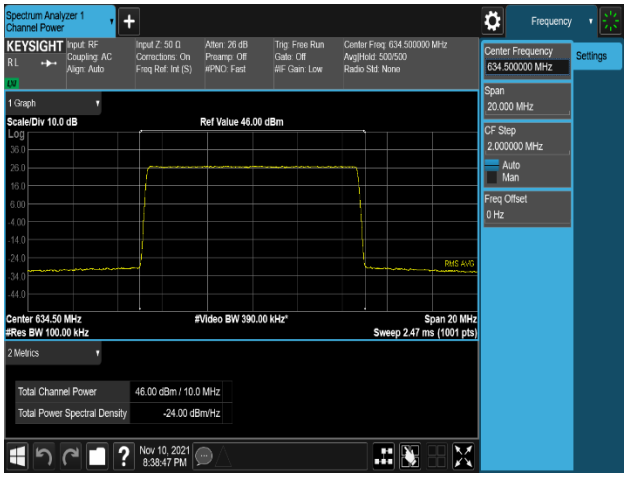


Plot 8-31. Conducted Average Output Power Plot
(NR_n71_10M_16QAM - Mid Channel, Port 2)

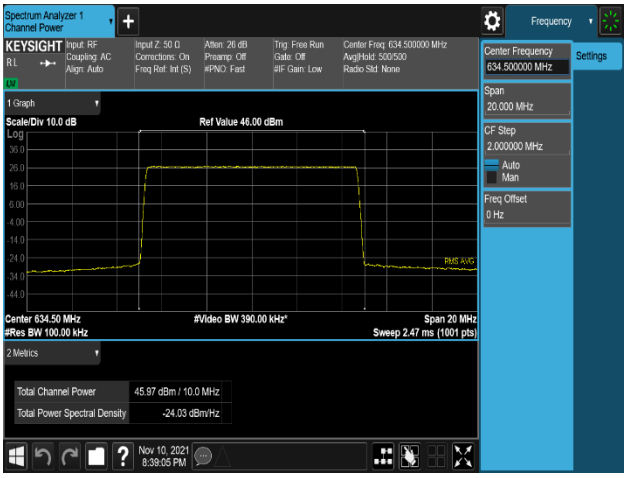


Plot 8-32. Conducted Average Output Power Plot
(NR_n71_10M_16QAM - Mid Channel, Port 3)

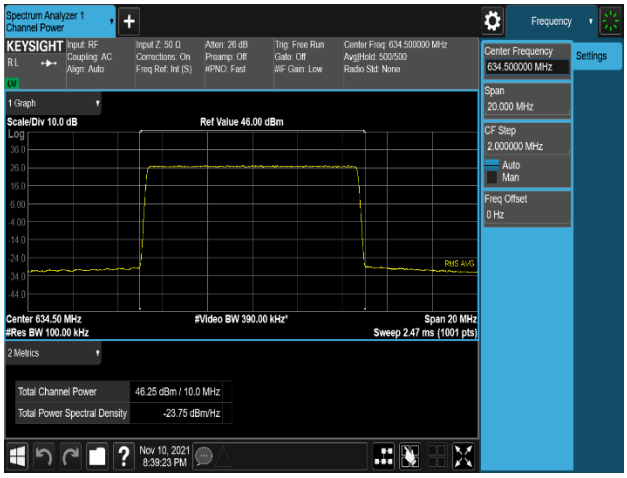
Plot 8-33. Conducted Average Output Power Plot
(NR_n71_10M_64QAM - Mid Channel, Port 0)



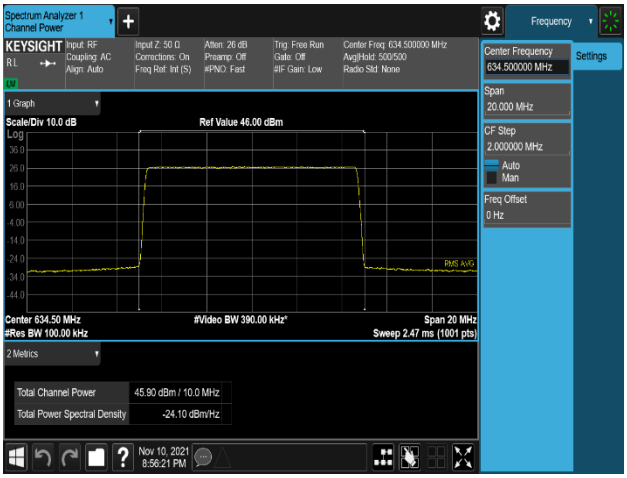
Plot 8-34. Conducted Average Output Power Plot
(NR_n71_10M_64QAM - Mid Channel, Port 1)



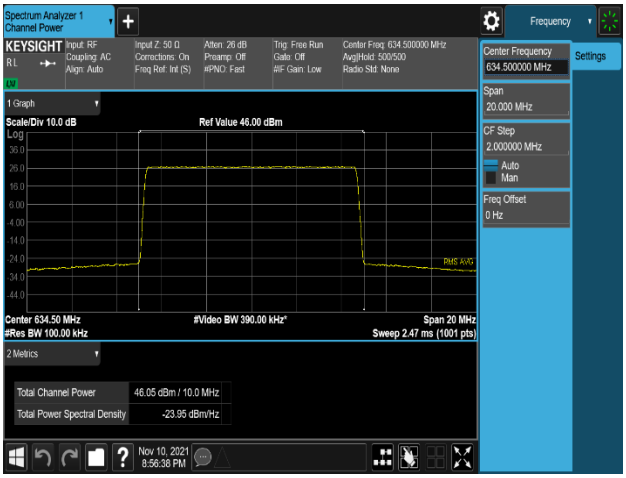
Plot 8-35. Conducted Average Output Power Plot
(NR_n71_10M_64QAM - Mid Channel, Port 2)



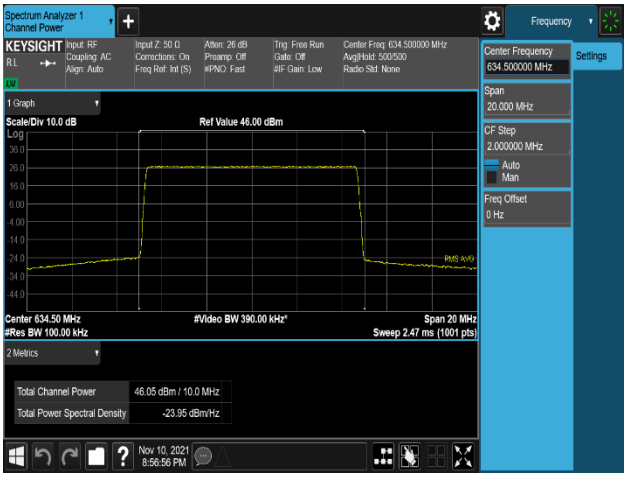
Plot 8-36. Conducted Average Output Power Plot
(NR_n71_10M_64QAM - Mid Channel, Port 3)



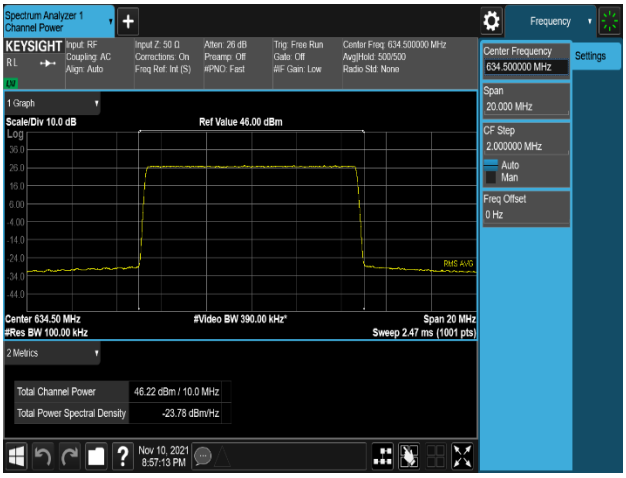
Plot 8-37. Conducted Average Output Power Plot
(NR_n71_10M_256QAM - Mid Channel, Port 0)



Plot 8-38. Conducted Average Output Power Plot
(NR_n71_10M_256QAM - Mid Channel, Port 1)



Plot 8-39. Conducted Average Output Power Plot
(NR_n71_10M_256QAM - Mid Channel, Port 2)



Plot 8-40. Conducted Average Output Power Plot
(NR_n71_10M_256QAM - Mid Channel, Port 3)

