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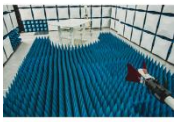

TEST REPORT
PART 27, 90 MEASUREMENT REPORT

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

Date of Testing:
08/01/2022 - 08/17/2022
Test Site/Location:
Element Lab., Suwon,
Yongin-si, Gyeonggi-do, Korea
Test Report Serial No.:
8K22051701-00-R1.A3L

FCC ID:	**A3LRF4450T-71A**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	RF4450t-71A
EUT Type:	RRU(RF4450t)
FCC Classification:	Licensed Non-Broadcast Station Transmitter
FCC Rule Part(s):	§27, §90(S)
Test Procedure(s):	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 662911 D01 v02r01

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

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

ACCREDITED
CERT #2041.04

Prepared by Jonathan Jang
Test Engineer

Reviewed by Charles.Shin
Technical Manager

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Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
NR_1C_5M	864 to 869	45.63	36.54	4M47G7D	QPSK
		45.54	35.79	4M49W7D	QAM

5G NR n26 EUT Overview

Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
NR_1C_5M	718 to 728	48.61	72.55	4M48G7D	QPSK
		48.64	73.05	4M50W7D	QAM

5G NR n29 EUT Overview

Mode	Tx Frequency (MHz)	Total Conducted output power		Max Emission Designator	Modulation
		Max. Power (dBm)	Max. Power (W)		
NR_1C_10M	617 to 652	51.71	148.37	9M29G7D	QPSK
		51.72	148.48	9M31W7D	QAM

5G NR n71 EUT Overview

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

1.0 REVISION RECORD

Issue Number	Issued Date	Revision History
8K22051701-00.A3L	08/18/2022	Initial Issue
8K22051701-00-R1.A3L	08/22/2022	Revision due to updated Test Setup information

2.0 INTRODUCTION

2.1 Scope

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

2.2 Element Test Location

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

2.3 Test Facility / Accreditation

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

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

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

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

3.0 PRODUCT INFORMATION

3.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung RRU(RF4450t) FCC ID: A3LRF4450T-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 and 90.

3.2 Device Capabilities

This device supports the following conditional features and filter information:

EUT Type	RRU (RF4450t)		
Model Name	RF4450t-71A		
Test Device Serial No	S618614983		
Device Capabilities:	5G NR		
Operating Band/Frequency Range:	Band	Tx (Downlink)	Rx (Uplink)
	n26:	864 MHz to 869 MHz	819 MHz to 824 MHz
	n29:	718 MHz to 728 MHz	N/A
	n71:	617 MHz to 652 MHz	663 MHz to 698 MHz
Supported Modulation	QPSK, 16QAM, 64QAM, 256QAM		
n26 Supported Number of Carriers and Channel Bandwidth	NR: 5MHz bandwidth 1CC mode for 5G NR Band n26		
n29 Supported Number of Carriers and Channel Bandwidth	NR: 5MHz bandwidth 1CC mode for 5G NR Band n29		
n71 Supported Number of Carriers and Channel Bandwidth	NR: 10MHz bandwidth 1CC mode for 5G NR Band n71		
Inter-Band Carrier Aggregation Supported Number of Carriers and Channel Bandwidth	n26, n29 and n71 with up to 3CC aggregated of Max. Bandwidth 20 MHz		
Maximum Output Power	n26	Total 40 W	
	n29	Total 80 W	
	n71	Total 160 W	
Number of Antenna ports	4TX Configuration		
Supported Configurations	Single carrier, Inter-Band Carrier Aggregation		
Input Voltage:	-48 VDC		
Antenna:	Antenna is not provided by manufacture		

3.3 Test Configuration

The setup is as follows:

a) The EUT ("RRU(RF4450t)") and a Cabinet Digital Unit (CDU) are each powered by -48V DC power supply.
b) The CDU is connected to a test laptop via an ethernet cable acting as backhaul.
c) CDU 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 Cabinet Digital Unit (CDU) authorized under SDoC.

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

For Inter-Band Carrier Aggregation configuration, the QPSK modulation worst case was found while operating with all modulation and only the worst-case data were reported.

The n29 duplex mode is SDL (Supplemental Downlink) designed exclusively for downlink. It cannot operate n29 alone, and operate with uplink of other bands.

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

n26 Single Carrier Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)	Rated Power (W/path)
			Middle	
NR_1C_5M	1	5	866.5	10

n29 Single Carrier Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		Rated Power (W/path)
			Lowest	Highest	
NR_1C_5M	1	5	720.5	725.5	20

n71 Single Carrier Configuration	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)			Rated Power (W/path)
			Lowest	Middle	Highest	
NR_1C_10M	1	10	622	634.5	647	40

Inter-Band Carrier Aggregation	No. of Carriers	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)	Rated Power (W/path)
			Middle	
NR n71_1C_10M+ n29_1C_5M+ n26_1C_5M	3	10+5+5	622 + 720.5 + 866.5	70

3.4 EMI Suppression Device(s)/Modifications

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

4.0 DESCRIPTION OF TESTS

4.1 Measurement Procedure

The measurement procedures described in the document titled “American National Standard for Compliance Testing of Transmitter Used in Licensed Radio Service” (ANSI C63.26-2015) and the guidance provided in KDB 842590 D01 v01r01 were used in the measurement of the EUT.

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

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

Peak-to-Average Power Ratio:
KDB 971168 D01 v03r01 – Section 5.7
ANSI C63.26-2015 – Section 5.2.3.4

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

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

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

Frequency Stability / Temperature Variation
KDB 971168 D01 v03r01 – Section 9
ANSI C63.26-2015 – Section 5.6

4.2 Measurement Software

Test item	Name	Version
Conducted Measurement	Node B automation	1.0

5.0 MEASUREMENT UNCERTAINTY

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

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

6.0 TEST EQUIPMENT CALIBRATION DATA

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

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

Table 6-1. Test Equipment

Notes:

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

2. All testing was performed before the calibration due date.

7.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 4M47G7D

Occupied Bandwidth = 4.47 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 9M31W7D

Occupied Bandwidth = 9.31 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: A3LRF4450T-71A

FCC Classification: Licensed Non-Broadcast Station Transmitter

Mode(s): 5G NR

FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
§ 2.1046	Conducted Average Output Power	N/A	CONDUCTED	PASS	Annex 1
§ 2.1049	Occupied Bandwidth	N/A		PASS	Section 8.2
§ 2.1046, § 27.50(c)	Equivalent Isotropic Radiated Power (Power Spectral Density)	< 1000 W/MHz		PASS	Section 8.3 (Note 4)
§ 2.1046,	Peak-to-average ratio	N/A		PASS	Section 8.4
§ 2.1051, § 27.53(g)	Band Edge Emissions and Emission Mask at Antenna Terminal	> 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions		PASS	Section 8.5
§ 2.1051, § 27.53(g)	Spurious and Harmonic Emissions at Antenna Terminal			PASS	Section 8.6
§ 2.1055 § 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 8.7
§ 2.1055, § 27.53(g)	Radiated unwanted emission	> 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions	RADIATED	PASS	Section 8.8

Table 8-1. Summary of Rule part 27 Test Results

FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
§ 2.1046	Conducted Average Output Power	N/A	CONDUCTED	PASS	Annex 1
§ 2.1049	Occupied Bandwidth	N/A		PASS	Section 8.2
§ 2.1046, § 90.635	Equivalent Isotropic Radiated Power (Power Spectral Density)	< 100 W		PASS	Section 8.3 (Note 4)
§ 2.1046,	Peak-to-average ratio	N/A		PASS	Section 8.4
§ 2.1051, § 90(S).691(a)	Band Edge Emissions and Emission Mask at Antenna Terminal	> 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions except > 50 + log10(P[Watts]) at Band Edge and all out-of-band emissions within 37.5kHz of Block Edge		PASS	Section 8.5
§ 2.1051, § 90(S).691(a)	Spurious and Harmonic Emissions at Antenna Terminal			PASS	Section 8.6
§ 2.1055 § 90.213	Frequency Stability	< 1.5 ppm		PASS	Section 8.7
§ 2.1055, § 90(S).691(a)	Radiated unwanted emission	> 43 + log10(P[Watts]) at Band Edge and all out-of-band emissions	RADIATED	PASS	Section 8.8

Table 8-2. Summary of Rule part 90 Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

2) The analyzer plots were all taken with a correction table loaded into the analyzer.

3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

4) The maximum antenna gain is determined at the time of licensing depending on the geographical location of the base station

8.2 Occupied Bandwidth

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 – Section 4.3

ANSI C63.26-2015 – Section 5.4.4

Test Setting

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

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

Test Setup

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

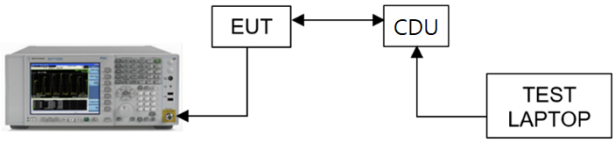


Figure 8-1. Test Instrument & Measurement Setup

Test Notes

None

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Middle	0	4.45	**4.49**	4.46	4.46
	1	**4.47**	4.46	4.46	4.47
	2	4.46	4.48	4.45	4.46
	3	4.46	4.47	4.48	4.48

Table 8-3. Occupied Bandwidth Summary Data (NR_n26_1C_5M)

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

Table 8-4. Occupied Bandwidth Summary Data (NR_n29_1C_5M)

Channel	Port	OBW (MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	9.28	9.25	9.30	9.29
	1	9.28	9.24	9.27	9.28
	2	9.28	9.25	9.30	9.29
	3	9.28	9.20	9.29	9.27
Middle	0	9.28	9.25	9.29	9.26
	1	**9.29**	9.25	9.29	9.29
	2	9.28	9.26	9.29	9.30
	3	9.27	9.24	9.30	9.29
High	0	9.28	9.21	9.28	9.28
	1	9.27	9.23	9.27	9.28
	2	9.27	9.23	**9.31**	9.29
	3	9.27	9.20	9.28	9.27

Table 8-5. Occupied Bandwidth Summary Data (NR_n71_1C_10M)

Plot 8-1. Occupied Bandwidth Plot
(n26_1C_5M_QPSK - Mid Channel, Port 1)

Plot 8-2. Occupied Bandwidth Plot
(n26_1C_5M_16QAM - Mid Channel, Port 0)

Plot 8-3. Occupied Bandwidth Plot
(n29_1C_5M_QPSK - Low Channel, Port 0)

Plot 8-4. Occupied Bandwidth Plot
(n29_1C_5M_16QAM - Low Channel, Port 1)

Plot 8-5. Occupied Bandwidth Plot
(n71_1C_10M_QPSK - Mid Channel, Port 1)

Plot 8-6. Occupied Bandwidth Plot
(n71_1C_10M_64QAM - High Channel, Port 2)

8.3 Equivalent Isotropic Radiated Power (Power Spectral Density)

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedure Used

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

Test Setting

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

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

Test Setup

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

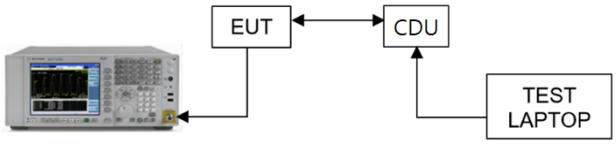


Figure 8-2. Test Instrument & Measurement Setup

Limit

N/A

Test Notes

1. Consider the following factors for MIMO:
   The output power per each port is measured as dBm/MHz or dBm, the output powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01 - Section E) 2).

2. The EIRP Limit is determined at the time of licensing depending on the geographical location of the base station.

3. The output power per port (dBm/MHz or dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO Conducted Power (mW). We convert this back to logarithmic scale for further output power calculations.

4. All transmit signals from different antennas are completely uncorrelated with each other. So the maximum 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 10671.07 milliWatts
   b)

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		10671.07	mW/MHz
Summed MIMO Conducted Power (dBm)	= 10 * log (10671.07) =	40.28	dBm/MHz

Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Middle	0	**34.15**	34.19	34.21	34.20
	1	**34.78**	34.67	34.26	34.00
	2	**33.98**	34.04	34.01	34.06
	3	**34.09**	34.04	33.95	34.02
Total MIMO PSD Power (mW)		**10671.07**	10625.37	10304.00	10212.47
Total MIMO PSD Power (dBm)		**40.28**	40.26	40.13	40.09

Table 8-6. Peak Power Spectral Density Table (NR_n26_1C_5M)

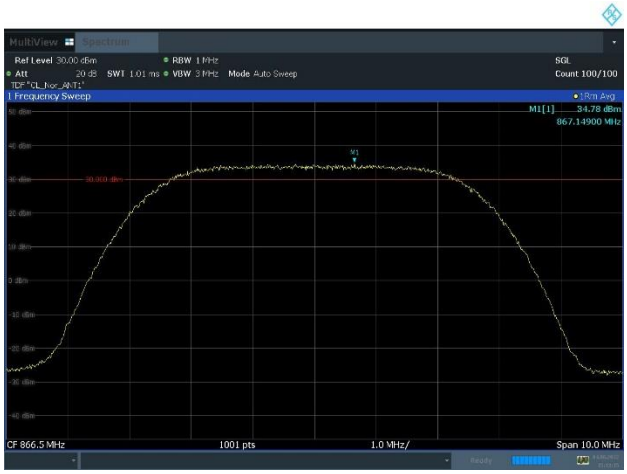
Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	36.33	36.52	36.74	36.73
	1	36.48	36.69	36.88	36.91
	2	36.51	36.55	36.72	36.80
	3	36.41	36.61	36.79	36.87
Total MIMO PSD Power (mW/MHz)		17594.03	18254.03	19070.15	19269.23
Total MIMO PSD Power (dBm/MHz)		42.45	42.61	42.80	42.85
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	36.63	**37.03**	36.59	36.56
	1	36.63	**36.83**	36.64	36.58
	2	36.77	**36.94**	36.83	36.73
	3	36.75	**36.88**	36.75	36.61
Total MIMO PSD Power (mW/MHz)		18690.00	**19684.48**	18724.54	18370.05
Total MIMO PSD Power (dBm/MHz)		42.72	**42.94**	42.72	42.64

Table 8-7. Peak Power Spectral Density Table (NR_n29_1C_5M)

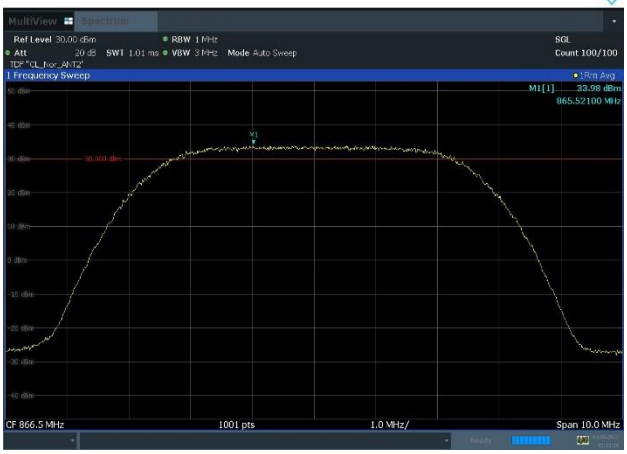
Channel	Port	PSD Power (dBm/MHz)			
		QPSK	16QAM	64QAM	256QAM
Low	0	37.15	37.82	37.39	37.13
	1	36.92	38.03	37.19	37.12
	2	37.02	37.72	37.09	37.29
	3	36.87	37.97	37.12	37.34
Total MIMO PSD Power (mW/MHz)		20007.47	24588.47	20987.88	21094.43
Total MIMO PSD Power (dBm/MHz)		43.01	43.91	43.22	43.24
Channel	Port	QPSK	16QAM	64QAM	256QAM
Middle	0	37.03	**37.81**	36.98	37.04
	1	36.96	**37.97**	36.83	36.80
	2	37.34	**37.98**	37.10	37.21
	3	37.18	**37.91**	37.20	37.04
Total MIMO PSD Power (mW/MHz)		20656.51	**24766.37**	20185.01	20162.97
Total MIMO PSD Power (dBm/MHz)		43.15	**43.94**	43.05	43.05
Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	37.04	37.99	37.25	37.34
	1	36.99	37.65	37.31	36.94
	2	37.44	37.86	37.05	37.13
	3	37.09	38.10	37.08	37.14
Total MIMO PSD Power (mW/MHz)		20721.67	24682.06	20866.50	20703.35
Total MIMO PSD Power (dBm/MHz)		43.16	43.92	43.19	43.16

Table 8-8. Peak Power Spectral Density Table (NR_n71_1C_10M)

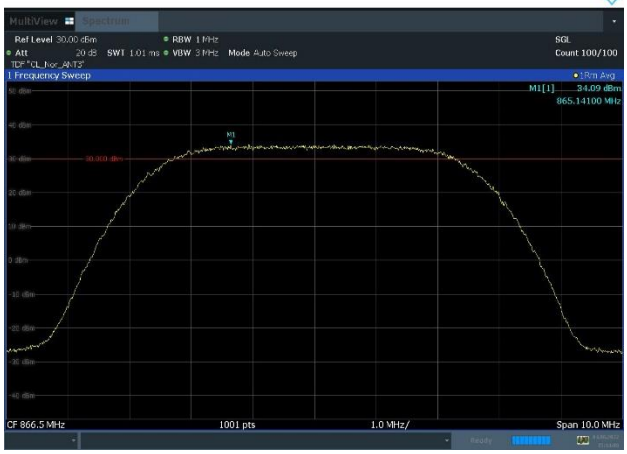
Plot 8-7. Power Spectral Density Plot
(n26_1C_5M_QPSK - Mid Channel, Port 0)