8.4 Peak To Average Power Ratio (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.

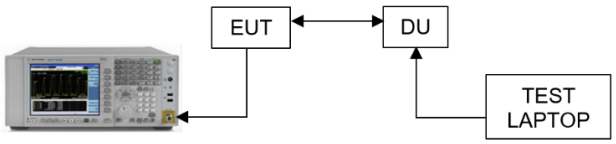


Figure 8-3. Test Instrument & Measurement Setup

Limit

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

Test Notes

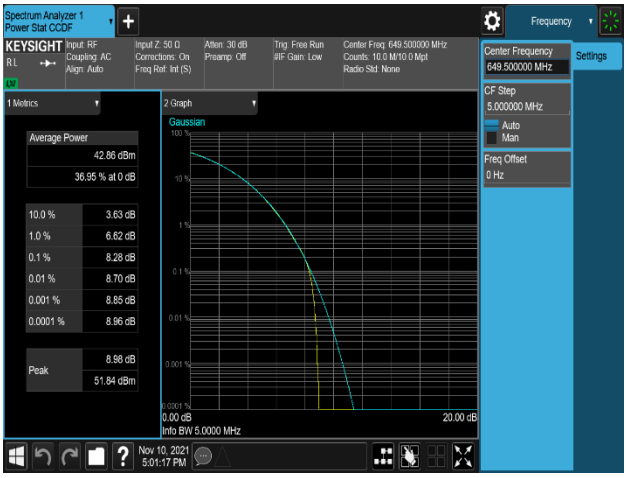
1. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.21	8.24	8.11	8.17	< 13
	1	8.20	8.25	8.11	8.19	< 13
	2	8.20	8.25	8.16	8.19	< 13
	3	8.20	8.23	8.10	8.18	< 13
Middle	0	8.21	8.25	8.13	8.19	< 13
	1	8.22	8.24	8.13	8.18	< 13
	2	8.21	8.25	8.16	8.17	< 13
	3	8.22	8.25	8.12	8.19	< 13
High	0	8.24	**8.28**	8.09	8.21	< 13
	1	8.24	8.20	8.08	8.21	< 13
	2	8.23	8.26	8.10	8.21	< 13
	3	8.24	8.25	8.08	8.20	< 13

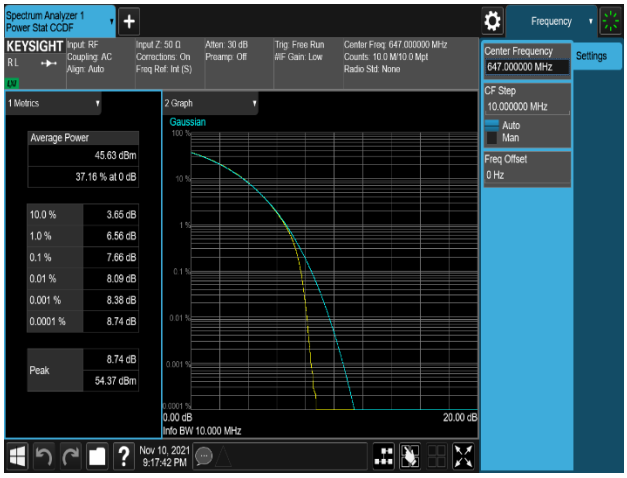
Table 8-6. Peak To Average Power Ratio Summary Data (NR_n71_5M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	7.57	7.54	7.58	7.54	< 13
	1	7.55	7.52	7.54	7.52	< 13
	2	7.57	7.54	7.60	7.55	< 13
	3	7.56	7.56	7.59	7.52	< 13
Middle	0	7.58	7.55	7.56	7.55	< 13
	1	7.57	7.54	7.55	7.54	< 13
	2	7.59	7.59	7.58	7.57	< 13
	3	7.57	7.56	7.57	7.54	< 13
High	0	**7.66**	7.59	7.65	7.65	< 13
	1	7.61	7.57	7.60	7.59	< 13
	2	7.65	7.60	7.62	7.61	< 13
	3	7.62	7.58	7.61	7.64	< 13

Table 8-7. Peak To Average Power Ratio Summary Data (NR_n71_10M)



Plot 8-41. Peak To Average Power Radio Plot
(NR_n71_5M_16QAM - High Channel, Port 0)



Plot 8-42. Peak To Average Power Radio Plot
(NR_n71_10M_QPSK - High Channel, Port 0)

8.5 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.

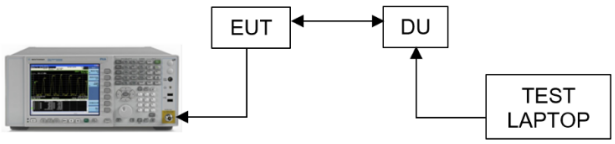


Figure 8-4. Test Instrument & Measurement Setup

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.

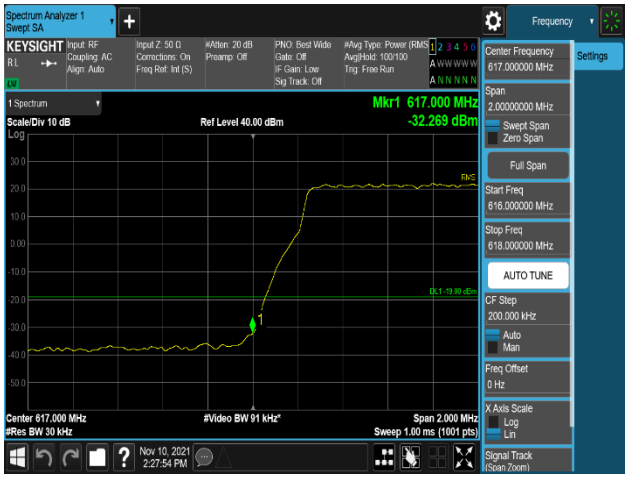
2. The highest values are highlighted in the following tables. The plots are presented only for the highlighted values.

Ch.	Port	Max. Value (dBm)				Limit (dBm)
		QPSK	16QAM	64QAM	256QAM	
Low	0	-34.46	-35.06	-33.34	-34.42	-19.0
	1	-34.60	-34.23	**-32.27**	-35.06	-19.0
	2	-35.24	-33.56	-33.91	-34.55	-19.0
	3	-33.77	-34.90	-32.30	-34.07	-19.0
High	0	-35.20	-35.92	-36.09	-33.99	-19.0
	1	-34.06	-34.18	**-32.02**	-33.41	-19.0
	2	-34.18	-33.49	-35.62	-34.53	-19.0
	3	-34.11	-35.22	-35.23	-36.55	-19.0

Table 8-8. Band Edge Emission Summary Data (NR_n71_5M)

Ch.	Port	Max. Value (dBm)				Limit (dBm)
		QPSK	16QAM	64QAM	256QAM	
Low	0	-36.26	-36.32	-35.73	-36.89	-19.0
	1	-35.11	-35.13	-34.81	-36.60	-19.0
	2	-33.94	-34.85	-36.85	-35.23	-19.0
	3	**-33.63**	-35.91	-35.80	-34.41	-19.0
High	0	-37.08	-34.89	-35.63	-37.18	-19.0
	1	-34.58	-35.90	**-32.48**	-35.04	-19.0
	2	-37.48	-38.67	-36.89	-34.95	-19.0
	3	-36.31	-34.45	-34.77	-35.14	-19.0

Table 8-9. Band Edge Emission Summary Data (NR_n71_10M)



Plot 8-43. Lower Band Edge Emission Plot
(NR_n71_5M_64QAM – Low Channel, Port 1)

Plot 8-44. Upper Band Edge Emission Plot
(NR_n71_5M_64QAM – High Channel, Port 1)

Plot 8-45. Lower Band Edge Emission Plot
(NR_n71_10M_QPSK – Low Channel, Port 3)

Plot 8-46. Upper Band Edge Emission Plot
(NR_n71_10M_64QAM – High Channel, Port 1)

8.6 Spurious and Harmonic Emissions at Antenna Terminal

§ 2.1051, § 27.53(g)

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at 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 frequency was set to 9 kHz and stop frequency was set to at least 10 * the fundamental frequency excluding the frequency range of the band edge measurement.
2. RBW: Please see test notes below.
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Number of sweep points ≥ 2 x Span/RBW
6. Trace mode = trace average
7. Sweep time = auto couple
8. 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.

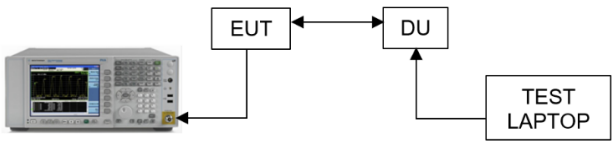


Figure 8-5. Test Instrument & Measurement Setup

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. Testing was conducted for all ports but worst port and worst modulation were reported.
3. To increase accuracy, the limit for the 9kHz to 150kHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: -39dBm = -19dBm -10log(100kHz/1kHz)].
   The limit for the 150kHz to 30MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: -29dBm = -19dBm -10log(100kHz/10kHz)].
   The required limit of -19dBm with a RBW of > 100kHz was used for all other frequency ranges.

Channel	Port	Measurement Range	Level (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	9 kHz to 150 kHz	-50.48	-50.43	-50.52	-50.48	-39.02	-11.41
		150 kHz to 30 MHz	-40.29	-40.11	-39.64	-39.25	-29.02	-10.23
		30 MHz to 616.9 MHz	-33.32	-32.11	-32.64	-33.11	-19.02	-13.09
		652.1 MHz to 1 GHz	-32.79	-32.38	-32.87	-33.09	-19.02	-13.36
		1 GHz to 3 GHz	-25.48	-25.39	-25.07	-25.24	-19.02	-6.05
		3 GHz to 8 GHz	-29.02	-29.21	-29.32	-29.19	-19.02	-10.00
	1	9 kHz to 150 kHz	-51.15	-51.78	-51.55	-51.45	-39.02	-12.13
		150 kHz to 30 MHz	-39.01	-38.86	-39.07	-40.03	-29.02	-9.84
		30 MHz to 616.9 MHz	-32.68	-33.13	-29.16	-32.18	-19.02	-10.14
		652.1 MHz to 1 GHz	-33.33	-32.62	-33.24	-33.42	-19.02	-13.60
		1 GHz to 3 GHz	-25.64	-25.33	-25.28	-25.46	-19.02	-6.26
		3 GHz to 8 GHz	-28.95	-28.79	-28.79	-29.02	-19.02	-9.77
	2	9 kHz to 150 kHz	-51.95	-51.91	-51.40	-51.48	-39.02	-12.38
		150 kHz to 30 MHz	-40.44	-39.65	-40.04	-39.60	-29.02	-10.58
		30 MHz to 616.9 MHz	-33.38	-33.57	-29.67	-31.93	-19.02	-10.65
		652.1 MHz to 1 GHz	-33.12	-32.28	-32.94	-33.17	-19.02	-13.26
		1 GHz to 3 GHz	-24.46	-24.61	-24.47	-24.22	-19.02	-5.20
		3 GHz to 8 GHz	-27.35	-27.35	-27.30	-27.30	-19.02	-8.28
	3	9 kHz to 150 kHz	-51.26	-52.19	-52.00	-51.80	-39.02	-12.24
		150 kHz to 30 MHz	-40.01	-40.98	-40.80	-40.29	-29.02	-10.99
		30 MHz to 616.9 MHz	-32.67	-31.30	-31.34	-31.10	-19.02	-12.08
		652.1 MHz to 1 GHz	-31.52	-31.79	-31.49	-31.11	-19.02	-12.09
		1 GHz to 3 GHz	-24.78	-24.46	-24.64	-24.54	-19.02	-5.44
		3 GHz to 8 GHz	-27.69	-27.31	-27.58	-27.55	-19.02	-8.29
Middle	0	9 kHz to 150 kHz	-49.72	-50.51	-51.34	-51.71	-39.02	-10.70
		150 kHz to 30 MHz	-39.99	-40.21	-38.19	-39.84	-29.02	-9.17
		30 MHz to 616.9 MHz	-36.10	-35.85	-36.11	-36.22	-19.02	-16.83
		652.1 MHz to 1 GHz	-35.29	-34.81	-35.12	-34.84	-19.02	-15.79
		1 GHz to 3 GHz	-25.48	-25.35	-25.73	-25.51	-19.02	-6.33
		3 GHz to 8 GHz	-28.91	-28.78	-29.18	-29.18	-19.02	-9.76
	1	9 kHz to 150 kHz	-50.73	-50.91	-51.30	-52.31	-39.02	-11.71
		150 kHz to 30 MHz	-40.13	-40.91	-41.11	-40.31	-29.02	-11.11
		30 MHz to 616.9 MHz	-36.50	-36.26	-36.32	-36.24	-19.02	-17.22
		652.1 MHz to 1 GHz	-34.79	-35.03	-34.13	-34.75	-19.02	-15.11
		1 GHz to 3 GHz	-25.17	-25.48	-25.23	-25.29	-19.02	-6.15
		3 GHz to 8 GHz	-28.87	-28.52	-28.89	-28.96	-19.02	-9.50

	2	9 kHz to 150 kHz	-52.42	-52.06	-51.95	-51.97	-39.02	-12.93
		150 kHz to 30 MHz	-40.35	-40.76	-39.76	-39.83	-29.02	-10.74
		30 MHz to 616.9 MHz	-35.64	-35.91	-36.12	-35.51	-19.02	-16.49
		652.1 MHz to 1 GHz	-35.38	-34.79	-34.73	-34.99	-19.02	-15.71
		1 GHz to 3 GHz	-24.35	-24.53	-24.45	-24.47	-19.02	-5.33
		3 GHz to 8 GHz	-27.34	-27.49	-27.36	-27.32	-19.02	-8.30
	3	9 kHz to 150 kHz	-51.94	-51.33	-51.60	-51.66	-39.02	-12.31
		150 kHz to 30 MHz	-41.15	-40.30	-40.35	-40.10	-29.02	-11.08
		30 MHz to 616.9 MHz	-36.57	-36.30	-36.70	-36.12	-19.02	-17.10
		652.1 MHz to 1 GHz	-31.47	-31.66	-30.93	-30.92	-19.02	-11.90
		1 GHz to 3 GHz	-24.35	-24.63	-24.59	-24.71	-19.02	-5.33
		3 GHz to 8 GHz	-27.48	-27.25	-27.62	-27.48	-19.02	-8.23
High	0	9 kHz to 150 kHz	-50.80	-50.80	-50.36	-50.13	-39.02	-11.11
		150 kHz to 30 MHz	-40.11	-39.31	-39.65	-40.58	-29.02	-10.29
		30 MHz to 616.9 MHz	-36.24	-36.10	-36.54	-36.54	-19.02	-17.08
		652.1 MHz to 1 GHz	-28.05	-26.48	-26.12	-26.94	-19.02	-7.10
		1 GHz to 3 GHz	-25.15	-25.38	-25.25	-25.45	-19.02	-6.13
		3 GHz to 8 GHz	-29.25	-29.29	-29.03	-29.27	-19.02	-10.01
	1	9 kHz to 150 kHz	-50.72	-51.69	**-50.78**	-50.45	-39.02	-11.43
		150 kHz to 30 MHz	-40.14	-39.78	**-40.28**	-39.20	-29.02	-10.18
		30 MHz to 616.9 MHz	-36.11	-36.16	**-35.82**	-36.03	-19.02	-16.80
		652.1 MHz to 1 GHz	-26.40	-25.74	**-24.15**	-25.93	-19.02	**-5.13**
		1 GHz to 3 GHz	-25.45	-25.30	**-25.51**	-25.26	-19.02	-6.24
		3 GHz to 8 GHz	-28.80	-28.88	**-28.86**	-28.90	-19.02	-9.78
	2	9 kHz to 150 kHz	-51.63	-51.48	-51.87	-51.39	-39.02	-12.37
		150 kHz to 30 MHz	-41.21	-40.16	-38.83	-39.13	-29.02	-9.81
		30 MHz to 616.9 MHz	-35.63	-36.06	-36.03	-36.22	-19.02	-16.61
		652.1 MHz to 1 GHz	-26.49	-25.46	-26.08	-27.37	-19.02	-6.44
		1 GHz to 3 GHz	-24.73	-24.32	-24.55	-24.31	-19.02	-5.29
		3 GHz to 8 GHz	-27.48	-27.49	-27.37	-27.38	-19.02	-8.35
	3	9 kHz to 150 kHz	-51.65	-51.65	-50.90	-51.29	-39.02	-11.88
		150 kHz to 30 MHz	-41.09	-39.93	-41.24	-39.36	-29.02	-10.34
		30 MHz to 616.9 MHz	-36.22	-36.67	-36.46	-36.18	-19.02	-17.16
		652.1 MHz to 1 GHz	-27.04	-25.64	-26.22	-26.86	-19.02	-6.62
		1 GHz to 3 GHz	-24.60	-24.44	-24.62	-24.65	-19.02	-5.42
		3 GHz to 8 GHz	-27.57	-27.51	-27.35	-27.40	-19.02	-8.33

Table 8-10. Conducted Spurious Emission Summary Data (NR_n71_5M)