Plot 8-8. Power Spectral Density Plot
(n26_1C_5M_QPSK - Mid Channel, Port 1)



Plot 8-9. Power Spectral Density Plot
(n26_1C_5M_QPSK - Mid Channel, Port 2)



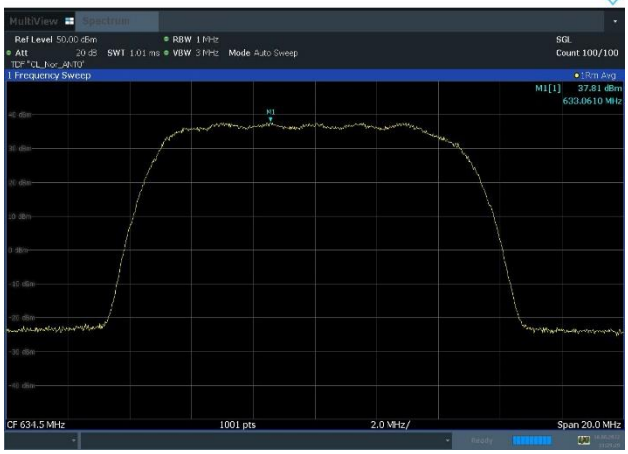
Plot 8-10. Power Spectral Density Plot
(n26_1C_5M_QPSK - Mid Channel, Port 3)

Plot 8-11. Power Spectral Density Plot
(n29_1C_5M_16QAM - High Channel, Port 0)

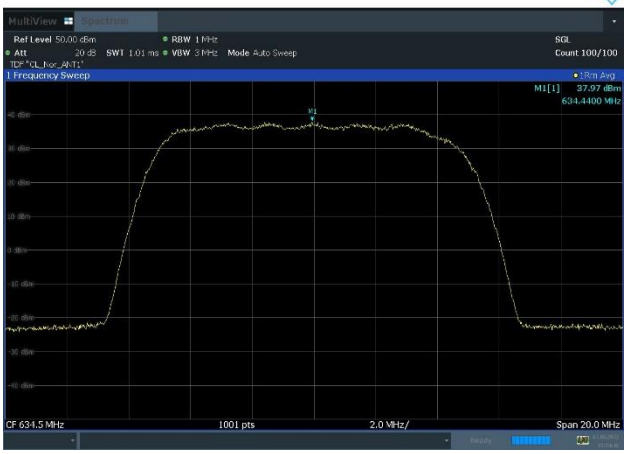
Plot 8-12. Power Spectral Density Plot
(n29_1C_5M_16QAM - High Channel, Port 1)

Plot 8-13. Power Spectral Density Plot
(n29_1C_5M_16QAM - High Channel, Port 2)

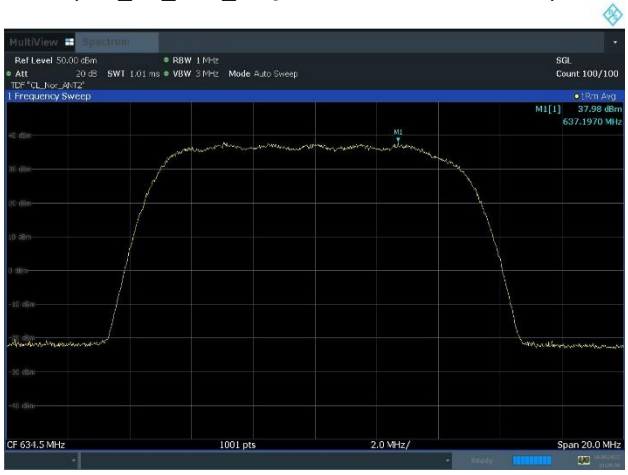
Plot 8-14. Power Spectral Density Plot
(n29_1C_5M_16QAM - High Channel, Port 3)



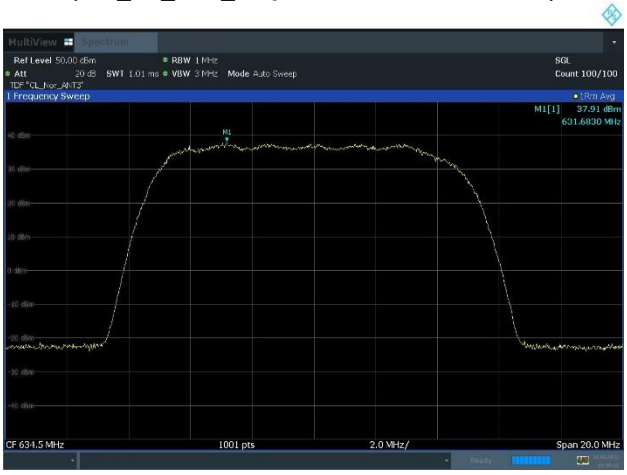
Plot 8-15. Power Spectral Density Plot
(n71_1C_10M_16QAM - Mid Channel, Port 0)



Plot 8-16. Power Spectral Density Plot
(n71_1C_10M_16QAM - Mid Channel, Port 1)



Plot 8-17. Power Spectral Density Plot
(n71_1C_10M_16QAM - Mid Channel, Port 2)



Plot 8-18. Power Spectral Density Plot
(n71_1C_10M_16QAM - Mid Channel, Port 3)

8.4 Peak To Average Power Ratio

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 5.7

ANSI C63.26-2015 – Section 5.2.3.4

Test Setting

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

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

Test Setup

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

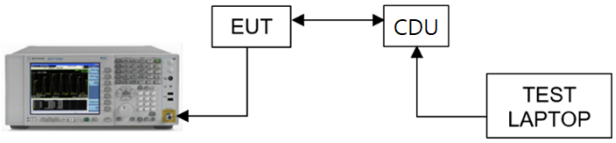


Figure 8-3. Test Instrument & Measurement Setup

Limit

N/A

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Middle	0	7.76	7.76	7.78	7.76	N/A
	1	**7.78**	**7.78**	7.78	7.76	
	2	7.76	7.78	7.76	7.76	
	3	7.78	7.76	7.76	7.76	

Table 8-9. Peak To Average Power Ratio Summary Data (NR_n26_1C_5M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.26	8.32	8.34	8.18	N/A
	1	**8.28**	8.34	8.32	8.18	
	2	8.26	8.32	8.32	8.18	
	3	8.28	8.34	8.32	8.18	
High	0	8.26	8.32	8.30	8.22	
	1	8.26	8.34	8.36	8.24	
	2	8.26	8.36	**8.40**	8.24	
	3	8.28	8.34	8.32	8.24	

Table 8-10. Peak To Average Power Ratio Summary Data (NR_n29_1C_5M)

Channel	Port	PAPR (dB)				Limit (dB)
		QPSK	16QAM	64QAM	256QAM	
Low	0	8.14	8.12	8.14	8.16	N/A
	1	**8.38**	8.36	**8.44**	8.42	
	2	8.16	8.10	8.10	8.18	
	3	8.16	8.12	8.14	8.14	
Middle	0	8.08	8.06	8.06	8.06	
	1	8.08	8.06	8.44	8.38	
	2	8.10	8.08	8.06	8.08	
	3	8.10	8.06	8.04	8.08	
High	0	8.10	8.12	8.10	8.12	
	1	8.10	8.12	8.14	8.14	
	2	8.12	8.10	8.06	8.12	
	3	8.12	8.10	8.10	8.12	

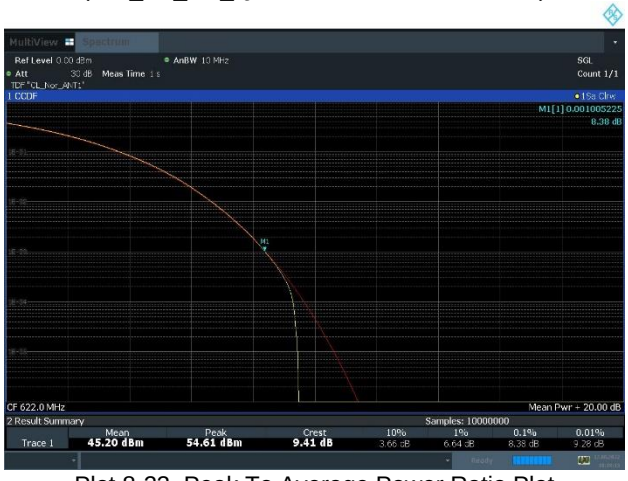
Table 8-11. Peak To Average Power Ratio Summary Data (NR_n71_1C_10M)

Plot 8-19. Peak To Average Power Ratio Plot (n26_1C_5M_QPSK - Mid Channel, Port 1)

Plot 8-20. Peak To Average Power Ratio Plot (n26_1C_5M_16QAM - Mid Channel, Port 1)

Plot 8-21. Peak To Average Power Ratio Plot (n29_1C_5M_QPSK - Low Channel, Port 1)

Plot 8-22. Peak To Average Power Ratio Plot (n29_1C_5M_64QAM- High Channel, Port 2)



Plot 8-23. Peak To Average Power Ratio Plot (n71_1C_10M_QPSK-Low Channel, Port 1)

Plot 8-24. Peak To Average Power Ratio Plot (n71_1C_10M_64QAM-Low Channel, Port 1)

8.5 Band Edge Emissions and Emission Mask at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6
KDB 662911 D01 v02r01 – Section E)3) Out-of-Band and Spurious Emission Measurements
a) Absolute Emission Limits
iii) Measure and add 10 log(N_{ANT}) dB
ANSI C63.26-2015 – Section 5.7.3

Test Setting

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW: Please see test notes below.
4. VBW $\geq$ 3 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

NR n29 and n71 operation under Part 27.53
The minimum permissible attenuation level of any spurious emission is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

NR n26 operation under Part 90.691
For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Test Setup

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

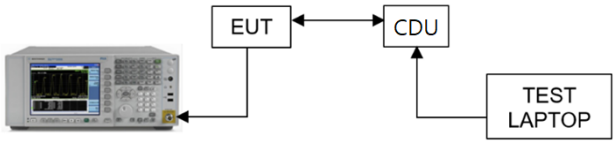


Figure 8-4. Test Instrument & Measurement Setup

Test Notes

1. Per Part 27.53(g), 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 the licensee's frequency block, a resolution bandwidth of at least 30 kilohertz may be employed.

2. Per Part 90.691, the frequency block by up to and including 37.5 kHz range complies with 50 + 10 Log10(P) decibels and frequency block greater than 37.5 kHz range complies with 43 + 10Log10(P) decibels limit.

3. All the measurement has been tested but test plots are referred from the highest of value of each of modulation of each antenna ports.

4. When the channel edge detect with a margin of under 1dB to Limit, That used to integration method was performed using the spectrum analyzer's band power functions according to ANSI C63.26-2015 – Section 5.7. The spectrum analyzer marker was placed at one-half of the RBW away from the band edge. The integration value was set to a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter.

5. The limits were adjusted by a factor of [-10*log (4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911. MIMO Factor calculation as below:
   MIMO Factor = 10*log (4) = 6.02 dB

Frequency range	Basic Limit (dBm)	4Tx MIMO Factor (dB)	RBW Factor (dB)	Adjusted limit (dBm)
Low Frequency block lower than 37.5 kHz	-13	6.02	0	-19.02
Low Frequency block – 37.5kHz	-20	6.02	0	-26.02
High Frequency block + 37.5kHz	-20	6.02	0	-26.02
High Frequency block greater than 37.5 kHz	-13	6.02	0	-19.02
Note: Adjusted limit (dBm) = Basic limit (dBm) - MIMO Factor - RBW Factor				

Frequency range	Basic Limit (dBm)	4Tx MIMO Factor (dB)	RBW Factor (dB)	Adjusted limit (dBm)
Low Frequency block – 100kHz	-13	6.02	0	-19.02
High Frequency block + 100kHz	-13	6.02	0	-19.02
Note: Adjusted limit (dBm) = Basic limit (dBm) - MIMO Factor - RBW Factor				

Channel	Port	Measured Range (MHz)	Max. Value (dBm)				Limit (dBm)
			QPSK	16QAM	64QAM	256QAM	
Middle	0	863.8625 to 863.9625	**-31.02**	-30.64	-30.98	-31.16	-19.02
	0	863.9625 to 864	**-28.67**	-28.98	-29.56	-28.90	-26.02
	0	869 to 869.0375	**-29.80**	-29.59	-29.84	-29.40	
	0	869.0375 to 869.1375	**-33.28**	-32.96	-33.49	-33.59	-19.02
	1	863.8625 to 863.9625	-31.11	-30.31	-30.73	-30.51	-19.02
	1	863.9625 to 864	-29.04	-30.01	-29.90	-29.41	-26.02
	1	869 to 869.0375	-29.39	-30.01	-30.51	-29.71	
	1	869.0375 to 869.1375	-32.88	-32.75	-33.17	-32.95	-19.02
	2	863.8625 to 863.9625	-31.50	-30.67	-31.04	-31.72	-19.02
	2	863.9625 to 864	-30.17	-30.93	-31.46	-31.09	-26.02
	2	869 to 869.0375	-31.06	-31.71	-32.12	-31.59	
	2	869.0375 to 869.1375	-33.17	-33.05	-33.45	-33.78	-19.02
	3	863.8625 to 863.9625	-29.94	-29.70	-29.72	-30.52	-19.02
	3	863.9625 to 864	-30.51	-31.34	-31.56	-31.03	-26.02
	3	869 to 869.0375	-31.73	-32.31	-32.19	-31.62	
	3	869.0375 to 869.1375	-31.80	-31.76	-32.14	-32.21	-19.02

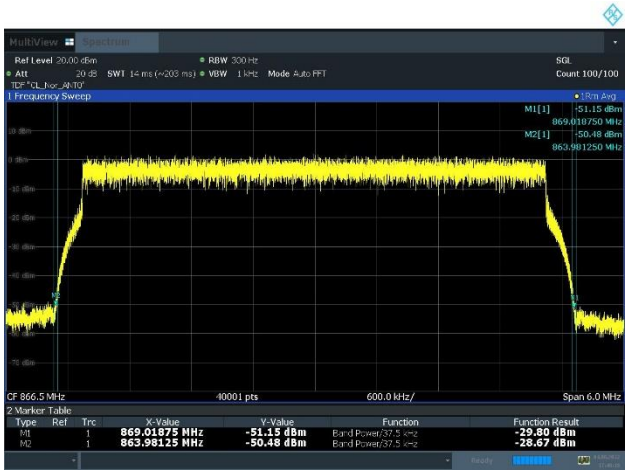
Table 8-12. Emission Mask Summary Data (NR_n26_1C_5M)

Channel	Port	Measured Range (MHz)	Max. Value (dBm)				Limit (dBm)
			QPSK	16QAM	64QAM	256QAM	
Low	0	616 to 618	-24.27	-23.64	**-22.85**	-23.41	-19.02
	1	616 to 618	-24.08	-23.12	-23.43	-24.32	
	2	616 to 618	-24.99	-25.40	-24.07	-24.65	
	3	616 to 618	-25.38	-24.99	-23.83	-23.74	
High	0	651 to 653	-22.69	-21.74	**-20.45**	-22.37	
	1	651 to 653	-22.73	-22.28	-21.10	-22.37	
	2	651 to 653	-23.73	-23.91	-23.81	-23.33	
	3	651 to 653	-23.80	-24.39	-22.97	-23.67	

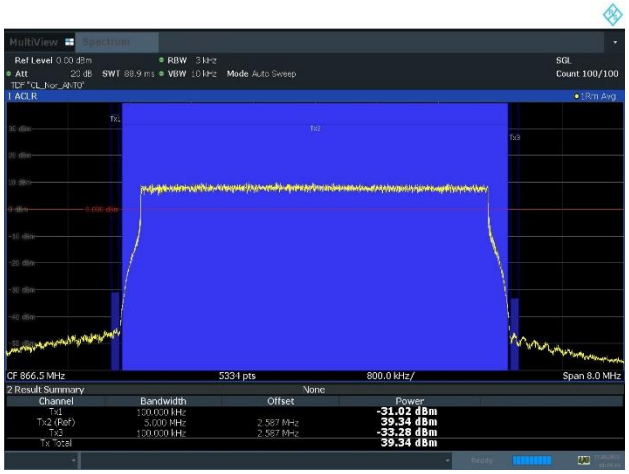
Table 8-13. Band Edge Emission Summary Data (NR_n29_1C_5M)

Channel	Port	Measured Range (MHz)	Max. Value (dBm)				Limit (dBm)
			QPSK	16QAM	64QAM	256QAM	
Low	0	717 to 719	-24.28	-24.66	-22.72	-24.25	-19.02
	1	717 to 719	-23.38	-25.99	-24.86	-24.61	
	2	717 to 719	-24.19	-26.99	-23.59	-24.58	
	3	717 to 719	-24.71	-23.77	**-22.27**	-23.24	
High	0	727 to 729	-24.97	-25.85	-25.21	-25.72	
	1	727 to 729	-24.76	-29.66	**-23.86**	-25.61	
	2	727 to 729	-24.01	-26.61	-24.43	-25.50	
	3	727 to 729	-25.10	-26.88	-26.05	-25.77	

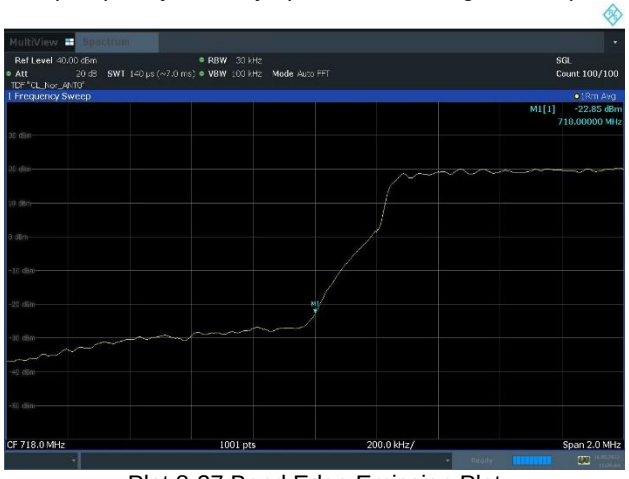
Table 8-14. Band Edge Emission Summary Data (NR_n71_1C_10M)



Plot 8-25. Emission Mask Plot
(n26_1C_5M_QPSK - Mid Channel, Port 0)
(Frequency block by up to and including 37.5kHz)



Plot 8-26. Emission Mask Plot
(n26_1C_5M_QPSK - Mid Channel, Port 0)
(Frequency block by greater than 37.5kHz)



Plot 8-27 Band Edge Emission Plot
(n29_1C_5M_64QAM - Low Channel, Port 0)

Plot 8-28. Band Edge Emission Plot
(n29_1C_5M_64QAM - High Channel, Port 0)

Plot 8-29. Band Edge Emission Plot
(n71_1C_10M_64QAM - Low Channel, Port 3)

Plot 8-30. Band Edge Emission Plot
(n71_1C_10M_64QAM - High Channel, Port 1)

8.6 Spurious and Harmonic Emissions at Antenna Terminal

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

NR n29 and n71 operation under Part 27.53
The minimum permissible attenuation level of any spurious emission is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

NR n26 operation under Part 90.691
For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Test Setup

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

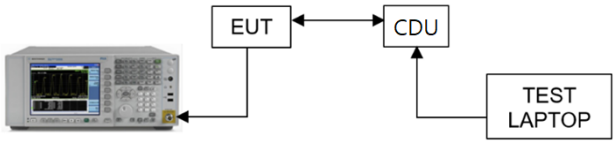


Figure 8-5. Test Instrument & Measurement Setup

Test Notes

1. Per Part 27.53(g), 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 the licensee's frequency block, a resolution bandwidth of at least 30 kilohertz may be employed.