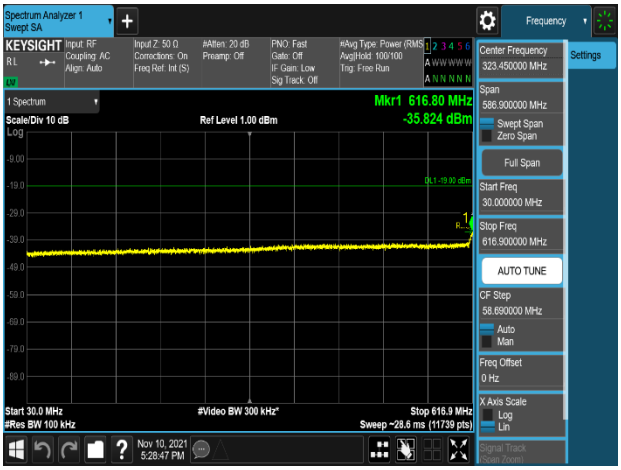
Channel	Port	Measurement Range	Level (dBm)				Limit (dBm)	Worst Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	9 kHz to 150 kHz	-51.61	-49.80	-50.89	-50.93	-39.02	-10.78
		150 kHz to 30 MHz	-40.25	-40.77	-40.40	-39.89	-29.02	-10.87
		30 MHz to 616.9 MHz	-31.61	-30.53	-30.32	-31.10	-19.02	-11.30
		652.1 MHz to 1 GHz	-33.00	-31.54	-33.27	-33.43	-19.02	-12.52
		1 GHz to 3 GHz	-25.57	-25.33	-25.28	-25.39	-19.02	-6.26
		3 GHz to 8 GHz	-29.41	-29.17	-29.20	-28.88	-19.02	-9.86
	1	9 kHz to 150 kHz	-51.09	-50.90	-51.41	-50.78	-39.02	-11.76
		150 kHz to 30 MHz	-40.91	-41.38	-40.59	-40.98	-29.02	-11.57
		30 MHz to 616.9 MHz	-30.41	-30.67	-31.48	-31.06	-19.02	-11.39
		652.1 MHz to 1 GHz	-33.04	-31.74	-32.87	-32.95	-19.02	-12.72
		1 GHz to 3 GHz	-25.30	-25.51	-25.43	-25.43	-19.02	-6.28
		3 GHz to 8 GHz	-29.07	-28.93	-28.85	-29.12	-19.02	-9.83
	2	9 kHz to 150 kHz	-52.13	-51.31	-51.41	-51.27	-39.02	-12.25
		150 kHz to 30 MHz	-39.67	-40.30	-39.98	-40.13	-29.02	-10.65
		30 MHz to 616.9 MHz	-30.76	-30.02	-29.86	-31.24	-19.02	-10.84
		652.1 MHz to 1 GHz	-32.84	-31.22	-32.82	-32.76	-19.02	-12.20
		1 GHz to 3 GHz	-24.68	-24.47	-24.45	-24.37	-19.02	-5.35
		3 GHz to 8 GHz	-27.50	-27.39	-27.47	-27.33	-19.02	-8.31
	3	9 kHz to 150 kHz	-50.76	-50.37	-51.23	-50.77	-39.02	-11.35
		150 kHz to 30 MHz	-39.55	-39.24	-40.33	-40.53	-29.02	-10.22
		30 MHz to 616.9 MHz	-32.57	-31.80	-30.83	-32.59	-19.02	-11.81
		652.1 MHz to 1 GHz	-30.86	-31.19	-31.06	-30.87	-19.02	-11.84
		1 GHz to 3 GHz	-24.75	-24.64	-24.81	-24.87	-19.02	-5.62
		3 GHz to 8 GHz	-27.40	-27.57	-27.45	-27.46	-19.02	-8.38
Middle	0	9 kHz to 150 kHz	-50.99	-51.22	-50.83	-50.91	-39.02	-11.81
		150 kHz to 30 MHz	-38.07	-38.59	-39.81	-39.58	-29.02	-9.05
		30 MHz to 616.9 MHz	-35.90	-36.00	-35.83	-35.87	-19.02	-16.81
		652.1 MHz to 1 GHz	-34.68	-34.99	-34.89	-34.91	-19.02	-15.66
		1 GHz to 3 GHz	-25.48	-25.70	-25.36	-25.63	-19.02	-6.34
		3 GHz to 8 GHz	-29.24	-29.10	-28.94	-29.01	-19.02	-9.92
	1	9 kHz to 150 kHz	-50.96	-51.20	-51.47	-51.18	-39.02	-11.94
		150 kHz to 30 MHz	-38.82	-40.26	-38.62	-39.39	-29.02	-9.60
		30 MHz to 616.9 MHz	-35.58	-35.19	-35.45	-35.23	-19.02	-16.17
		652.1 MHz to 1 GHz	-34.87	-34.32	-34.61	-34.39	-19.02	-15.30
		1 GHz to 3 GHz	-25.46	-25.35	-25.49	-25.16	-19.02	-6.14
		3 GHz to 8 GHz	-29.01	-28.82	-28.88	-28.86	-19.02	-9.80

	2	9 kHz to 150 kHz	-51.60	-51.73	-52.69	-51.37	-39.02	-12.35
		150 kHz to 30 MHz	-40.61	-39.56	-40.10	-39.48	-29.02	-10.46
		30 MHz to 616.9 MHz	-35.73	-36.10	-35.54	-35.51	-19.02	-16.49
		652.1 MHz to 1 GHz	-34.74	-35.09	-34.57	-34.45	-19.02	-15.43
		1 GHz to 3 GHz	-24.52	-24.69	-24.71	-24.55	-19.02	-5.50
		3 GHz to 8 GHz	-27.30	-27.34	-27.20	-27.18	-19.02	-8.16
	3	9 kHz to 150 kHz	-51.15	-51.03	-51.26	-50.90	-39.02	-11.88
		150 kHz to 30 MHz	-39.82	-39.24	-40.14	-41.32	-29.02	-10.22
		30 MHz to 616.9 MHz	-35.92	-36.02	-35.62	-35.47	-19.02	-16.45
		652.1 MHz to 1 GHz	-31.46	-31.47	-31.23	-31.04	-19.02	-12.02
		1 GHz to 3 GHz	-24.61	-24.78	-24.58	-24.58	-19.02	-5.56
		3 GHz to 8 GHz	-27.63	-27.58	-27.45	-27.48	-19.02	-8.43
High	0	9 kHz to 150 kHz	-50.78	-51.59	-50.76	-50.83	-39.02	-11.74
		150 kHz to 30 MHz	-40.36	-39.68	-38.38	-38.93	-29.02	-9.36
		30 MHz to 616.9 MHz	-35.88	-35.66	-36.10	-35.76	-19.02	-16.64
		652.1 MHz to 1 GHz	-32.44	-32.95	-31.93	-32.64	-19.02	-12.91
		1 GHz to 3 GHz	-25.50	-25.38	-25.46	-25.29	-19.02	-6.27
		3 GHz to 8 GHz	-28.99	-29.19	-28.95	-29.08	-19.02	-9.93
	1	9 kHz to 150 kHz	-51.71	-51.41	-51.52	-50.90	-39.02	-11.88
		150 kHz to 30 MHz	-40.55	-39.49	-39.94	-40.12	-29.02	-10.47
		30 MHz to 616.9 MHz	-35.70	-35.85	-35.52	-35.62	-19.02	-16.50
		652.1 MHz to 1 GHz	-29.87	-31.40	-31.00	-30.33	-19.02	-10.85
		1 GHz to 3 GHz	-25.11	-25.45	-25.17	-25.45	-19.02	-6.09
		3 GHz to 8 GHz	-28.82	-28.86	-28.81	-28.76	-19.02	-9.74
	2	9 kHz to 150 kHz	-52.01	-52.23	-52.00	-51.34	-39.02	-12.32
		150 kHz to 30 MHz	-38.86	-40.58	-39.44	-38.86	-29.02	-9.84
		30 MHz to 616.9 MHz	-36.10	-36.23	-35.24	-35.93	-19.02	-16.22
		652.1 MHz to 1 GHz	-32.15	-29.60	-31.98	-32.21	-19.02	-10.58
		1 GHz to 3 GHz	-24.35	-24.58	-24.65	-24.66	-19.02	-5.33
		3 GHz to 8 GHz	-27.23	-27.37	-27.10	-27.23	-19.02	-8.08
	3	9 kHz to 150 kHz	**-50.95**	-51.94	-51.31	-51.77	-39.02	-11.93
		150 kHz to 30 MHz	**-40.87**	-39.19	-39.89	-40.11	-29.02	-10.17
		30 MHz to 616.9 MHz	**-35.84**	-35.55	-36.08	-36.06	-19.02	-16.53
		652.1 MHz to 1 GHz	**-30.24**	-30.88	-30.85	-30.97	-19.02	-11.22
		1 GHz to 3 GHz	**-24.13**	-24.40	-24.59	-24.53	-19.02	**-5.11**
		3 GHz to 8 GHz	**-27.12**	-27.41	-27.50	-27.50	-19.02	-8.10

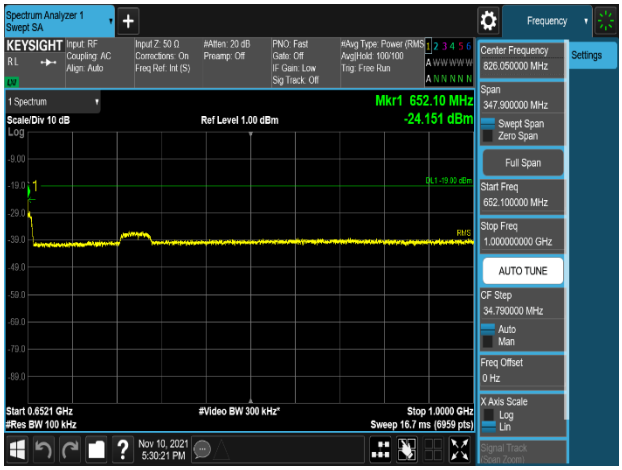
Table 8-11. Conducted Spurious Emission Summary Data (NR_n71_10M)

Plot 8-47. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(NR_n71_5M_64QAM - High Channel, Port 1)

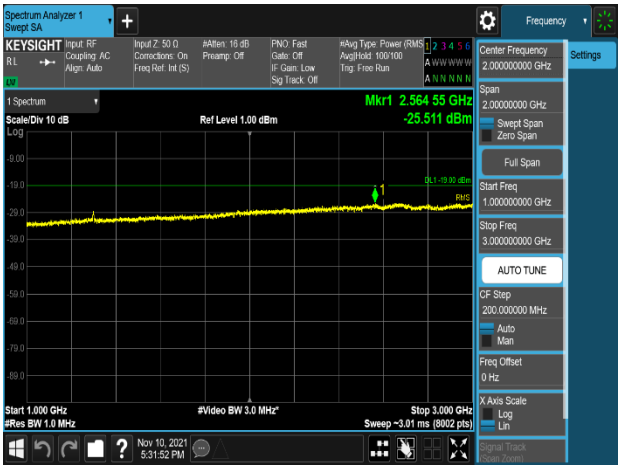
Plot 8-48. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(NR_n71_5M_64QAM - High Channel, Port 1)