2. Per Part 90.691, the frequency block by up to and including 37.5 kHz range complies with 50 + 10 Log10(P) decibels and frequency block greater than 37.5 kHz range complies with 43 + 10Log10(P) decibels limit.

3. The n29 is an SDL(Supplemental Downlink) designed exclusively for downlink. Therefore, the n29 cannot operate alone, it was tested by simultaneously operating n29 and n71.

4. All the measurement has been tested but test plots are referred from the highest of value of each of modulation of each antenna ports.

5. The limits were adjusted by a factor of [-10*log (4)] dB to account for the device operation as a 4 port MIMO transmitter, as per FCC KDB 622911. MIMO Factor calculation as below:
   MIMO Factor = 10*log (4) = 6.02 dB

6. Narrower RBW parameter is applied according to Section 5.7 of ANSI C63.26-2015 for some edge channels due to improving measurement accuracy. RBW Factor calculation as below:
   - RBW Factor = 10*log (1/0.01) = 20 dB for the measurement range from 9 kHz to 150 kHz.
   - RBW Factor = 10*log (1/0.1) = 10 dB for the measurement range from 150 kHz to 30 MHz.

Frequency range	Basic Limit (dBm)	4 TX MIMO Factor (dB)	RBW Factor (dB)	Adjusted limit (dBm)
9 kHz to 150 kHz	-13	6.02	20	-39.02
150 kHz to 30 MHz	-13	6.02	10	-29.02
30 MHz to 1 GHz	-13	6.02	0	-19.02
Frequency range	**Basic Limit (dBm/MHz)**	**4 TX MIMO Factor (dB)**	**RBW Factor (dB)**	**Adjusted limit (dBm)**
1 GHz to 9 GHz	-13	6.02	0	-19.02
Note: Adjusted limit (dBm) = Basic limit (dBm) - MIMO Factor - RBW Factor Adjusted limit (dBm/MHz) = Basic limit (dBm/MHz) - MIMO Factor - RBW Factor				

Channel	Port	Measurement Range	Level (dBm)				Limit (dBm)	Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Middle	0	9 kHz to 150 kHz	-61.89	-62.23	-62.22	-62.67	-39.02	-22.87
		150 kHz to 30 MHz	-46.76	-47.24	-46.64	-46.80	-29.02	-17.62
		30 MHz to 863.8625 MHz	-27.48	-27.93	-27.88	-27.83	-19.02	-8.46
		869.1375 MHz to 1 GHz	-29.47	-29.25	-29.46	-28.88	-19.02	-9.86
		1 GHz to 3 GHz	-28.85	-28.64	-29.07	-28.80	-19.02	-9.62
		3 GHz to 9 GHz	-35.60	-35.74	-35.87	-35.68	-19.02	-16.58
	1	9 kHz to 150 kHz	-60.34	-61.11	-60.64	-60.77	-39.02	-21.32
		150 kHz to 30 MHz	-45.36	-45.71	-45.61	-45.71	-29.02	-16.34
		30 MHz to 863.8625 MHz	-26.88	-28.14	-28.06	-27.72	-19.02	-7.86
		869.1375 MHz to 1 GHz	-29.85	-28.54	-29.35	-29.76	-19.02	-9.52
		1 GHz to 3 GHz	-28.59	-28.57	-28.83	-28.95	-19.02	-9.55
		3 GHz to 9 GHz	-35.26	-35.36	-35.25	-35.48	-19.02	-16.23
	2	9 kHz to 150 kHz	-61.17	-61.91	-61.61	-62.08	-39.02	-22.15
		150 kHz to 30 MHz	-45.20	-45.43	-45.52	-45.78	-29.02	-16.18
		30 MHz to 863.8625 MHz	-29.23	-28.65	-28.53	-28.61	-19.02	-9.51
		869.1375 MHz to 1 GHz	-30.49	-30.49	-30.44	-30.73	-19.02	-11.42
		1 GHz to 3 GHz	-29.28	-29.50	-29.59	-29.58	-19.02	-10.26
		3 GHz to 9 GHz	-35.35	-35.43	-35.24	-35.42	-19.02	-16.22
	3	9 kHz to 150 kHz	-46.92	**-46.77**	-46.97	-47.25	-39.02	**-7.75**
		150 kHz to 30 MHz	-47.26	**-48.13**	-47.94	-48.20	-29.02	-18.24
		30 MHz to 863.8625 MHz	-29.81	**-27.74**	-28.74	-28.62	-19.02	-8.72
		869.1375 MHz to 1 GHz	-30.91	**-30.44**	-30.46	-29.52	-19.02	-10.50
		1 GHz to 3 GHz	-29.19	**-29.37**	-29.05	-29.10	-19.02	-10.03
		3 GHz to 9 GHz	-37.83	**-37.78**	-37.70	-37.68	-19.02	-18.66

Table 8-15. Conducted Spurious Emission Summary Data (n26_1C_5M)

Channel	Port	Measurement Range	Level (dBm)				Limit (dBm)	Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	9 kHz to 150 kHz	-59.92	-60.58	-58.58	-60.35	-39.02	-19.56
		150 kHz to 30 MHz	-49.39	-50.27	-48.98	-49.61	-29.02	-19.96
		30 MHz to 717 MHz	-34.74	-35.42	-34.08	-33.61	-19.02	-14.59
		729 MHz to 1 GHz	-32.83	-33.60	-33.14	-32.60	-19.02	-13.58
		1 GHz to 3 GHz	-29.14	-29.01	-28.96	-28.44	-19.02	-9.42
		3 GHz to 9 GHz	-25.78	-25.55	-25.79	-25.85	-19.02	-6.53
	1	9 kHz to 150 kHz	-60.74	-61.50	-59.40	-61.17	-39.02	-20.38
		150 kHz to 30 MHz	-48.24	-49.64	-47.69	-49.00	-29.02	-18.67
		30 MHz to 717 MHz	-32.58	-33.49	-33.33	-33.78	-19.02	-13.56
		729 MHz to 1 GHz	-34.67	-34.30	-34.46	-34.28	-19.02	-15.26
		1 GHz to 3 GHz	-28.38	-28.18	-27.85	-28.01	-19.02	-8.83
		3 GHz to 9 GHz	-25.19	-25.45	-25.45	-25.36	-19.02	-6.17
	2	9 kHz to 150 kHz	-64.66	-64.11	-62.73	-63.77	-39.02	-23.71
		150 kHz to 30 MHz	-48.23	-48.33	-47.81	-48.15	-29.02	-18.79
		30 MHz to 717 MHz	-35.69	-36.05	-34.77	-34.13	-19.02	-15.11
		729 MHz to 1 GHz	-36.76	-36.37	-36.18	-36.73	-19.02	-17.16
		1 GHz to 3 GHz	-29.06	-28.56	-28.63	-28.57	-19.02	-9.54
		3 GHz to 9 GHz	-25.48	-25.64	-25.55	-25.48	-19.02	-6.46
	3	9 kHz to 150 kHz	-49.65	-47.57	-47.34	-47.76	-39.02	-8.32
		150 kHz to 30 MHz	-48.03	-49.11	-47.41	-48.48	-29.02	-18.39
		30 MHz to 717 MHz	-35.25	-35.84	-35.77	-35.28	-19.02	-16.23
		729 MHz to 1 GHz	-35.35	-35.97	-35.97	-36.08	-19.02	-16.33
		1 GHz to 3 GHz	-29.23	-28.85	-29.06	-28.63	-19.02	-9.61
		3 GHz to 9 GHz	-27.63	-27.79	-27.57	-27.45	-19.02	-8.43
High	0	9 kHz to 150 kHz	-63.10	-63.44	-63.34	**-62.99**	-39.02	-23.97
		150 kHz to 30 MHz	-51.97	-51.68	-52.29	**-52.93**	-29.02	-22.66
		30 MHz to 717 MHz	-35.36	-35.41	-35.59	**-35.60**	-19.02	-16.34
		729 MHz to 1 GHz	-24.21	-24.44	-24.07	**-23.59**	-19.02	**-4.57**
		1 GHz to 3 GHz	-28.69	-27.91	-28.50	**-28.31**	-19.02	-8.89
		3 GHz to 9 GHz	-25.85	-25.81	-25.69	**-25.53**	-19.02	-6.51
	1	9 kHz to 150 kHz	-63.41	-62.48	-63.26	-63.64	-39.02	-23.46
		150 kHz to 30 MHz	-50.45	-51.13	-51.31	-51.20	-29.02	-21.43
		30 MHz to 717 MHz	-35.94	-35.66	-35.74	-36.15	-19.02	-16.64
		729 MHz to 1 GHz	-25.59	-25.21	-25.02	-25.54	-19.02	-6.00
		1 GHz to 3 GHz	-28.02	-27.77	-27.73	-28.26	-19.02	-8.71
		3 GHz to 9 GHz	-25.13	-25.51	-25.19	-25.28	-19.02	-6.11
	2	9 kHz to 150 kHz	-64.18	-63.02	-62.97	-63.68	-39.02	-23.95
		150 kHz to 30 MHz	-51.00	-49.86	-50.78	-50.94	-29.02	-20.84
		30 MHz to 717 MHz	-35.39	-35.50	-35.58	-35.42	-19.02	-16.37
		729 MHz to 1 GHz	-27.95	-27.56	-27.28	-28.37	-19.02	-8.26
		1 GHz to 3 GHz	-28.52	-28.28	-28.36	-28.81	-19.02	-9.26
		3 GHz to 9 GHz	-25.35	-25.54	-25.15	-25.36	-19.02	-6.13
	3	9 kHz to 150 kHz	-46.51	-46.50	-46.31	-46.29	-39.02	-7.27
		150 kHz to 30 MHz	-51.43	-50.86	-51.50	-51.41	-29.02	-21.84
		30 MHz to 717 MHz	-35.41	-35.25	-35.09	-35.26	-19.02	-16.07
		729 MHz to 1 GHz	-29.10	-27.93	-28.64	-28.55	-19.02	-8.91
		1 GHz to 3 GHz	-28.47	-28.77	-28.81	-28.77	-19.02	-9.45
		3 GHz to 9 GHz	-27.82	-27.61	-27.67	-27.62	-19.02	-8.59

Table 8-16. Conducted Spurious Emission Summary Data (n29_1C_5M)

Channel	Port	Measurement Range	Level (dBm)				Limit (dBm)	Margin (dB)
			QPSK	16QAM	64QAM	256QAM		
Low	0	9 kHz to 150 kHz	-61.96	-62.14	-61.90	-62.02	-39.02	-22.88
		150 kHz to 30 MHz	-47.41	-47.34	-47.33	-47.26	-29.02	-18.24
		30 MHz to 616 MHz	-32.24	-32.64	-32.74	-33.20	-19.02	-13.22
		653 MHz to 1 GHz	-39.45	-38.94	-39.25	-39.02	-19.02	-19.92
		1 GHz to 3 GHz	-28.81	-28.11	-28.76	-28.97	-19.02	-9.09
		3 GHz to 9 GHz	-28.21	-27.84	-28.44	-28.32	-19.02	-8.82
	1	9 kHz to 150 kHz	-56.12	-56.08	-56.09	-56.07	-39.02	-17.05
		150 kHz to 30 MHz	-45.66	-45.52	-45.82	-45.98	-29.02	-16.50
		30 MHz to 616 MHz	-32.51	-32.40	-31.63	-31.83	-19.02	-12.61
		653 MHz to 1 GHz	-39.61	-39.86	-39.42	-39.61	-19.02	-20.40
		1 GHz to 3 GHz	-28.74	-28.67	-28.94	-28.69	-19.02	-9.65
		3 GHz to 9 GHz	-27.95	-27.69	-27.32	-27.41	-19.02	-8.30
	2	9 kHz to 150 kHz	-60.71	-61.32	-61.38	-61.26	-39.02	-21.69
		150 kHz to 30 MHz	-46.10	-45.92	-46.10	-46.05	-29.02	-16.90
		30 MHz to 616 MHz	-30.65	-31.64	-29.10	-32.85	-19.02	-10.08
		653 MHz to 1 GHz	-38.95	-39.18	-38.88	-39.07	-19.02	-19.86
		1 GHz to 3 GHz	-28.83	-28.75	-28.59	-29.27	-19.02	-9.57
		3 GHz to 9 GHz	-27.74	-27.68	-27.78	-27.56	-19.02	-8.54
	3	9 kHz to 150 kHz	-50.89	-50.63	-50.09	-49.87	-39.02	-10.85
		150 kHz to 30 MHz	-48.74	-49.63	-49.50	-50.05	-29.02	-19.72
		30 MHz to 616 MHz	-33.62	-32.74	-31.87	-33.11	-19.02	-12.85
		653 MHz to 1 GHz	-38.13	-38.51	-38.75	-39.00	-19.02	-19.11
		1 GHz to 3 GHz	-28.91	-28.85	-29.20	-28.98	-19.02	-9.83
		3 GHz to 9 GHz	-30.50	-31.09	-30.51	-30.79	-19.02	-11.48
Middle	0	9 kHz to 150 kHz	-61.70	-61.78	-61.65	-61.87	-39.02	-22.63
		150 kHz to 30 MHz	-46.69	-47.25	-47.49	-47.40	-29.02	-17.67
		30 MHz to 616 MHz	-38.21	-37.02	-36.81	-36.67	-19.02	-17.65
		653 MHz to 1 GHz	-39.98	-38.84	-38.56	-39.72	-19.02	-19.54
		1 GHz to 3 GHz	-28.85	-29.29	-28.56	-28.71	-19.02	-9.54
		3 GHz to 9 GHz	-28.27	-28.40	-28.31	-27.74	-19.02	-8.72
	1	9 kHz to 150 kHz	-55.78	-56.00	-55.83	-55.99	-39.02	-16.76
		150 kHz to 30 MHz	-45.80	-45.79	-45.78	-45.97	-29.02	-16.76
		30 MHz to 616 MHz	-35.87	-35.78	-35.48	-35.98	-19.02	-16.46
		653 MHz to 1 GHz	-37.89	-37.89	-37.39	-37.89	-19.02	-18.37
		1 GHz to 3 GHz	-28.66	-28.55	-28.85	-28.88	-19.02	-9.53
		3 GHz to 9 GHz	-27.32	-27.56	-27.29	-27.87	-19.02	-8.27
	2	9 kHz to 150 kHz	-60.17	-61.94	-61.67	-61.50	-39.02	-21.15
		150 kHz to 30 MHz	-45.52	-46.39	-46.21	-46.16	-29.02	-16.50
		30 MHz to 616 MHz	-34.63	-34.76	-34.52	-33.98	-19.02	-14.96
		653 MHz to 1 GHz	-36.94	-36.68	-36.48	-37.18	-19.02	-17.46
		1 GHz to 3 GHz	-28.84	-28.40	-28.43	-28.81	-19.02	-9.38
		3 GHz to 9 GHz	-27.65	-27.60	-28.10	-28.08	-19.02	-8.58
	3	9 kHz to 150 kHz	-54.34	-50.76	-50.45	-51.10	-39.02	-11.43
		150 kHz to 30 MHz	-46.49	-49.84	-49.91	-49.85	-29.02	-17.47
		30 MHz to 616 MHz	-35.65	-35.02	-35.37	-35.43	-19.02	-16.00
		653 MHz to 1 GHz	-37.28	-37.22	-37.73	-37.76	-19.02	-18.20
		1 GHz to 3 GHz	-29.17	-29.20	-29.05	-29.04	-19.02	-10.02
		3 GHz to 9 GHz	-30.43	-30.37	-30.64	-30.38	-19.02	-11.35
High	0	9 kHz to 150 kHz	-60.96	-61.69	-61.53	-61.42	-39.02	-21.94
		150 kHz to 30 MHz	-46.56	-46.83	-46.91	-47.07	-29.02	-17.54
		30 MHz to 616 MHz	-37.65	-37.71	-37.59	-36.92	-19.02	-17.90
		653 MHz to 1 GHz	-34.09	-34.02	-34.42	-34.34	-19.02	-15.00
		1 GHz to 3 GHz	-28.98	-28.79	-28.91	-27.34	-19.02	-8.32
		3 GHz to 9 GHz	-28.12	-28.48	-28.79	-28.73	-19.02	-9.10

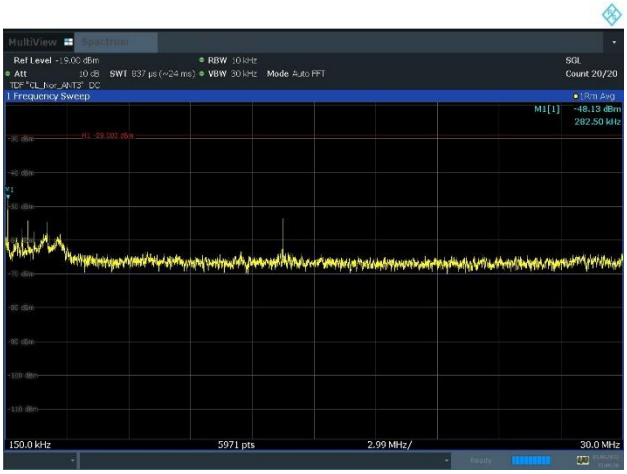
	1	9 kHz to 150 kHz	-59.64	-59.38	-60.29	**-59.74**	-39.02	-20.36
		150 kHz to 30 MHz	-45.36	-45.50	-45.41	**-45.65**	-29.02	-16.34
		30 MHz to 616 MHz	-37.16	-37.44	-37.46	**-36.50**	-19.02	-17.48
		653 MHz to 1 GHz	-33.04	-33.12	-32.64	**-31.21**	-19.02	-12.19
		1 GHz to 3 GHz	-28.66	-28.94	-28.60	**-28.31**	-19.02	-9.29
		3 GHz to 9 GHz	-28.06	-27.42	-27.58	**-27.23**	-19.02	**-8.21**
	2	9 kHz to 150 kHz	-59.77	-61.28	-61.48	-60.69	-39.02	-20.75
		150 kHz to 30 MHz	-45.10	-45.58	-45.65	-45.71	-29.02	-16.08
		30 MHz to 616 MHz	-36.93	-37.07	-37.03	-37.02	-19.02	-17.91
		653 MHz to 1 GHz	-32.56	-32.35	-32.35	-32.59	-19.02	-13.33
		1 GHz to 3 GHz	-27.72	-28.33	-28.98	-28.66	-19.02	-8.70
		3 GHz to 9 GHz	-27.72	-28.34	-27.95	-28.19	-19.02	-8.70
	3	9 kHz to 150 kHz	-54.67	-53.56	-53.37	-53.91	-39.02	-14.35
		150 kHz to 30 MHz	-46.01	-46.85	-46.74	-46.80	-29.02	-16.99
		30 MHz to 616 MHz	-37.18	-36.60	-36.99	-36.78	-19.02	-17.58
		653 MHz to 1 GHz	-33.75	-33.89	-33.81	-34.18	-19.02	-14.73
		1 GHz to 3 GHz	-28.85	-29.12	-28.80	-29.14	-19.02	-9.78
		3 GHz to 9 GHz	-30.77	-30.96	-31.26	-31.05	-19.02	-11.75

Table 8-17. Conducted Spurious Emission Summary Data (n71_1C_10M)

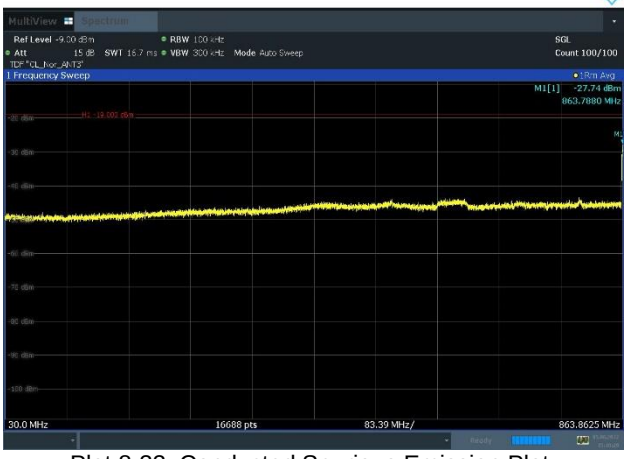
Channel	Configuration	Port	Measurement Range	Level (dBm)	Limit (dBm)	Margin (dB)
				QPSK		
Low	n26+n29+n71_ 3C_ 10M+5M+5M	0	9 kHz to 150 kHz	**-60.92**	-39.02	-21.90
			150 kHz to 30 MHz	**-49.68**	-29.02	-20.66
			30 MHz to 617 MHz	**-25.54**	-19.02	**-6.52**
			653 MHz to 717 MHz	**-32.65**	-19.02	-13.63
			729 MHz to 863 MHz	**-32.76**	-19.02	-13.74
			870 MHz to 1 GHz	**-40.72**	-19.02	-21.70
			1 GHz to 3 GHz	**-28.77**	-19.02	-9.75
			3 GHz to 9 GHz	**-29.11**	-19.02	-10.09
		1	9 kHz to 150 kHz	-62.34	-39.02	-23.32
			150 kHz to 30 MHz	-49.31	-29.02	-20.29
			30 MHz to 617 MHz	-28.25	-19.02	-9.23
			653 MHz to 717 MHz	-31.87	-19.02	-12.85
			729 MHz to 863 MHz	-33.41	-19.02	-14.39
			870 MHz to 1 GHz	-38.72	-19.02	-19.70
			1 GHz to 3 GHz	-27.88	-19.02	-8.86
			3 GHz to 9 GHz	-28.54	-19.02	-9.52
		2	9 kHz to 150 kHz	-64.12	-39.02	-25.10
			150 kHz to 30 MHz	-49.93	-29.02	-20.91
			30 MHz to 617 MHz	-26.53	-19.02	-7.51
			653 MHz to 717 MHz	-31.54	-19.02	-12.52
			729 MHz to 863 MHz	-31.04	-19.02	-12.02
			870 MHz to 1 GHz	-40.34	-19.02	-21.32
			1 GHz to 3 GHz	-29.13	-19.02	-10.11
			3 GHz to 9 GHz	-29.46	-19.02	-10.44
		3	9 kHz to 150 kHz	-46.75	-39.02	-7.73
			150 kHz to 30 MHz	-48.70	-29.02	-19.68
			30 MHz to 617 MHz	-28.95	-19.02	-9.93
			653 MHz to 717 MHz	-34.63	-19.02	-15.61
			729 MHz to 863 MHz	-34.72	-19.02	-15.70
			870 MHz to 1 GHz	-39.50	-19.02	-20.48
			1 GHz to 3 GHz	-28.81	-19.02	-9.79
			3 GHz to 9 GHz	-31.73	-19.02	-12.71

Table 8-18. Conducted Spurious Emission Summary Data (n26+n29+n71_Inter-Band Carrier Aggregation)

Plot 8-31. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(n26_1C_5M_16QAM - Low Channel, Port 3)

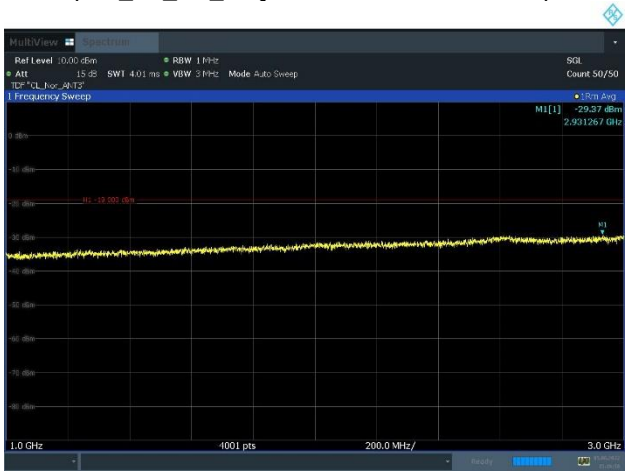


Plot 8-32. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(n26_1C_5M_16QAM - Low Channel, Port 3)

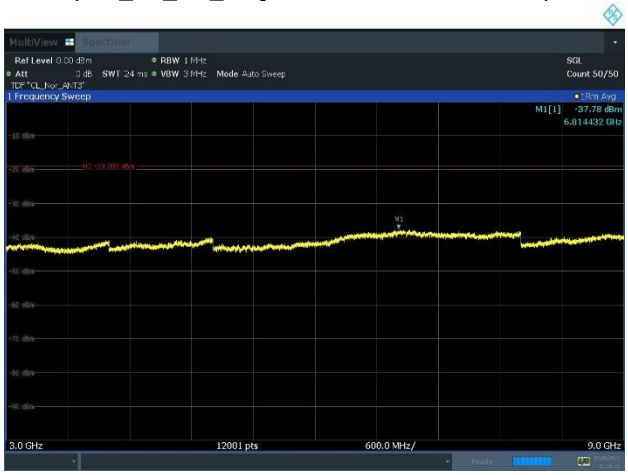


Plot 8-33. Conducted Spurious Emission Plot
30 MHz to 863.8625 MHz
(n26_1C_5M_16QAM - Low Channel, Port 3)

Plot 8-34. Conducted Spurious Emission Plot
869.1375 MHz to 1 GHz
(n26_1C_5M_16QAM - Low Channel, Port 3)

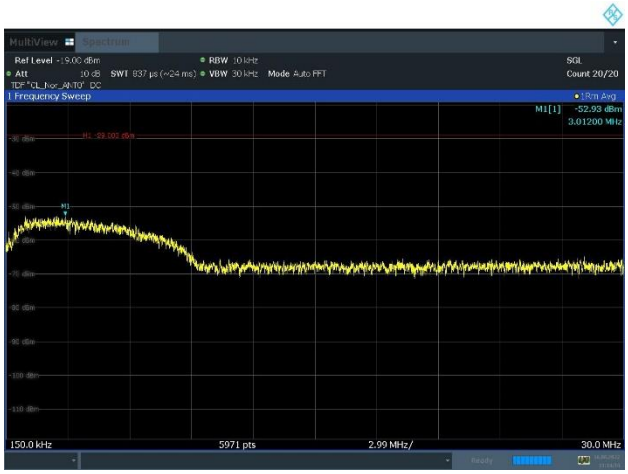


Plot 8-35. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(n26_1C_5M_16QAM - Low Channel, Port 3)



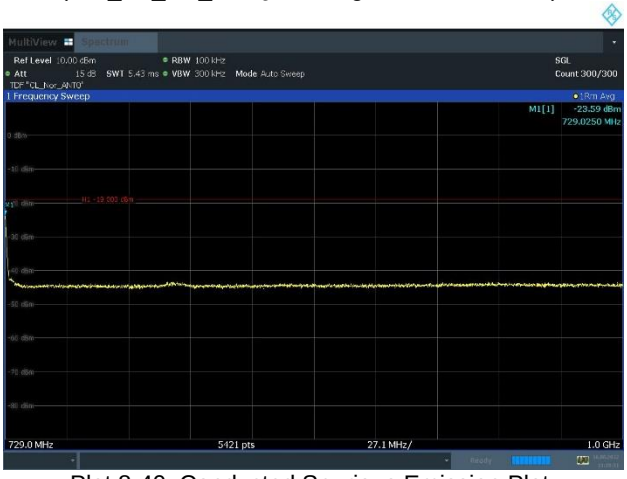
Plot 8-36. Conducted Spurious Emission Plot
3 GHz to 9 GHz
(n26_1C_5M_16QAM - Low Channel, Port 3)

Plot 8-37. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(n29_1C_5M_256QAM - High Channel, Port 0)

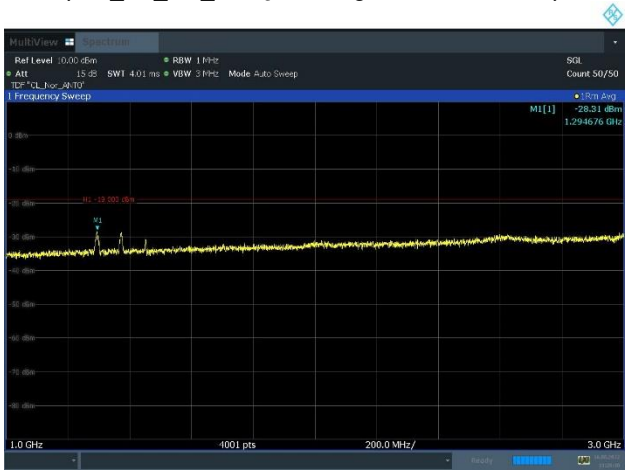


Plot 8-38. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(n29_1C_5M_256QAM - High Channel, Port 0)

Plot 8-39. Conducted Spurious Emission Plot
30 MHz to 717 MHz
(n29_1C_5M_256QAM - High Channel, Port 0)

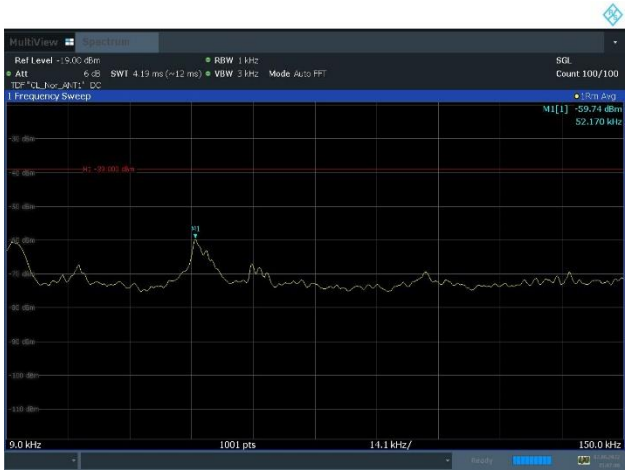


Plot 8-40. Conducted Spurious Emission Plot
729 MHz to 1 GHz
(n29_1C_5M_256QAM - High Channel, Port 0)

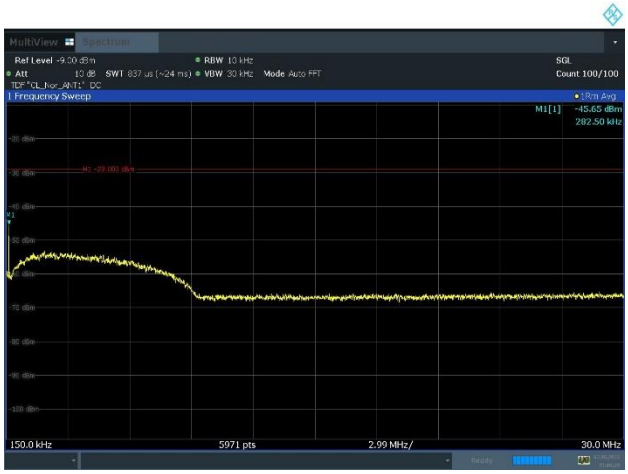


Plot 8-41. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(n29_1C_5M_256QAM - High Channel, Port 0)

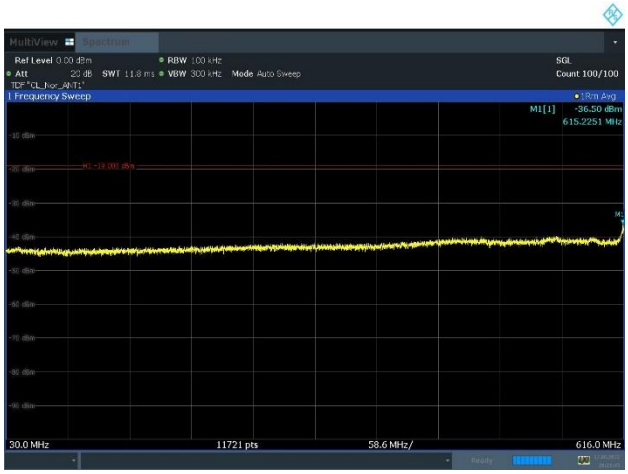
Plot 8-42. Conducted Spurious Emission Plot
3 GHz to 9 GHz
(n29_1C_5M_256QAM - High Channel, Port 0)



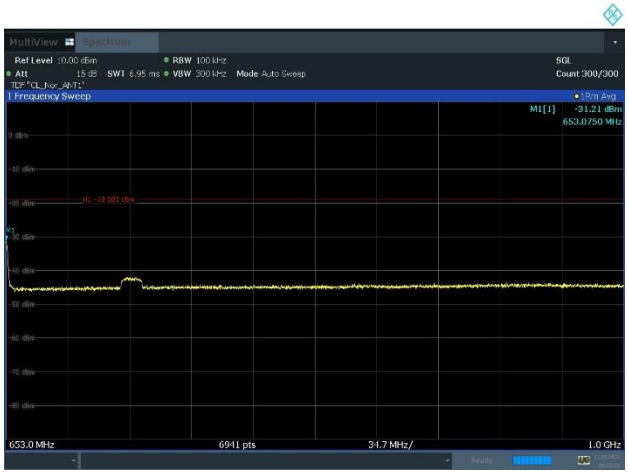
Plot 8-43. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(n71_1C_10M_256QAM - High Channel, Port 1)