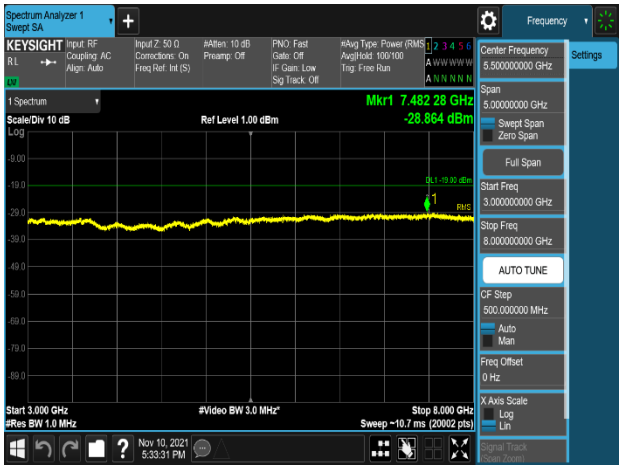
Plot 8-49. Conducted Spurious Emission Plot
30 MHz to 616.9 MHz
(NR_n71_5M_64QAM - High Channel, Port 1)



Plot 8-50. Conducted Spurious Emission Plot
652.1 MHz to 1 GHz
(NR_n71_5M_64QAM - High Channel, Port 1)



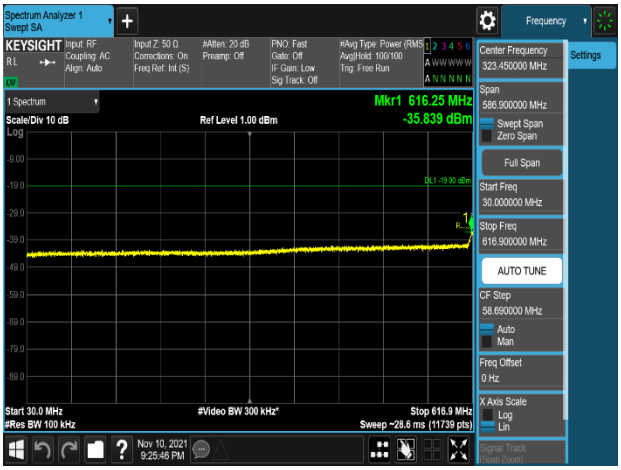
Plot 8-51. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(NR_n71_5M_64QAM - High Channel, Port 1)



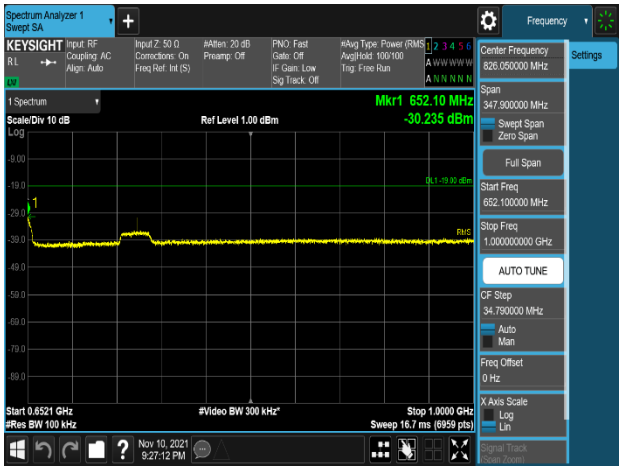
Plot 8-52. Conducted Spurious Emission Plot
3 GHz to 8 GHz
(NR_n71_5M_64QAM - High Channel, Port 1)

Plot 8-53. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(NR_n71_10M_QPSK - High Channel, Port 3)

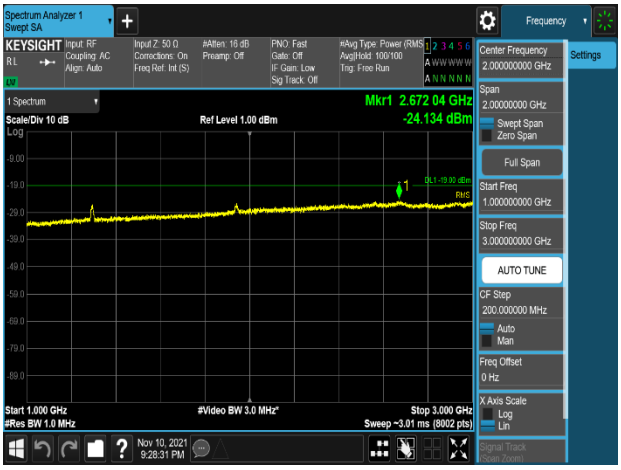
Plot 8-54. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(NR_n71_10M_QPSK - High Channel, Port 3)



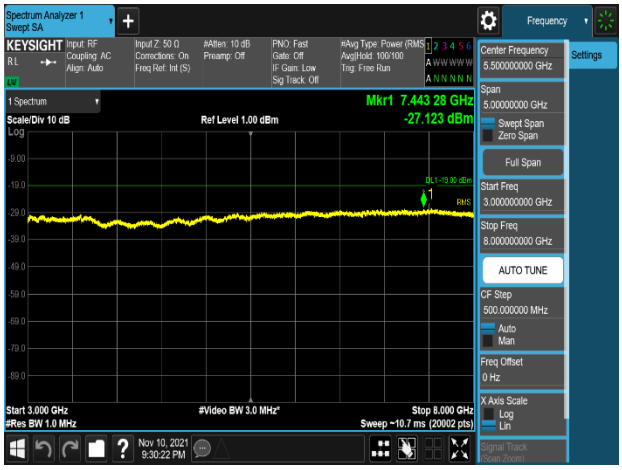
Plot 8-55. Conducted Spurious Emission Plot
30 MHz to 616.9 MHz
(NR_n71_10M_QPSK - High Channel, Port 3)



Plot 8-56. Conducted Spurious Emission Plot
652.1 MHz to 1 GHz
(NR_n71_10M_QPSK - High Channel, Port 3)



Plot 8-57. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(NR_n71_10M_QPSK - High Channel, Port 3)



Plot 8-58. Conducted Spurious Emission Plot
3 GHz to 8 GHz
(NR_n71_10M_QPSK - High Channel, Port 3)

8.7 Radiated spurious emission

§ 2.1051, § 27.53(g)

Test Overview

Radiated spurious emissions measurements are performed using the field strength method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizonally polarized broadband trilog antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedure Used

ANSI C63.26 - Section 5.5.3.2

Test Setting

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10 * the fundamental frequency
2. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1GHz
3. VBW ≥ 3 x RBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = Below 1 GHz Peak for the prescan, (In cases where the level is within 2 dB of the limit, the final measurement is taken using RMS detector.)

   Above 1GHz RMS for the prescan
6. Trace mode = Max Hold (In cases where the level is within 2 dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. 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.