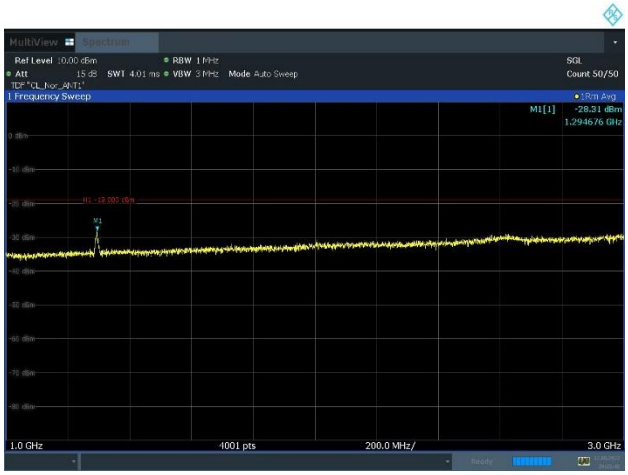
Plot 8-44. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(n71_1C_10M_256QAM - High Channel, Port 1)



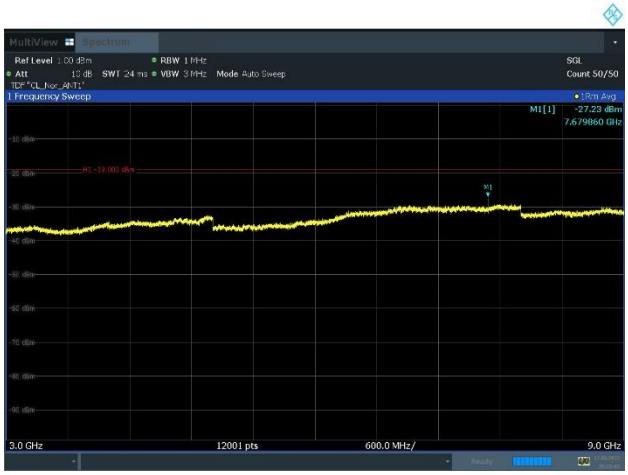
Plot 8-45. Conducted Spurious Emission Plot
30 MHz to 616 MHz
(n71_1C_10M_256QAM - High Channel, Port 1)



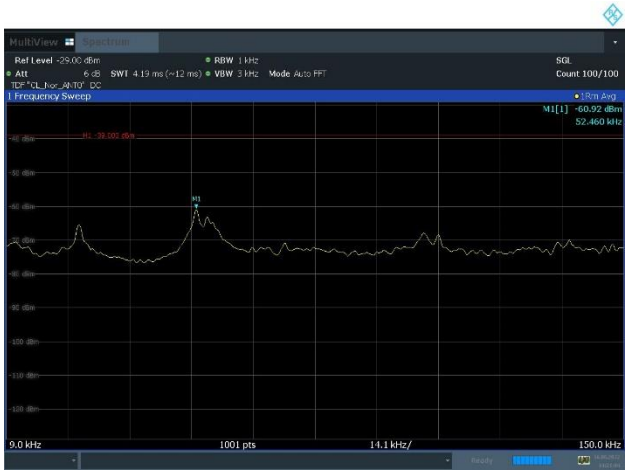
Plot 8-46. Conducted Spurious Emission Plot
653 MHz to 1 GHz
(n71_1C_10M_256QAM - High Channel, Port 1)



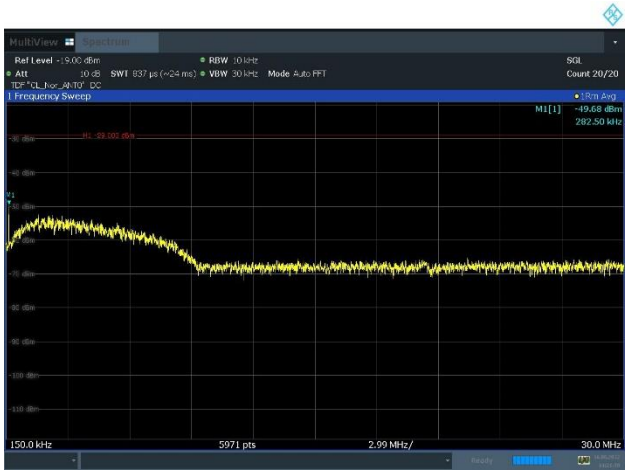
Plot 8-47. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(n71_1C_10M_256QAM - High Channel, Port 1)



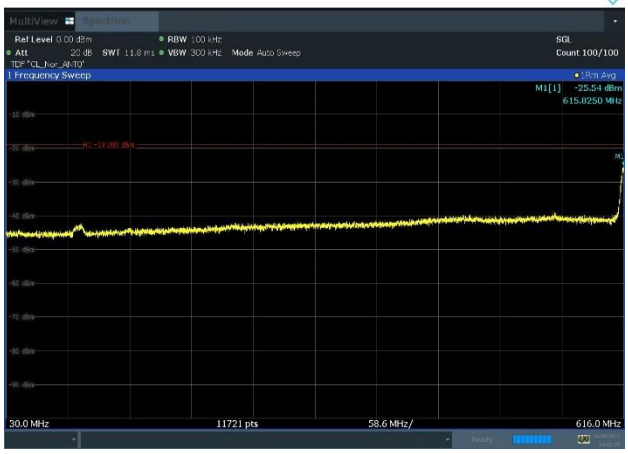
Plot 8-48. Conducted Spurious Emission Plot
3 GHz to 9 GHz
(n71_1C_10M_256QAM - High Channel, Port 1)



Plot 8-49. Conducted Spurious Emission Plot
9 kHz to 150 kHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)

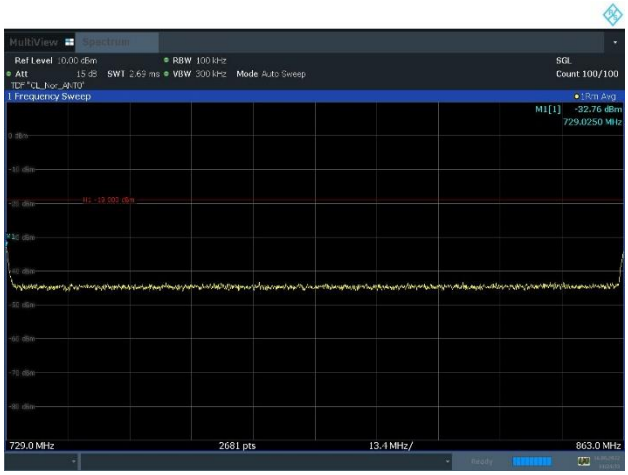


Plot 8-50. Conducted Spurious Emission Plot
150 kHz to 30 MHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)

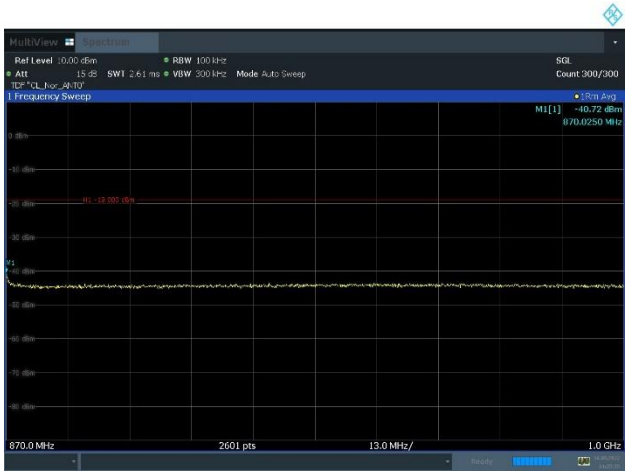


Plot 8-51. Conducted Spurious Emission Plot
30 MHz to 617 MHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)

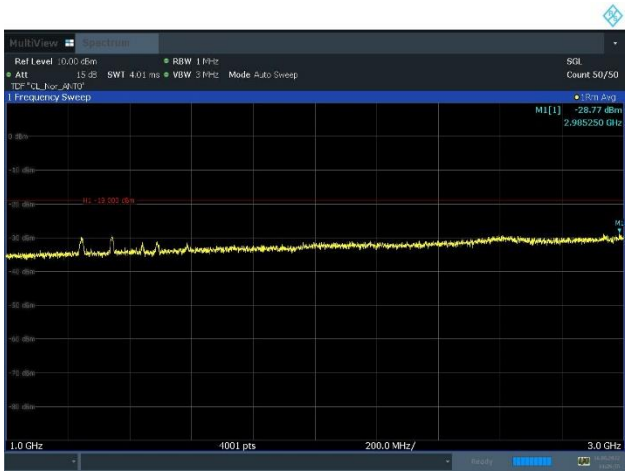
Plot 8-52. Conducted Spurious Emission Plot
653 MHz to 717 MHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)



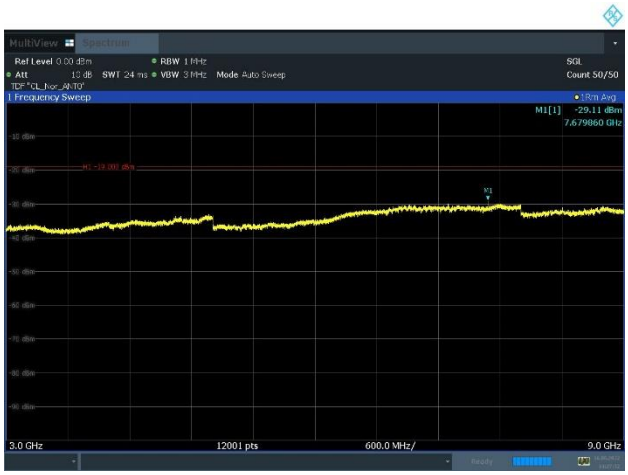
Plot 8-53. Conducted Spurious Emission Plot
729 MHz to 863 MHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)



Plot 8-54. Conducted Spurious Emission Plot
870 MHz to 1 GHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)



Plot 8-55. Conducted Spurious Emission Plot
1 GHz to 3 GHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)



Plot 8-56. Conducted Spurious Emission Plot
3 GHz to 9 GHz
(n26+n29+n71_3C_Inter-Band CA_QPSK, Port 0)

8.7 Frequency Stability

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of KDB 971168 D01 v03r01.
The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments 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 Description

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.

   Frequency measurements are made -30°C to +50°C in 10°C increments. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limit

NR n29 and n71 operation under Part 27.54
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

NR n26 operation under Part 90.213(a),
The frequency stability of the transmitter shall be maintained within ±1.5 ppm (±0.00015%) of center frequency.

Test Setup

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

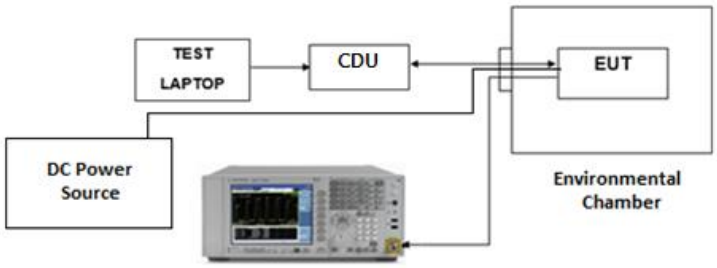


Figure 8-6. Test Instrument & Measurement Setup

Test Notes

None.

OPERATING FREQUENCY: 865,500,000 Hz
REFERENCE VOLTAGE: -48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (ºC)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	+ 20 (Ref)	865,500,040	0	0.0000000
100 %		- 30	865,500,051	11	0.0000013
100 %		- 20	865,500,051	11	0.0000013
100 %		- 10	865,500,050	10	0.0000012
100 %		0	865,500,050	10	0.0000012
100 %		+ 10	865,500,053	13	0.0000015
100 %		+ 30	865,500,040	0	0.0000000
100 %		+ 40	865,500,040	0	0.0000000
100 %		+ 50	865,500,040	0	0.0000000
85 %	-40.80	+ 20	865,500,040	0	0.0000000
115 %	-55.20	+ 20	865,500,040	0	0.0000000

Table 8-19. Frequency Stability Summary Data (NR_n26_1C_5M)

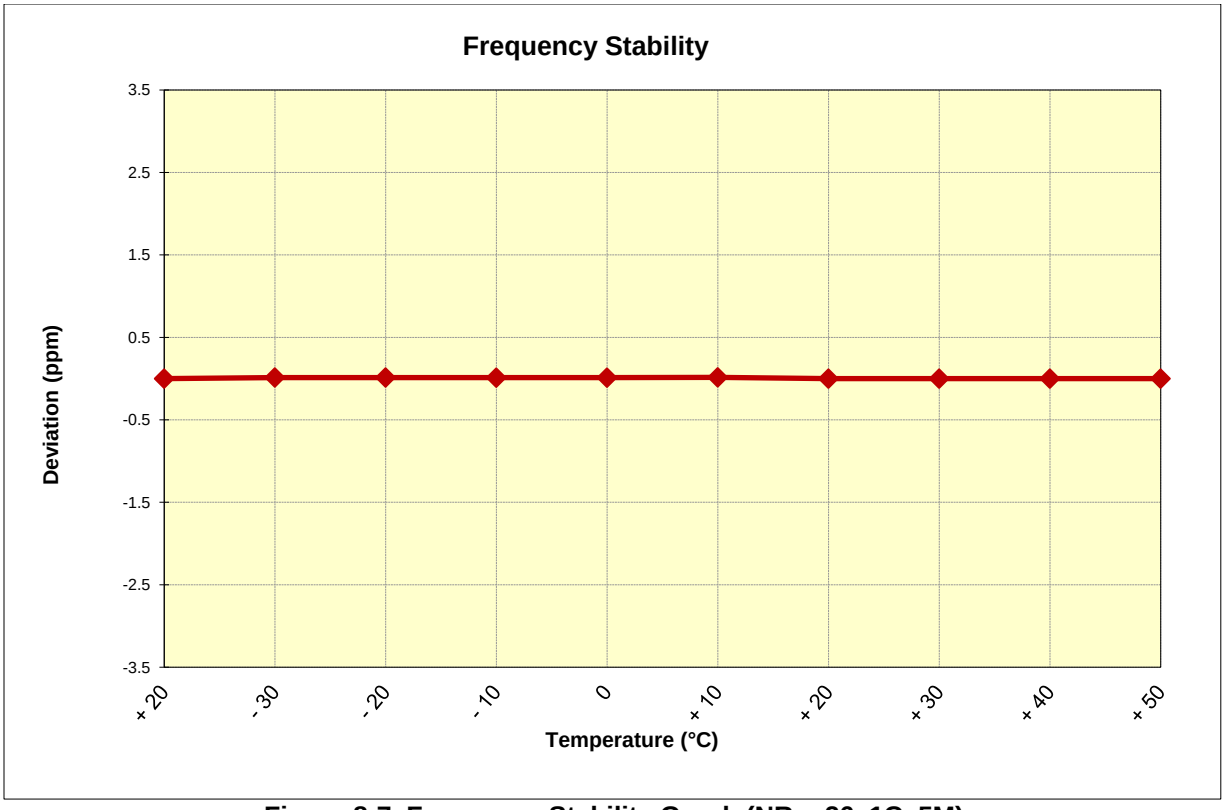


Figure 8-7. Frequency Stability Graph (NR_n26_1C_5M)

OPERATING FREQUENCY: 725,500,000 Hz
REFERENCE VOLTAGE: -48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	+ 20 (Ref)	725,500,028	0	0.0000000
100 %		- 30	725,500,029	1	0.0000001
100 %		- 20	725,500,028	0	0.0000000
100 %		- 10	725,500,029	1	0.0000001
100 %		0	725,500,029	1	0.0000001
100 %		+ 10	725,500,029	1	0.0000001
100 %		+ 30	725,500,028	0	0.0000000
100 %		+ 40	725,500,029	1	0.0000001
100 %		+ 50	725,500,029	1	0.0000001
85 %	-40.80	+ 20	725,500,028	0	0.0000000
115 %	-55.20	+ 20	725,500,028	0	0.0000000

Table 8-20. Frequency Stability Summary Data (NR_n29_1C_5M)