Test Setup

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

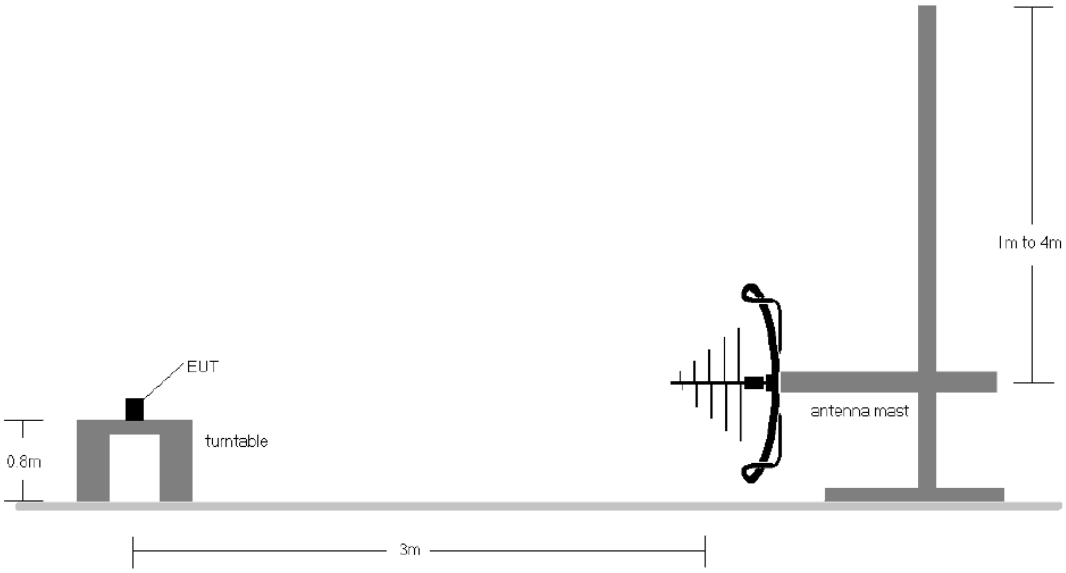


Figure 8-6. Test Instrument & Measurement Setup < 1GHz

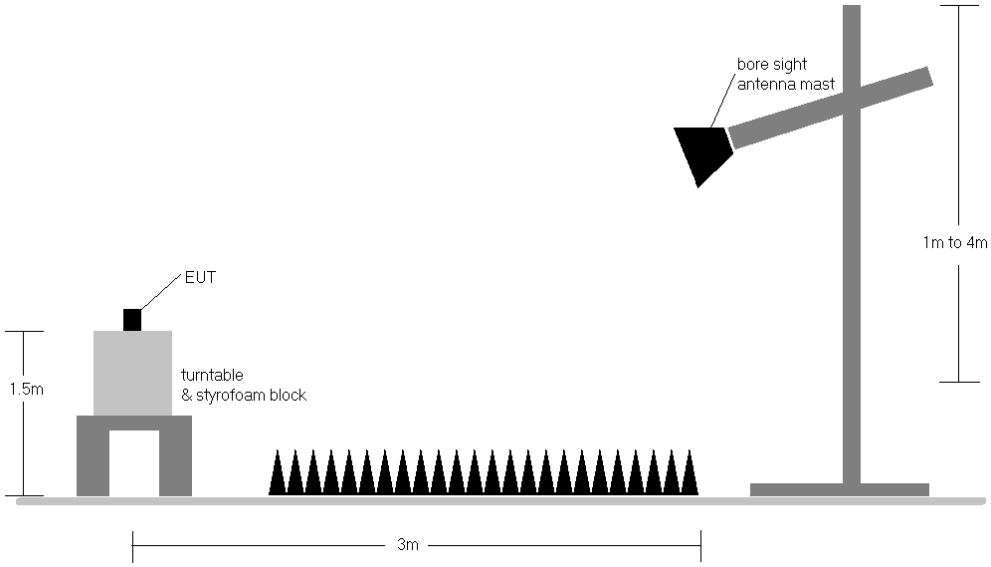


Figure 8-7. Test Instrument & Measurement Setup > 1GHz

Test Notes

1. The average EIRP reported below is calculated per 5.2.7 of ANSI C63.26-2015 which states:

   The measured e.i.r.p is converted to E-field in V/m. Then the distance correction is applied before converted back to calculated e.i.r.p.as explained in KDB 971168 D01 D01 v03r01.

Effective Isotropic Radiated Power Sample Calculation

Field Strength [dBµV/m] = Measured Value [dBm] + AFCL [dB/m] + 107

= -63.05 dBm + 17.38 dBm + 107 = 61.33 dBµV/m

e.i.r.p. [dBm] = E[dB μV/m] + 20 $\log_{10}$(d[m]) - 104.8

= 61.33 + (20*log (3)) - 104.8

= -33.87 dBm e.i.r.p.

*AFCL (dB/m) contains measurement antenna factor(dB/m) and cable loss(dB) as below:

Frequency [MHz]	Antenna Factor (dB/m)	Cable loss + PAM [dB]	AFCL (dB/m)
797.69	21.66	2.40	24.07
7007.85	36.20	-18.82	17.38

Table 8-12. Adopted AFCL value in the calculation

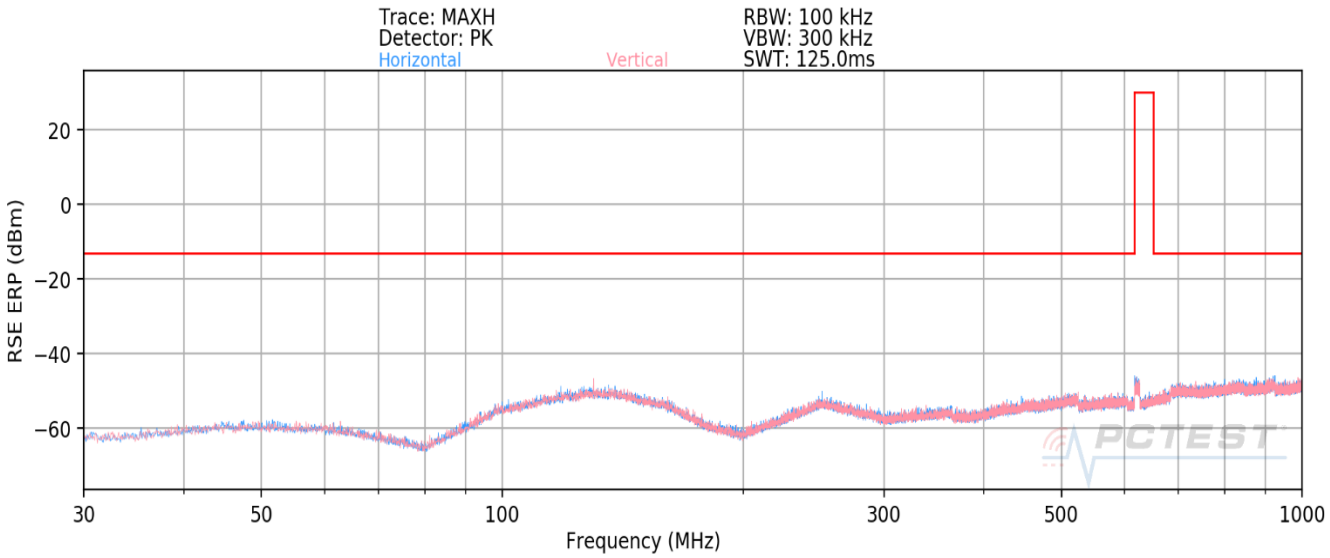
2. The EUT was tested in both horizontal and vertical antenna polarizations and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, channel bandwidth configurations shown in the tables below.

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

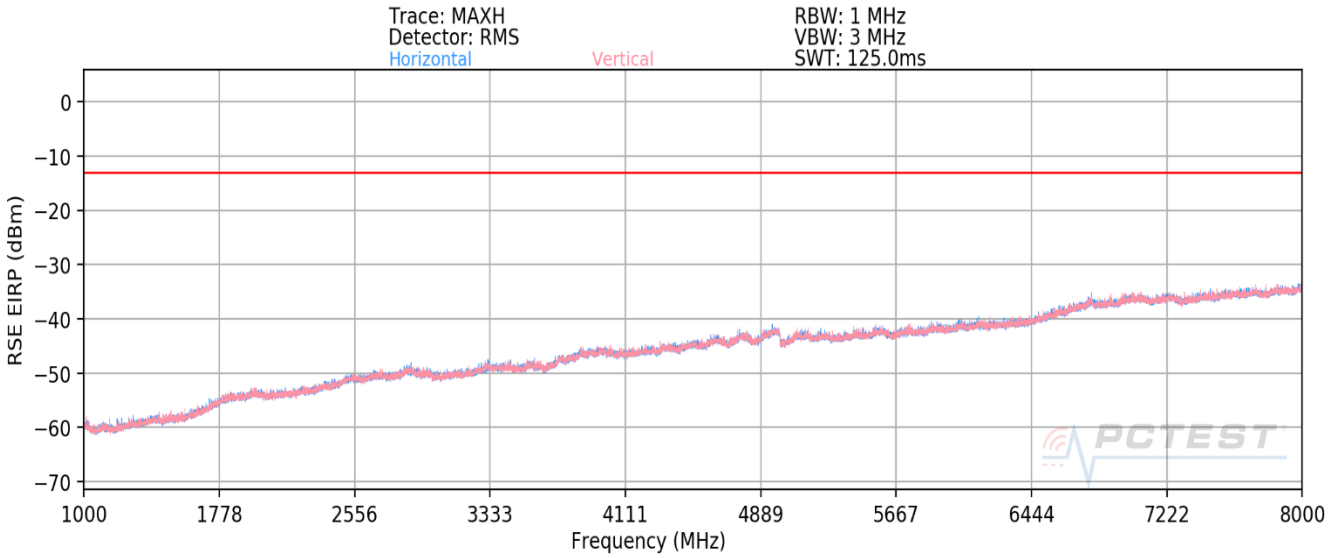
4. Emissions below 10 GHz were measured at a 3 meter test distance.

5. Spurious emissions were measured with all EUT antennas transmitting simultaneously.

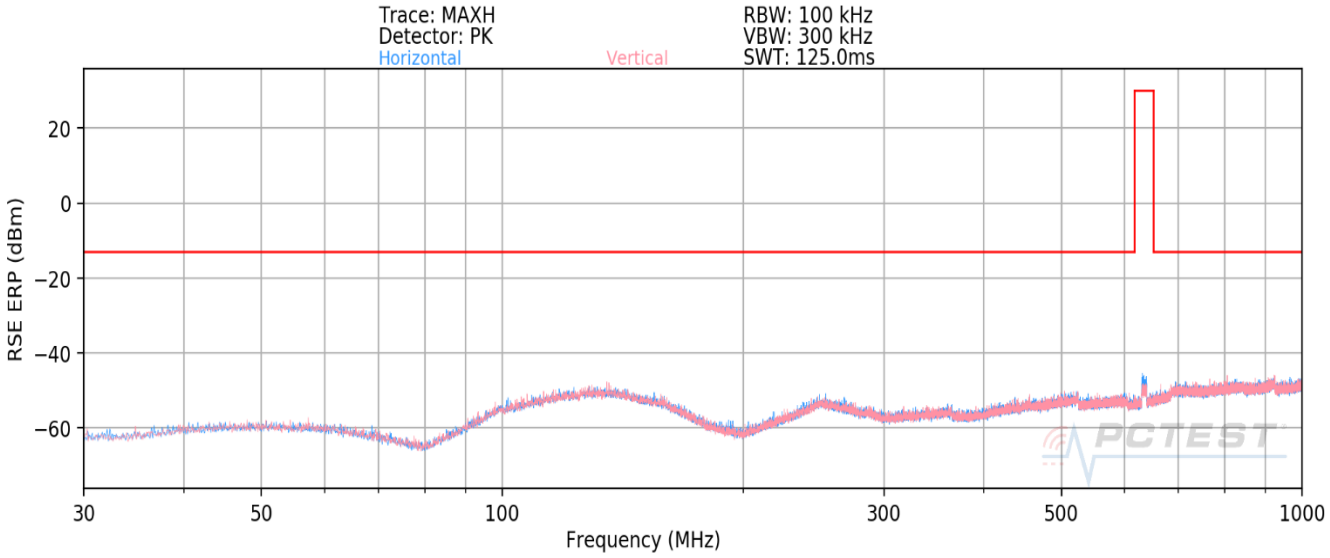
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.



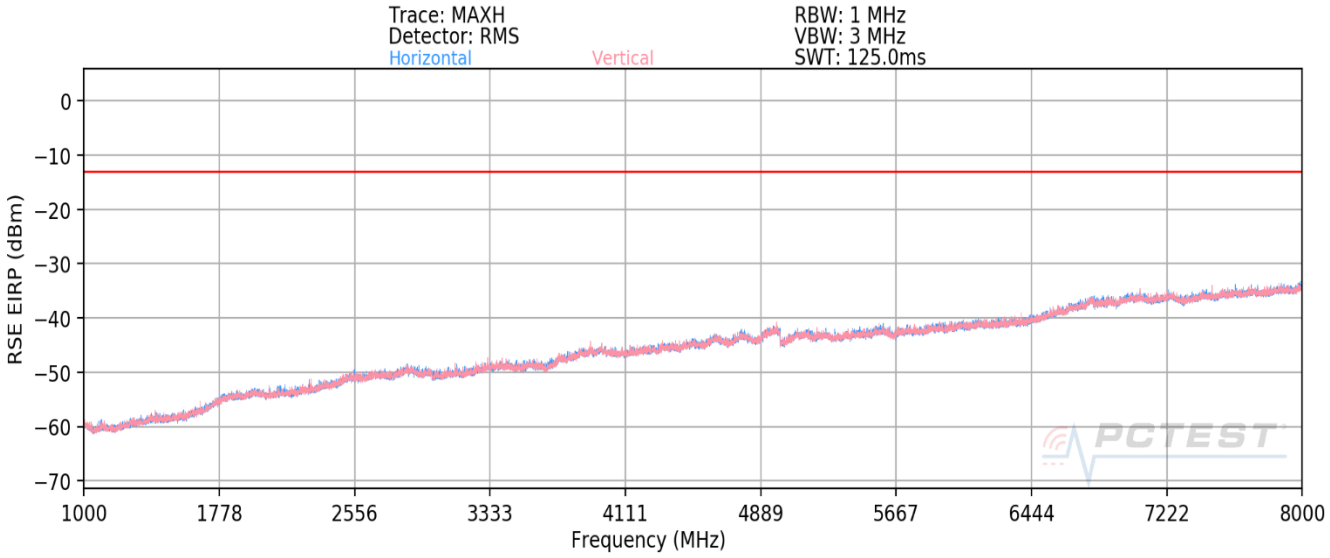
Plot 8-59. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_n71_10M_QPSK - Low Channel)



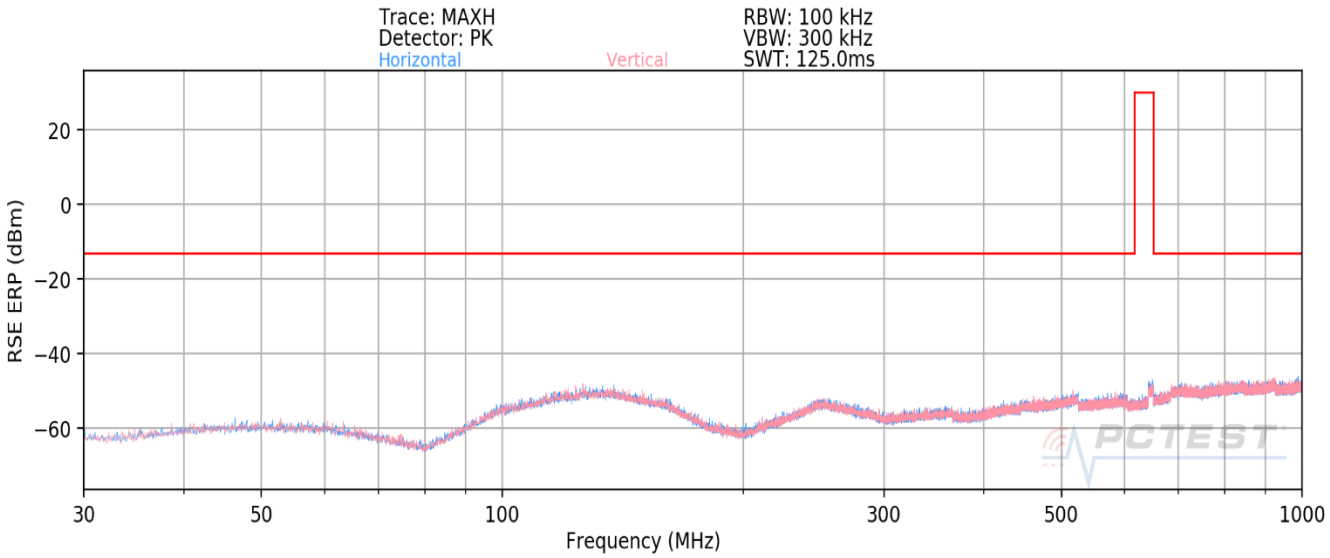
Plot 8-60. Radiated spurious emission Plot_1 GHz to 8 GHz (NR_n71_10M_QPSK - Low Channel)



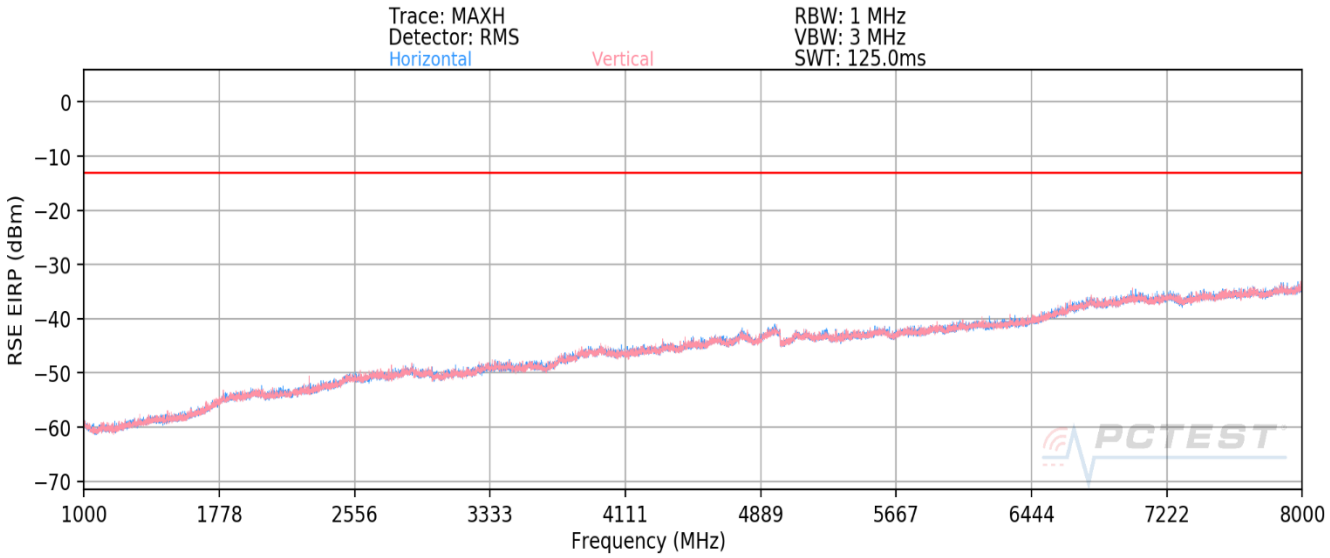
Plot 8-61. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_n71_10M_QPSK - Mid Channel)