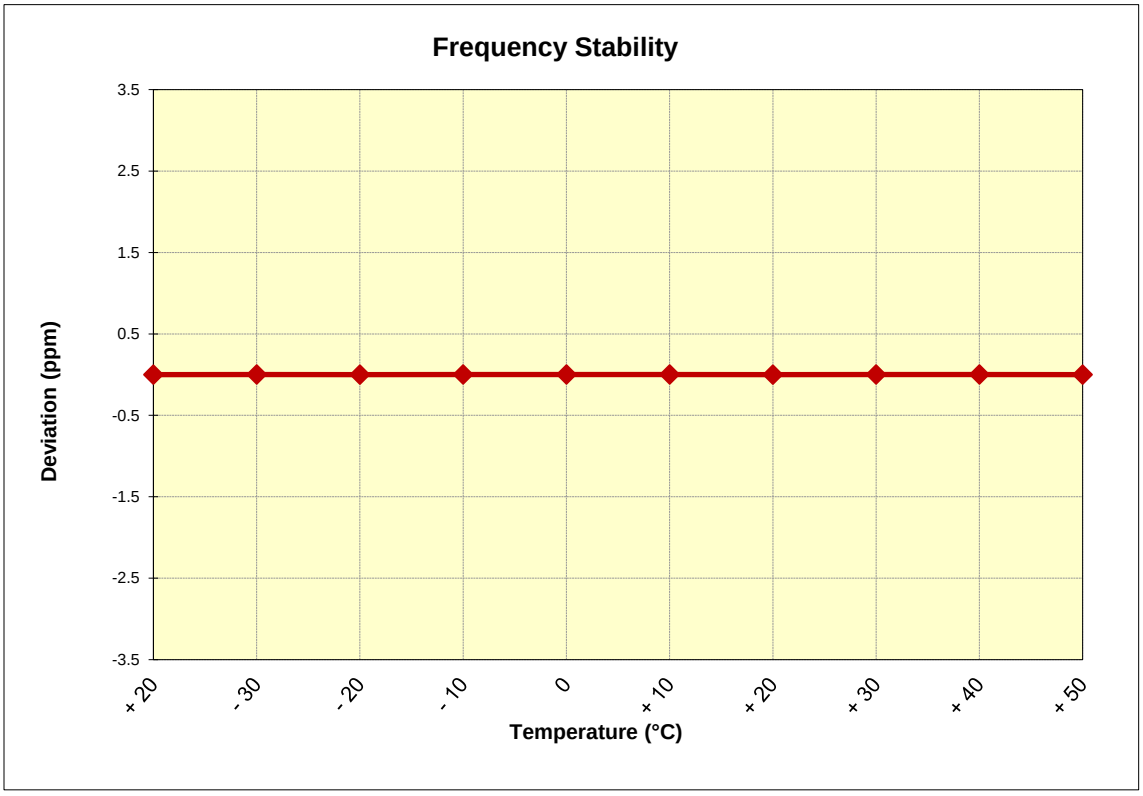


Figure 8-8. Frequency Stability Graph (NR_n29_1C_5M)

OPERATING FREQUENCY: 622,000,000 Hz
REFERENCE VOLTAGE: -48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	+ 20 (Ref)	622,000,024	0	0.0000000
100 %		- 30	622,000,024	0	0.0000000
100 %		- 20	622,000,025	1	0.0000002
100 %		- 10	622,000,026	2	0.0000003
100 %		0	622,000,025	1	0.0000002
100 %		+ 10	622,000,025	1	0.0000002
100 %		+ 30	622,000,024	0	0.0000000
100 %		+ 40	622,000,025	1	0.0000002
100 %		+ 50	622,000,024	0	0.0000000
85 %	-40.80	+ 20	622,000,024	0	0.0000000
115 %	-55.20	+ 20	622,000,024	0	0.0000000

Table 8-21. Frequency Stability Summary Data (NR_n71_1C_10M)

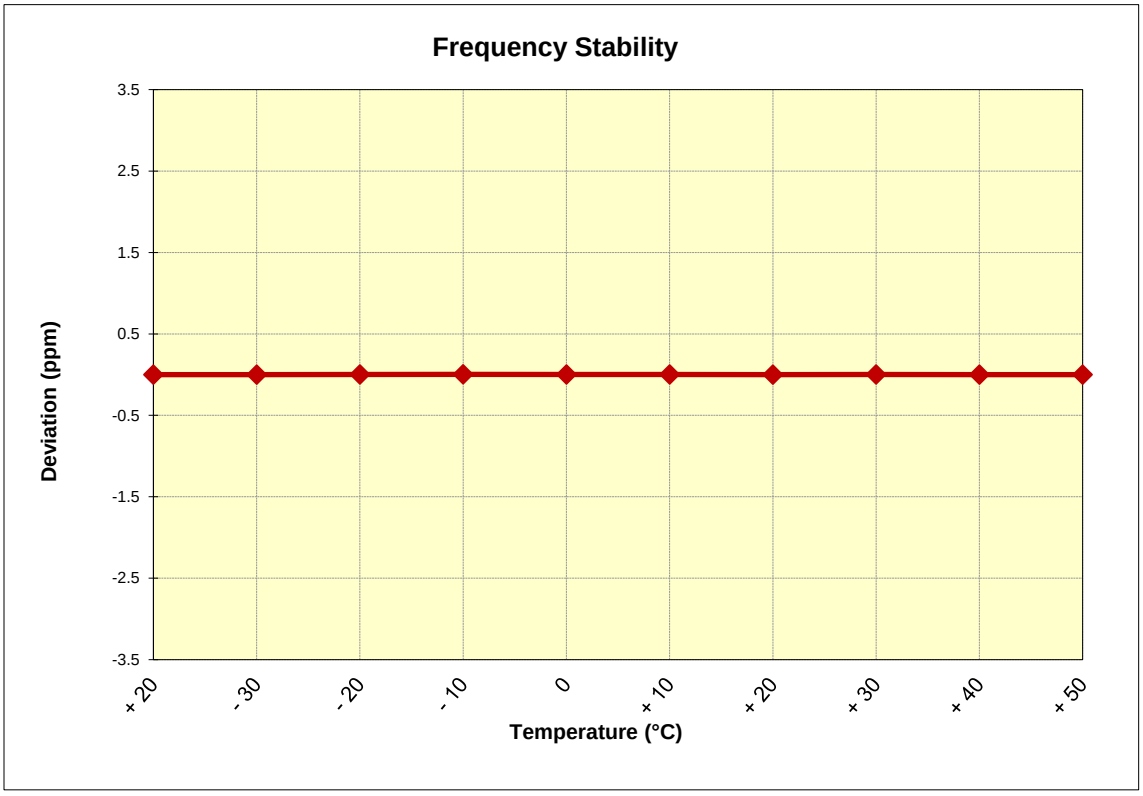


Figure 8-9. Frequency Stability Graph (NR_n71_1C_10M)

8.8 Radiated spurious emission

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 horizontally polarized broadband tri-log 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 = Peak for the pre-scan, (In cases where the level is within 2 dB of the limit, the final measurement is taken using RMS detector.)
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

NR n29 and n71 operation under Part 27.53
The minimum permissible attenuation level of any spurious emission is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

NR n26 operation under Part 90.691
For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Test Setup

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

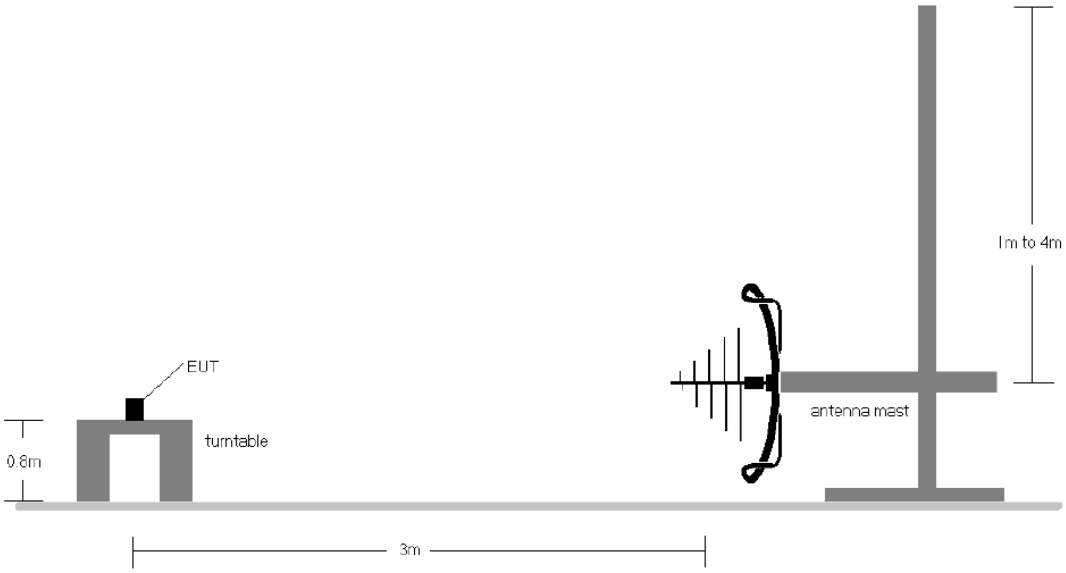


Figure 8-10. Test Instrument & Measurement Setup < 1 GHz

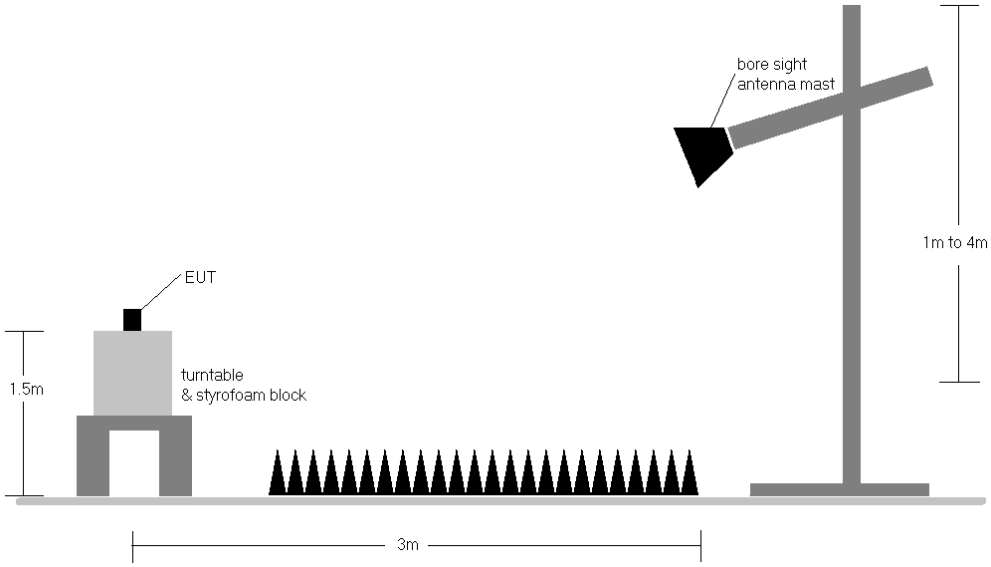


Figure 8-11. Test Instrument & Measurement Setup > 1 GHz

Test Notes

1. Per Part 90.691, the frequency block by up to and including 37.5 kHz range complies with 50 + 10 Log10(P) decibels and frequency block greater than 37.5 kHz range complies with 43 + 10Log10(P) decibels limit.

2. 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] + 107 + AFCL [dB/m]

= -75.54 [dBm] + 107 + 20.94 [dB/m] = 52.40 dBμV/m

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

= 52.40 dB[μV/m] + (20*log (3)) - 104.8

= -42.06 dBm

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

Frequency [MHz]	Antenna Factor (dB/m)	Chamber measurement cable loss + amplifier [dB]	AFCL (dB/m)
271.42	13.08	1.34	14.42
8946.47	37.34	-16.40	20.94

Table 8-22. Adopted AFCL value in the calculation

3. 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.

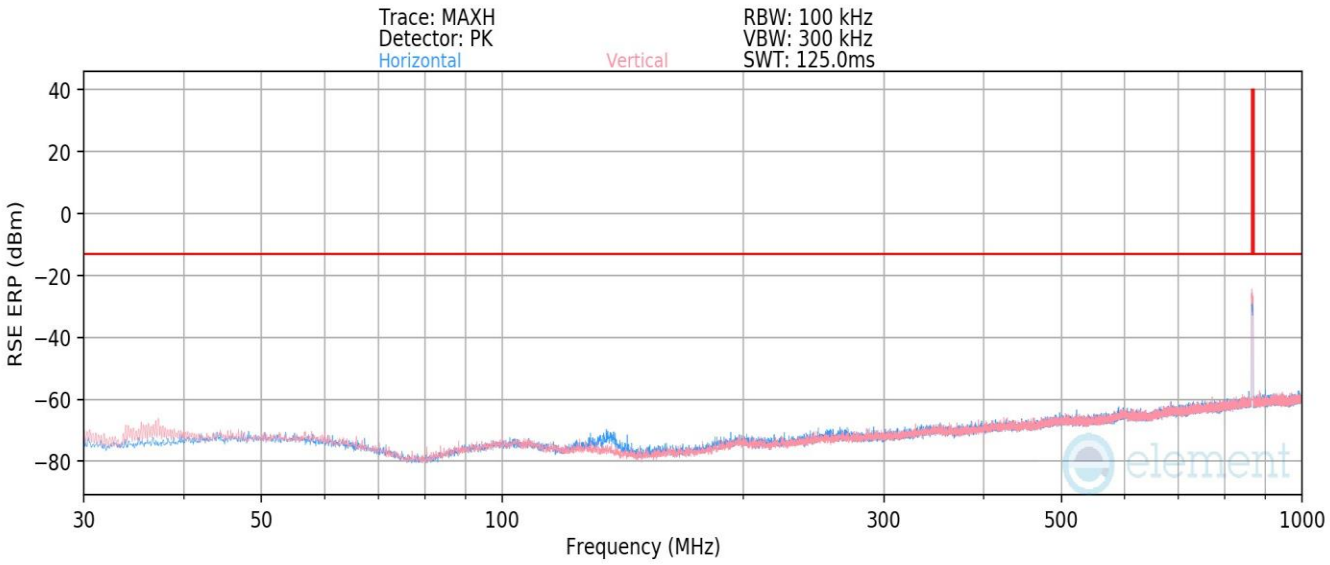
4. The spectrum is measured from 30 MHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

5. All emissions were measured at a 3-meter test distance.

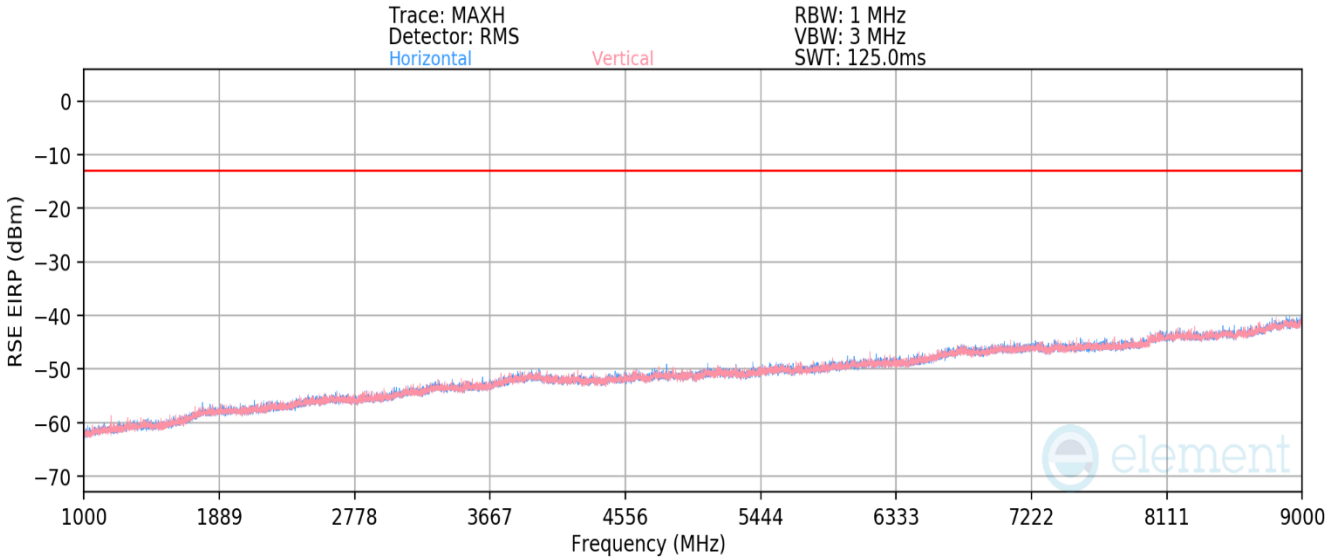
6. Spurious emissions were measured with all EUT antennas transmitting simultaneously and all antenna ports terminated.

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

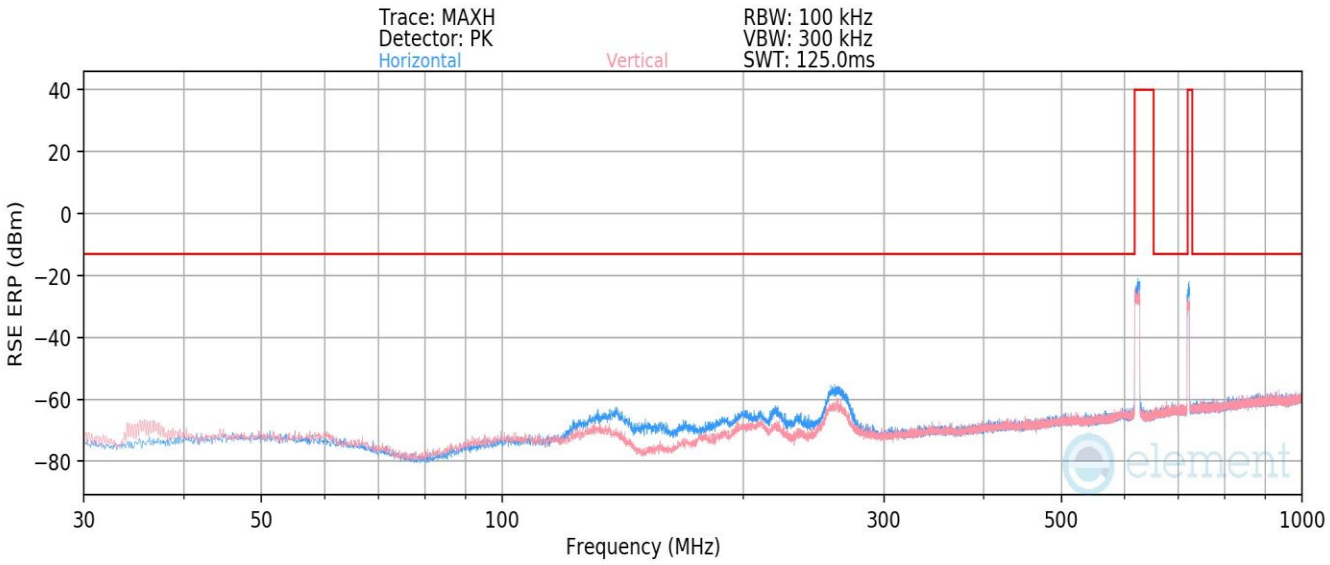
8. All modes of operation were investigated and the worst case configuration results are reported in this section.



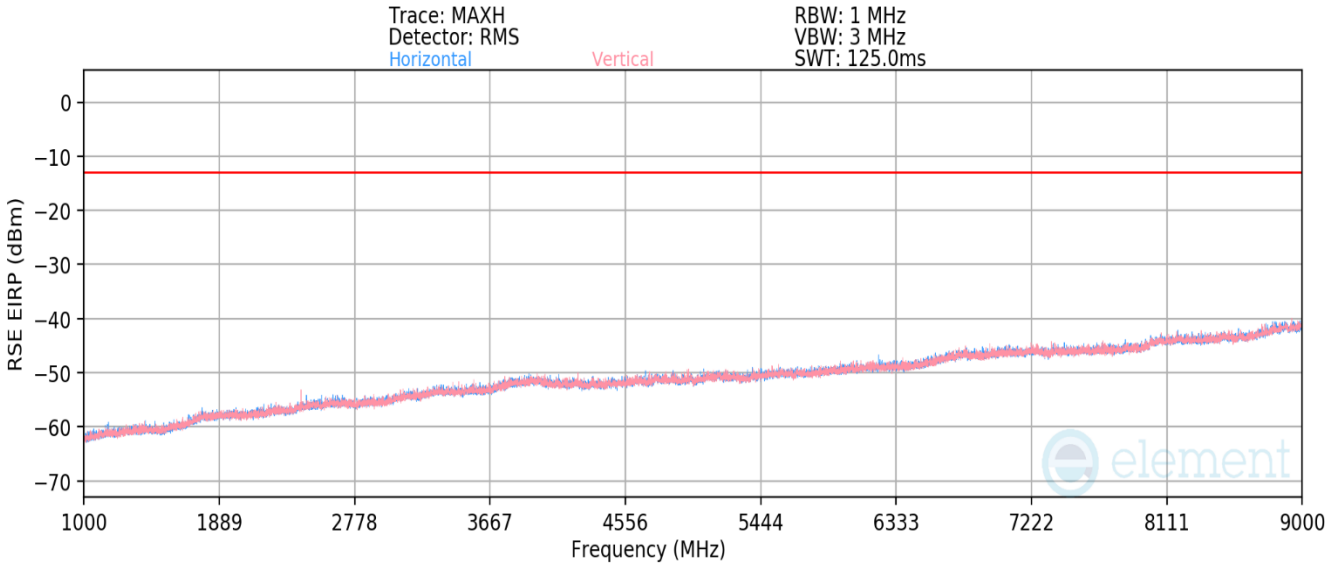
Plot 8-57. Radiated spurious emission_30 MHz to 1000 MHz (n26_1C_5M_Mid Channel)



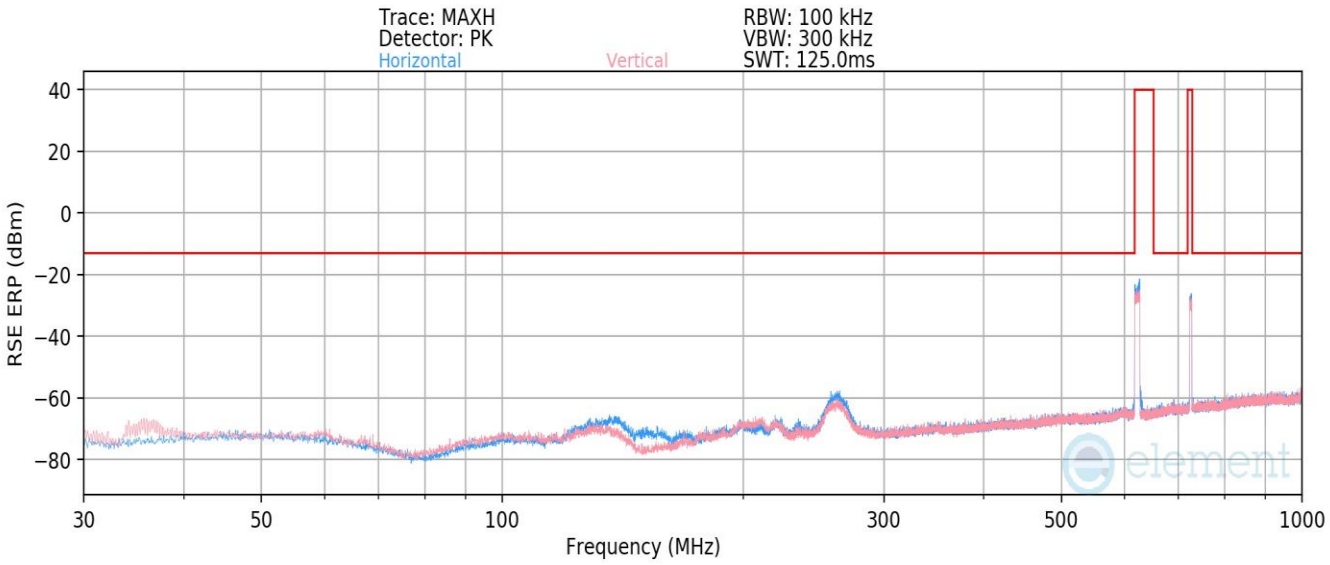
Plot 8-58. Radiated spurious emission_1 GHz to 9 GHz (n26_1C_5M_Mid Channel)



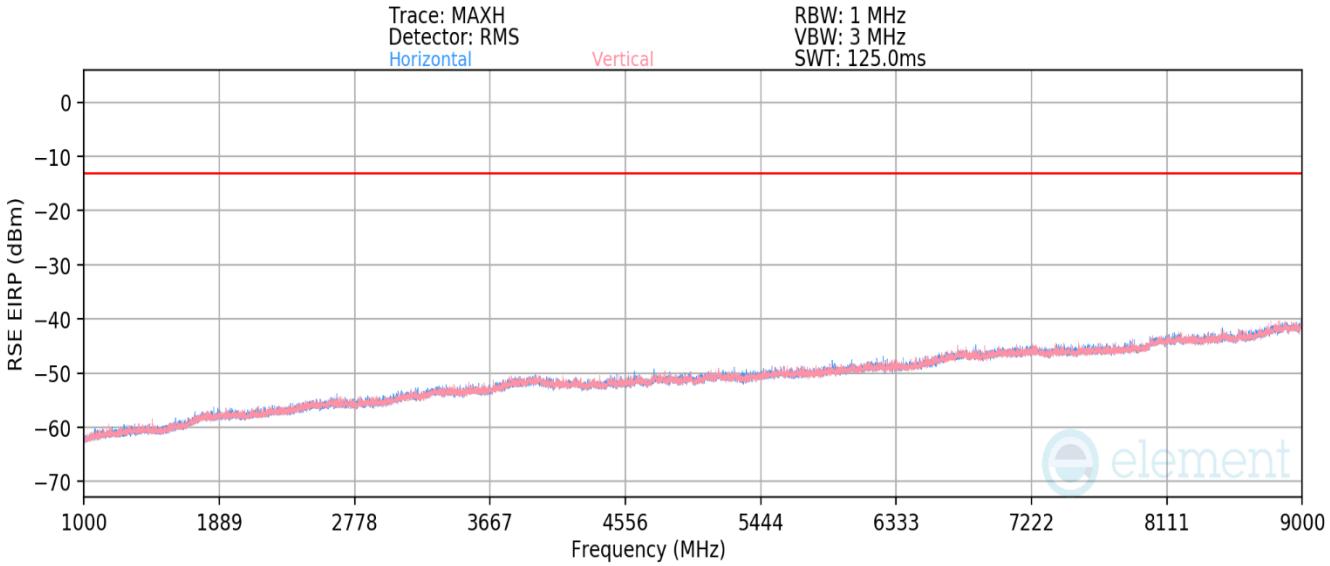
Plot 8-59. Radiated spurious emission_30 MHz to 1000 MHz (n71+n29_2C_10M+5M_Low Channel)



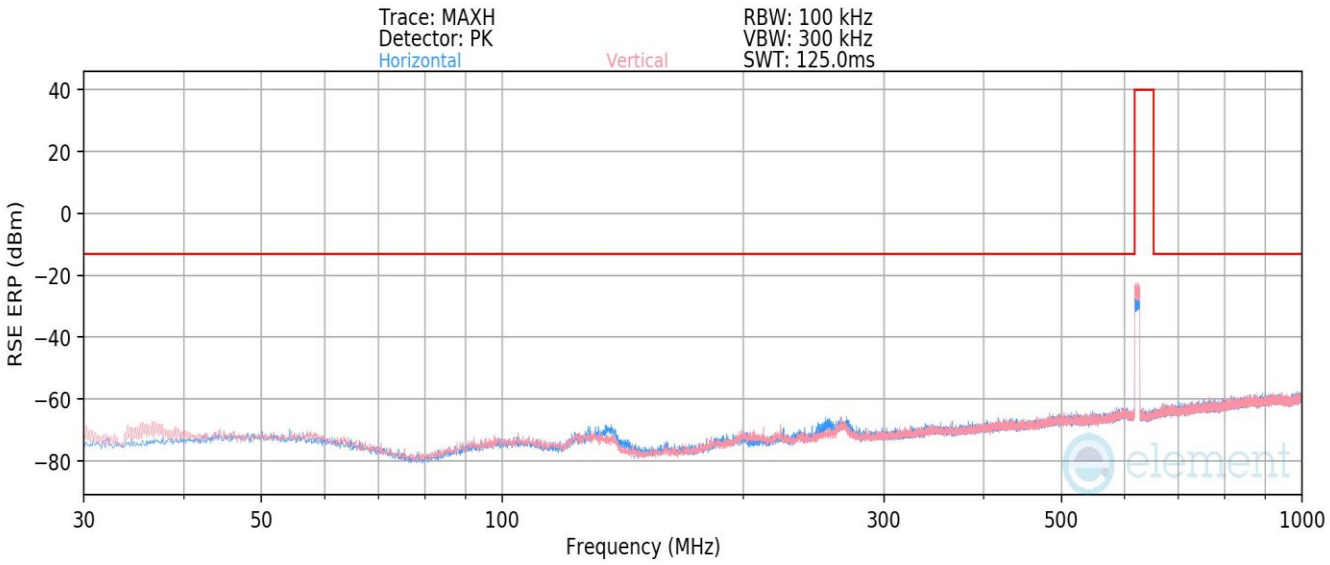
Plot 8-60. Radiated spurious emission Plot_1 GHz to 9 GHz (n71+n29_2C_10M+5M_Low Channel)



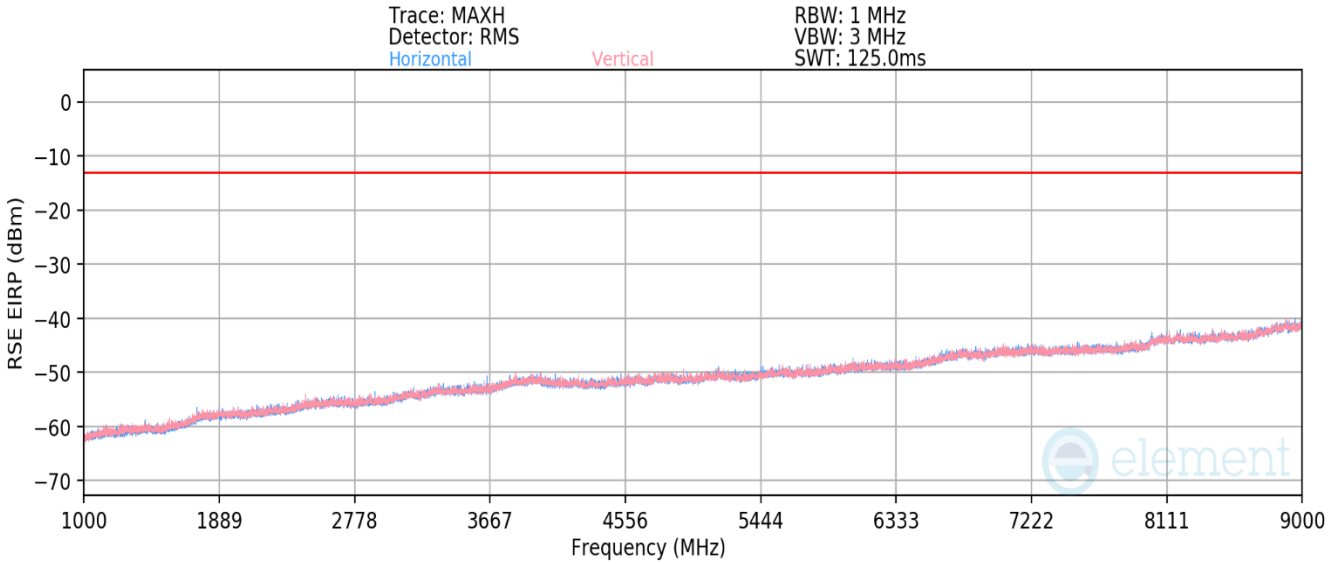
Plot 8-61. Radiated spurious emission_30 MHz to 1000 MHz (n71+n29_2C_10M+5M_High Channel)



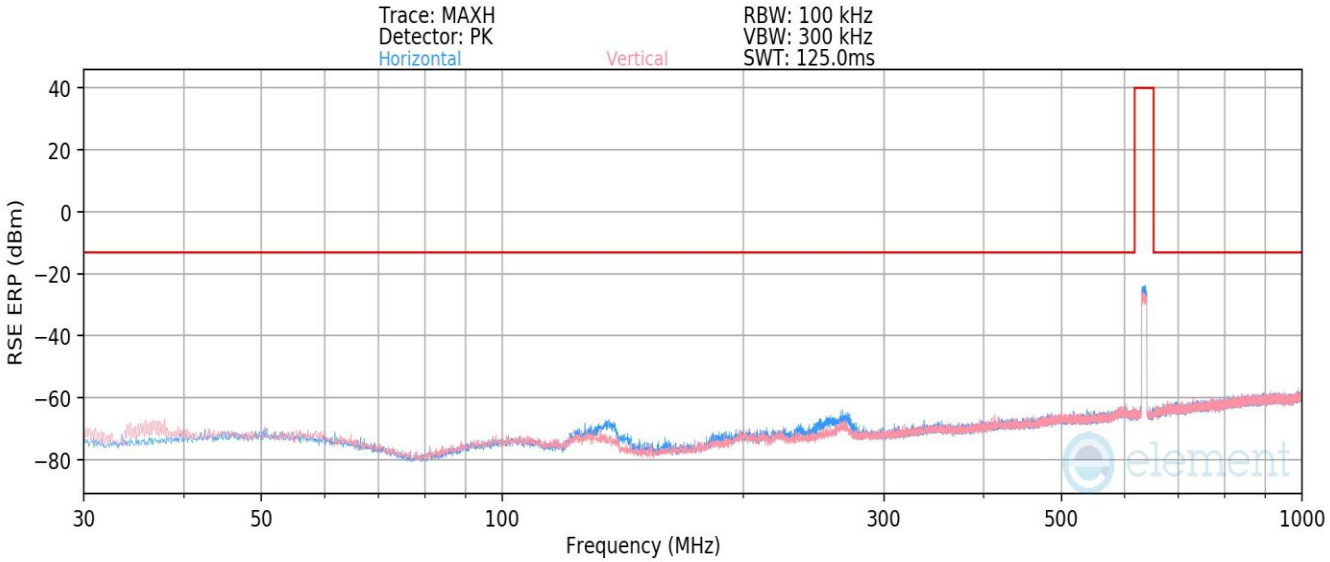
Plot 8-62. Radiated spurious emission Plot_1 GHz to 9 GHz (n71+n29_2C_10M+5M_High Channel)