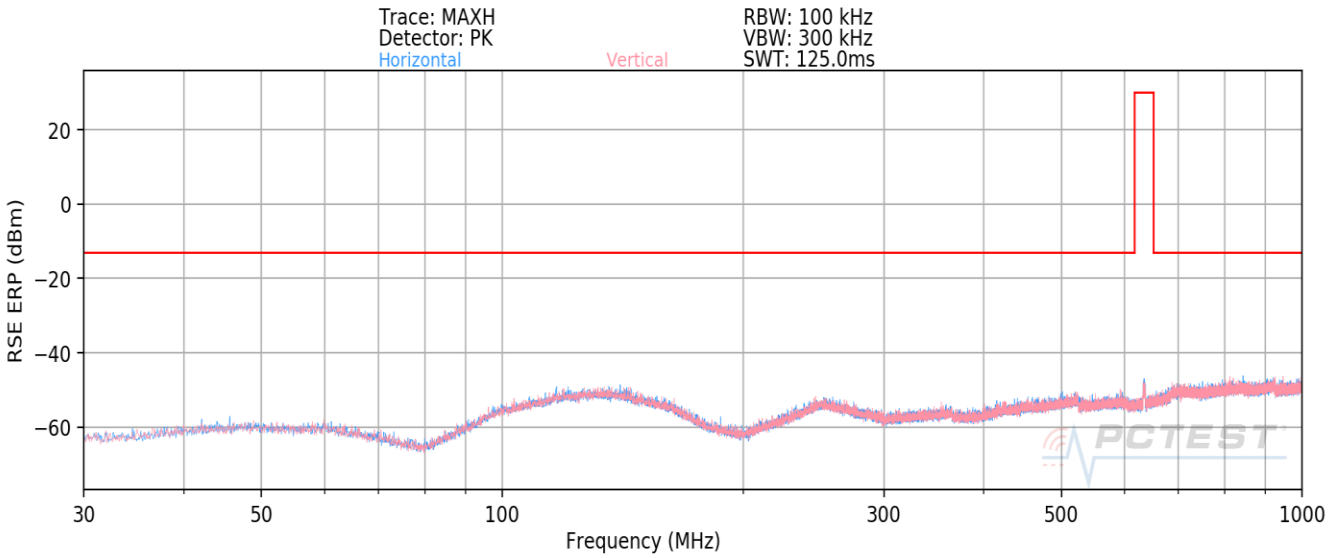
Plot 8-62. Radiated spurious emission Plot_1 GHz to 8 GHz (NR_n71_10M_QPSK - Mid Channel)



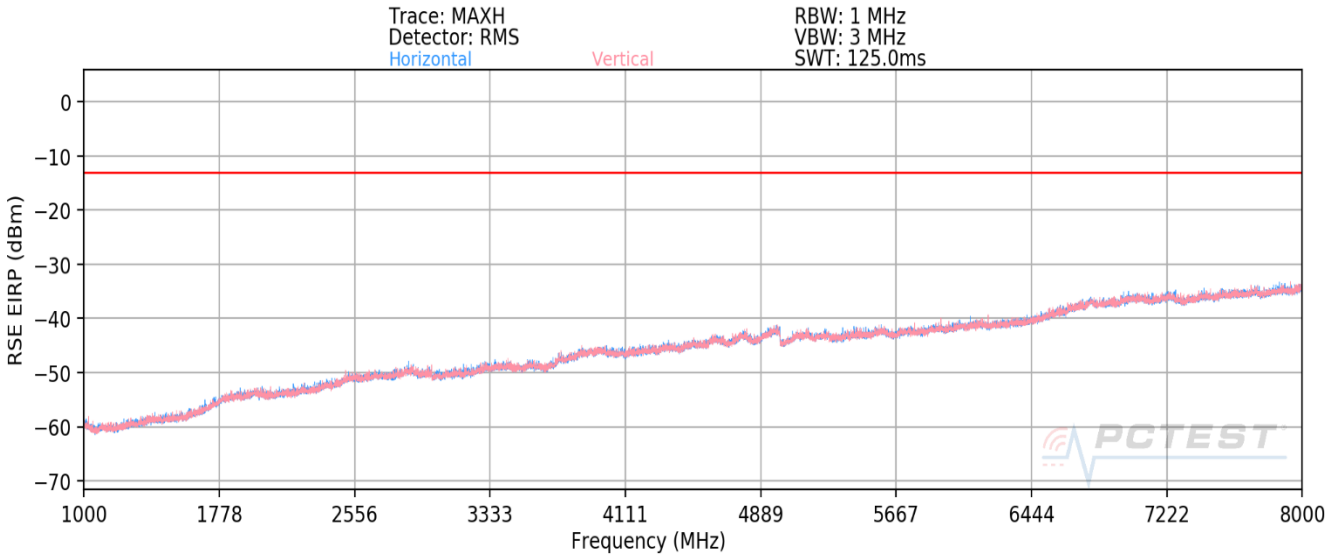
Plot 8-63. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_n71_10M_QPSK - High Channel)



Plot 8-64. Radiated spurious emission Plot_1 GHz to 8 GHz (NR_n71_10M_QPSK - High Channel)



Plot 8-65. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_n71_5M_QPSK – Mid Channel)



Plot 8-66. Radiated spurious emission Plot_30 MHz to 1000 MHz (NR_n71_5M_QPSK – Mid Channel)

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Heigh [cm]	Turntable azimuth [degree]	Analyzer Level [dBm/MHz]	AFCL [dBm]	Field Stength [dBμV/m]	RSE EIRP [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
797.69	H	241	150	-89.13	24.07	41.94	-53.26	-13.00	-40.26
797.72	V	234	100	-90.52	24.07	40.55	-54.65	-13.00	-41.65
7007.82	H	145	150	-63.05	-18.82	61.33	-33.87	-13.00	-20.87
7008.45	V	189	150	-63.41	-18.81	60.98	-34.22	-13.00	-21.22

Table 8-13. Radiated spurious emission worst case Table
(NR_n71_10M_QPSK – Mid Channel)

8.8 Frequency Stability / Temperature Variation

§ 2.1055

Test Overview and Limit

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

a.) **Temperature:** The temperature is varied from -30°C, +20°C and +50°C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for DC powered equipment.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

Test Setting

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made -30°C, +20°C and +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limit

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

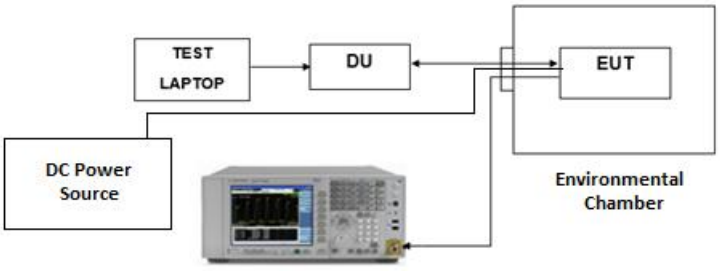


Figure 8-8. Test Instrument & Measurement Setup

Test Notes

N/A

OPERATING FREQUENCY: 634,500,000 Hz

REFERENCE VOLTAGE: -48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	+ 20 (Ref)	634,500,000.02	0.00	0.0000000
100 %		- 30	634,499,999.31	-0.71	-0.0000001
100 %		- 20	634,500,001.13	1.11	0.0000002
100 %		- 10	634,499,998.53	-1.49	-0.0000002
100 %		0	634,500,001.62	1.60	0.0000003
100 %		+ 10	634,499,998.08	-1.94	-0.0000003
100 %		+ 20	634,500,000.02	0.00	0.0000000
100 %		+ 30	634,500,001.11	1.09	0.0000002
100 %		+ 40	634,500,000.82	0.80	0.0000001
100 %		+ 50	634,499,998.26	-1.76	-0.0000003
85 %	-40.80	+ 20	634,499,999.56	-0.46	-0.0000001
115 %	-55.20	+ 20	634,500,000.50	0.48	0.0000001

Table 8-14. Frequency Stability Data (NR_n71_10M – Mid Channel)

Note:
Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore, the device is determined to remain operating in band over the temperature and voltage range as tested.

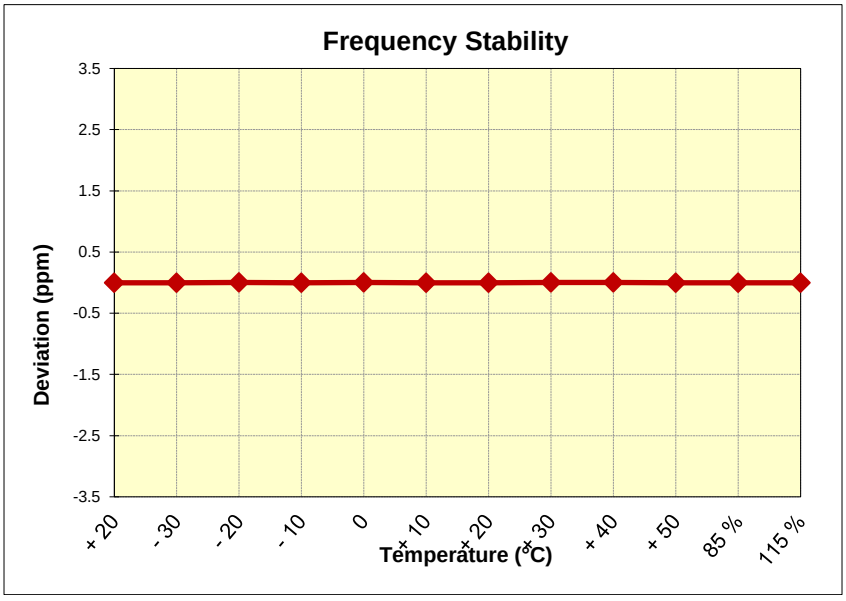


Figure 8-9. Frequency Stability Graph (NR_n71_10M – Mid Channel)

9.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung RRU (RF4435d) FCC ID: A3LRF4435D-71A** complies with all of the requirements of Part 27 FCC Rules.