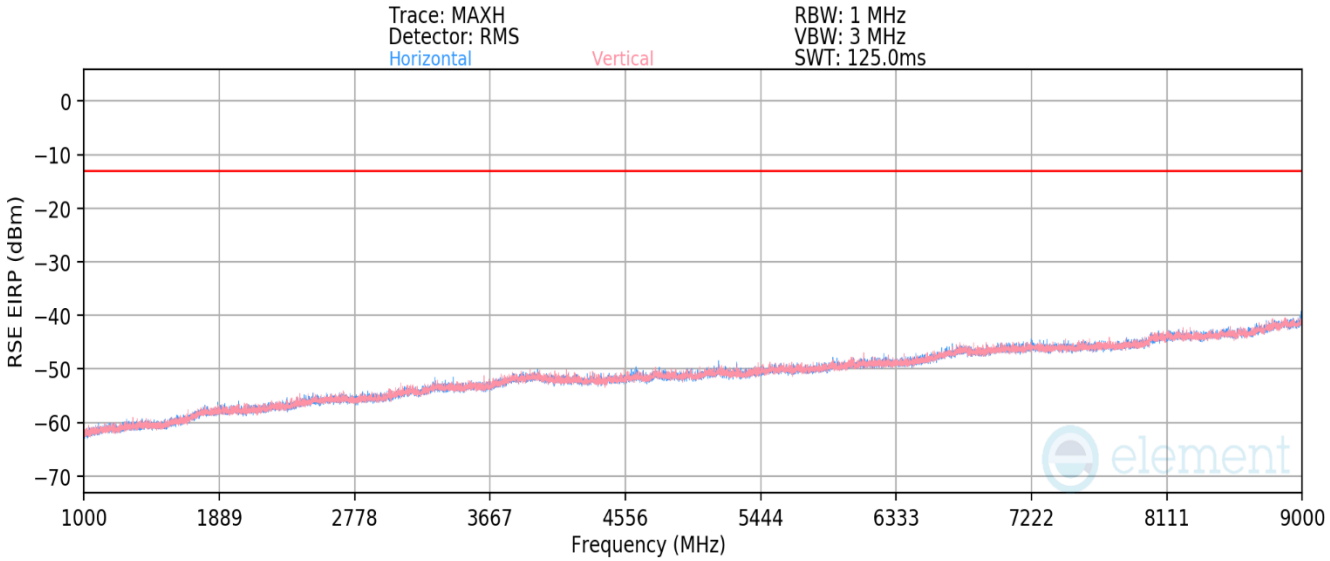
Plot 8-63. Radiated spurious emission_30 MHz to 1000 MHz (n71_1C_10M_Low Channel)



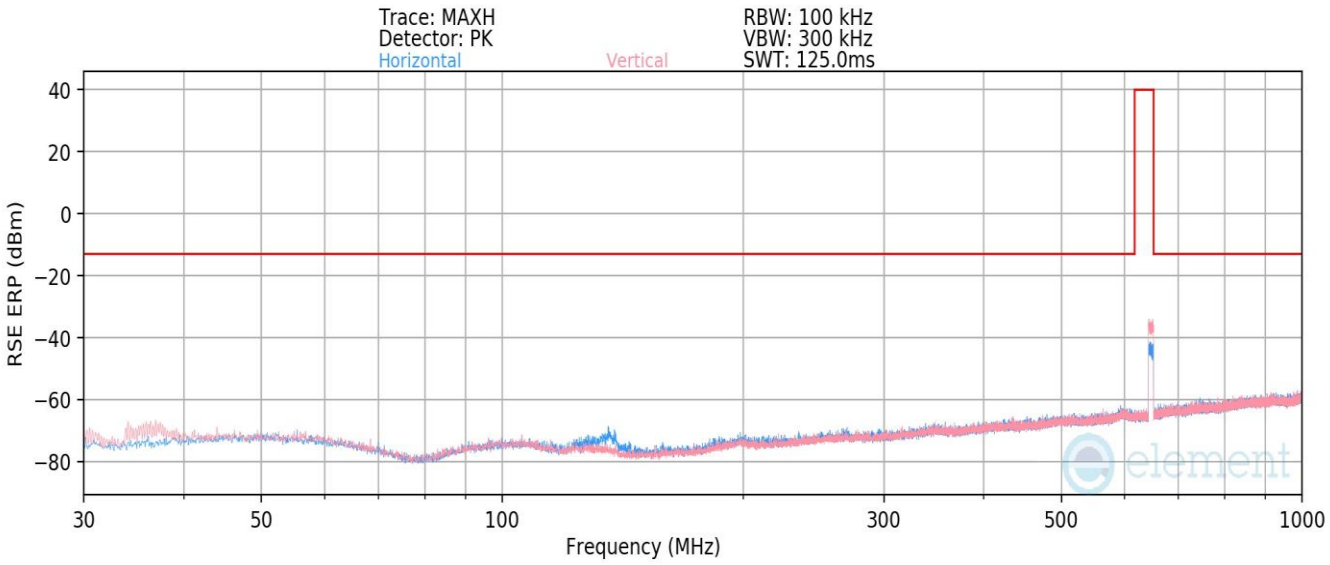
Plot 8-64. Radiated spurious emission Plot_1 GHz to 9 GHz (n71_1C_10M_Low Channel)



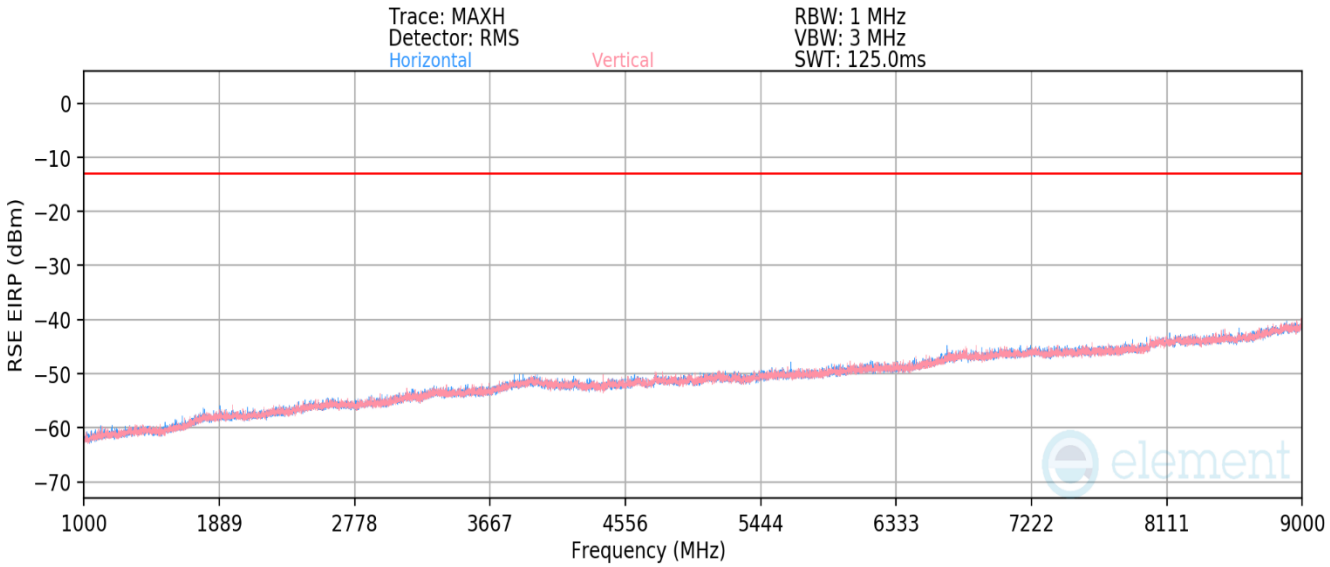
Plot 8-65. Radiated spurious emission_30 MHz to 1000 MHz (n71_1C_10M_Mid Channel)



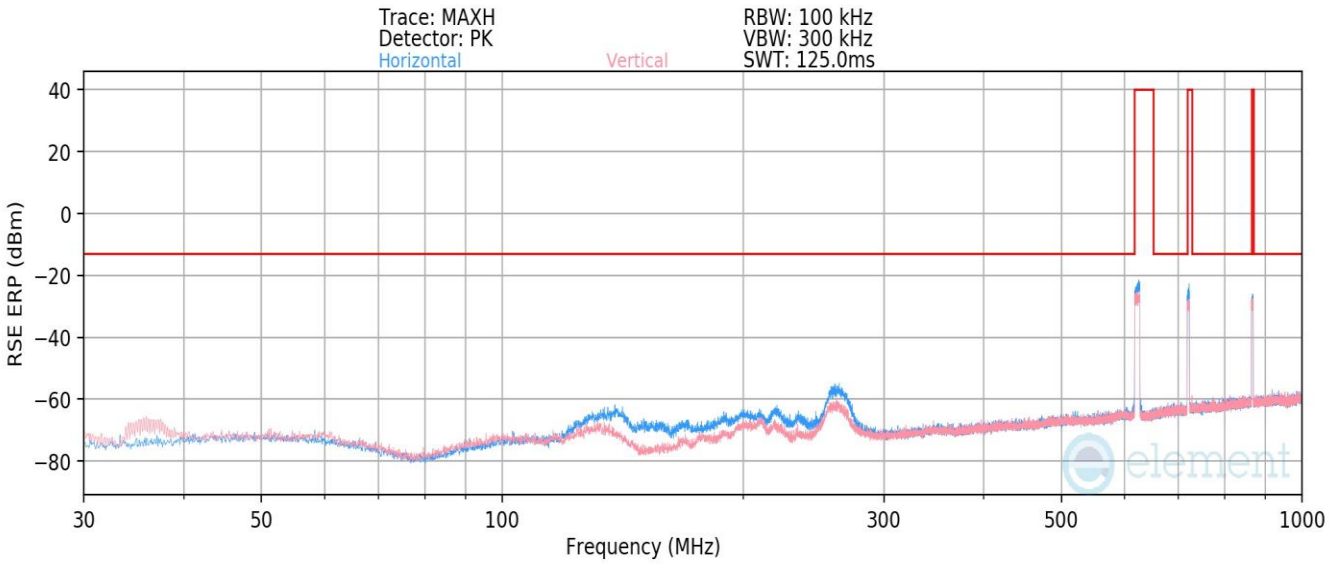
Plot 8-66. Radiated spurious emission Plot_1 GHz to 18 GHz (n71_1C_10M_Mid Channel)



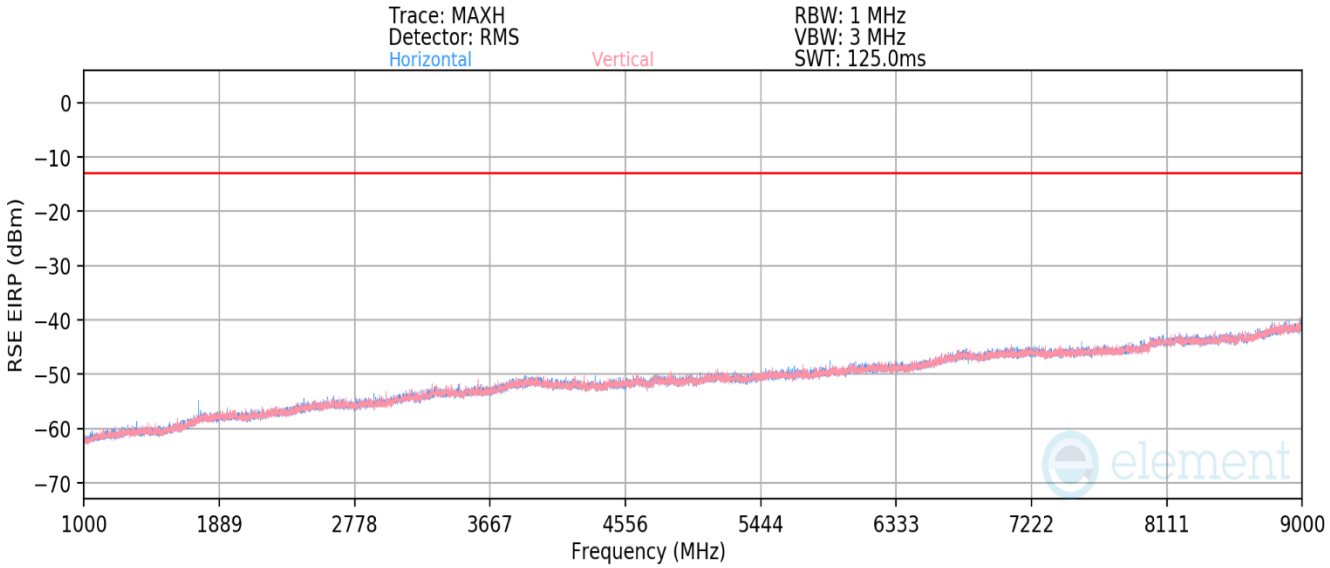
Plot 8-67. Radiated spurious emission_30 MHz to 1000 MHz (n71_1C_10M_High Channel)



Plot 8-68. Radiated spurious emission Plot_1 GHz to 9 GHz (n71_1C_10M_High Channel)



Plot 8-69. Radiated spurious emission_30 MHz to 1000 MHz (n71+n29+n26_3C_10M+5M+5M _Inter-Band Carrier Aggregation)



Plot 8-70. Radiated spurious emission Plot_1 GHz to 9 GHz (n71+n29+n26_3C_10M+5M+5M _Inter-Band Carrier Aggregation)

Bandwidth (MHz)	n71+n29_2C_10 MHz + 5 MHz
Center Frequency (MHz)	622 MHz + 720.5 MHz
Modulation Signal	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Heigh [cm]	Turntable azimuth [degree]	Analyzer Level [dBm/MHz]	AFCL [dBm]	Field Strength [dBμV/m]	RSE EIRP [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
271.42	H	120	250	-81.28	14.42	40.14	-54.32	-13	-41.32
274.65	V	100	40	-86.62	14.46	34.84	-59.62	-13	-46.62
8946.47	H	150	20	-75.54	20.94	52.40	-42.06	-13	-29.06
8929.85	V	200	100	-76.62	20.94	51.32	-43.14	-13	-30.14

Table 8-23. Radiated spurious emission Worst case Summary Data (n71+n29_2C_10M+5M_Low Channel)

9.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung RRU(RF4450t) FCC ID: A3LRF4450T-71A** complies with all of the requirements of Part 27 and 90 FCC Rules.

10.0 APPENDIX. A

10.1 Conducted Average Output Power

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Description

KDB 971168 D01 v03r01 – Section 5
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4.4.1

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

1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 ~ 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Span = 2 ~ 3 x OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger Settings is set to "RF Power" for signals with non-continuous operation with the sweep times set to "auto". Refer test note 3 for details.
8. Trace mode = Trace-Averaging (RMS) set to average over 100 sweeps
9. The trace was allowed to stabilize

Test Setup

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

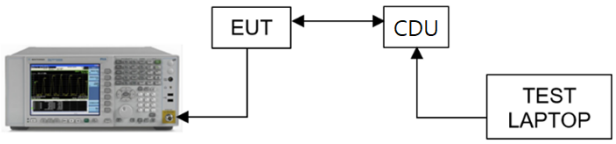


Figure 10-1. Test Instrument & Measurement Setup

Limit

N/A

Note

1. Conducted Average Output Power test result used to Grant of Authorization power and MPE.

2. MIMO Calculations are done considering output channel power for all ports and respective margins are calculated according to procedures in section 6.4 of ANSI C63.26 and section D of KDB 971168 D01 v03r01.

3. Consider the following factors for MIMO Power:
   Conducted power for each port is measured in dBm.
   Powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01-Section D.
   Conducted power per port (dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO conducted power in milliWatts (mW).

4. Sample Calculation:
   Let us assume the following numbers:
   a) Total MIMO Conducted Power as 36535.95 mW
   b)

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		36535.95	mW
Summed MIMO Conducted Power (dBm)	= 10 * log (81863.59) =	45.63	dBm

Channel	Port	QPSK	16QAM	64QAM	256QAM
Mid	0	**39.68**	39.22	39.60	**39.58**
	1	**39.84**	39.45	39.46	**39.65**
	2	**39.32**	39.20	39.20	**39.33**
	3	**39.57**	39.23	39.31	**39.50**
	Total Conducted Power (mW)	**36535.95**	33859.45	34799.55	**35786.81**
	Total Conducted Power(dBm)	**45.63**	45.30	45.42	**45.54**

Table 10-1. Conducted Average Output Power Table (NR_n26_1C_5M)

Channel	Port	QPSK	16QAM	64QAM	256QAM
Low	0	42.06	42.12	42.41	42.60
	1	42.32	42.21	42.57	42.50
	2	42.39	42.05	42.31	42.40
	3	42.05	42.10	42.45	42.42
	Total Conducted Power (mW)	66500.73	65177.64	70090.63	70816.03
	Total Conducted Power(dBm)	48.23	48.14	48.46	48.50
High	0	**42.52**	**42.62**	42.48	42.47
	1	**42.53**	**42.61**	42.50	42.55
	2	**42.72**	**42.71**	42.70	42.62
	3	**42.57**	**42.52**	42.46	42.53
	Total Conducted Power (mW)	**72549.50**	**73048.63**	71724.52	71836.15
	Total Conducted Power(dBm)	**48.61**	**48.64**	48.56	48.56

Table 10-2. Conducted Average Output Power Table (NR_n29_1C_5M)

Channel	Port	QPSK	16QAM	64QAM	256QAM
Low	0	45.84	45.76	**45.82**	45.72
	1	45.42	45.67	**45.57**	45.41
	2	45.72	45.61	**45.77**	45.61
	3	45.62	45.64	**45.62**	45.60
	Total Conducted Power (mW)	147004.87	147603.40	**148484.91**	144777.94
	Total Conducted Power(dBm)	51.67	51.69	**51.72**	51.61
Mid	0	**45.78**	45.68	45.74	45.70
	1	**45.64**	45.61	45.39	45.42
	2	**45.69**	45.62	45.70	45.68
	3	**45.66**	45.60	45.59	45.57
	Total Conducted Power (mW)	**148368.99**	146157.52	145469.06	145027.94
	Total Conducted Power(dBm)	**51.71**	51.65	51.63	51.61
High	0	45.46	45.81	45.64	45.65
	1	45.23	45.48	45.72	45.53
	2	45.64	45.60	45.62	45.58
	3	45.50	45.74	45.68	45.66
	Total Conducted Power (mW)	140623.78	147230.01	147426.99	145409.40
	Total Conducted Power(dBm)	51.48	51.68	51.69	51.63

Table 10-3. Conducted Average Output Power Table (NR_n71_1C_10M)