Choose Scandinavian trust

Radio Test report – LPRU 4420 B25B66

Type of assessment:

FCC: Class II Permissive Change

ISED: Class III Permissive Change

Report ID

REP033399

Project ID

PRJ0054747

Applicant:

Ericsson Canada Inc.

Product name:

Radio Unit

Model (PMN):

LPRU 4420 B25B66

Part number:

KRC 161 906/1

FCC Identifier

TA8AKRC161906-1

ISED certification number:

IC: 287AB-AS1619061

HVIN:

AS1619061

Requirements/Summary:

Standard	Environmental phenomenon	Compliance
FCC 47 CFR Part 27	Miscellaneous wireless communications services	Yes
RSS-139 Issue 4, September 29, 2022	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710–1780 MHz and 2110–2200 MHz	Yes

Date of issue: April 1, 2024

Nimish Kapoor, EMC/RF Test Specialist

Tested by

Signature

Kevin Rose, EMC/RF Test Specialist

Reviewed by

Signature

Nemko Canada Inc., a testing laboratory, is accredited by ANSI National Accreditation Board (ANAB).
The tests included in this report are within the scope of this accreditation.
The ANAB symbol is an official symbol of the ANSI National Accreditation Board, used under licence.

ANAB File Number: AT-3195 (Ottawa); AT-3193 (Pointe-Claire); AT-3194 (Cambridge)

Two test locations

Company name	Nemko Canada Inc.	
Address	303 River Road	349 Terry Fox
City	Ottawa	Ottawa
Province	Ontario	Ontario
Postal code	K1V 1H2	K2K 2V6
Country	Canada	Canada
Telephone	+1 613 737 9680	+1 613 963 8000
Facsimile	+1 613 737 9691	
Toll free	+1 800 563 6336	
Website	www.nemko.com	
Site number	FCC test site registration number: CA2040, IC: 2040A-4 (3 m semi anechoic chamber)	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.
Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.
Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
© Nemko Canada Inc.

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Ericsson Canada Inc.
Address	349 Terry Fox Drive, Ottawa, ON, Canada, K2K 2V6

1.2 Test specifications

FCC 47 CFR Part 2	Frequency Allocations and Radio Treaty Maters; General Rules and Regulations
FCC 47 CFR Part 27	Miscellaneous wireless communications services (2110–2200 MHz)
RSS-139 Issue 4, September 29, 2022	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710–1780 MHz and 2110–2200 MHz
RSS-Gen, Issue 5, April 2018	General Requirements for Compliance of Radio Apparatus

1.3 Test method

ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
KDB 662911 D01	Multiple Transmitter Output v02r01
KDB 662911 D02	MIMO with Cross-Polarized Antennas v01

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant. Testing was completed against customer test plan. Results obtained indicate that the product under test complies in full with the requirements tested.

This test report (**REP033399**) applies to the *LPRU 4420 B25B66* with part number *KRC 161 906/1.* See "Summary of test results" for full details.

EUT Configuration(s) SRO/MRO:
B66:
NR : 25, 30, 35, 40 MHz, Max 3 Carriers per branch

1.5 Test report revision history

Table 1.5-1: *Test report revision history*

Report ID	Date of issue	Details of changes made to test report
REP033399	April 1, 2024	Original report issued

Section 2. Summary of test results

2.1 Testing location

Test location (s)	Ottawa

2.2 Testing period

Test start date	March 20, 2024	Test end date	March 20, 2024

2.3 Sample information

Receipt date	March 20, 2024	Nemko sample ID number	PRJ00547470001

2.4 FCC Part 27 test results

Table 2.4-1: *FCC results summary*

Part	Test description	Verdict
§27.50(b)	Maximum output power at RF antenna connector	Pass
§27.53	Spurious emissions at RF antenna connector	Pass
§27.53	Spurious emissions (conducted)	Pass
§2.1049	Occupied bandwidth	Pass

Notes: Only tests requested by the client have been performed

[1]EUT transmits within 2110-2200 MHz frequency range

2.5 RSS-139 test results

Table 2.5-1: *ISED results summary*

Part	Test description	Verdict
RSS-139, 5.3	Types of Modulation	Pass[1]
RSS-139, 5.5	Transmitter output power and Equivalent Isotropic Radiated Power (e.i.r.p.)	Pass
RSS-139, 5.6	Unwanted emission limits	Pass
RSS-139, 5.6	Spurious emissions (conducted)	Pass
RSS-Gen, 6.7	Occupied bandwidth	Pass

Notes: Only tests requested by the client have been performed

[1]EUT employs digital modulation (QPSK)

Section 3. Equipment under test (EUT) details

3.1 EUT information

Product name	Radio Unit	
Model	LPRU 4420 B25B66	
Part number	KRC 161 906/1	
Revision	R2A	
Serial number	TD3F090346	
Antenna ports	4 TX/RX for B25 4 TX/RX for B66	
RF BW / IBW	B25 IBW DL: 65 MHz B25 IBW UL: 65 MHz	B66 IBW DL: 70 MHz B66 IBW UL: 70 MHz
FDD	B25: 80 MHz	B66: 400 MHz
Frequency	B25 TX (DL): 1930 – 1995 MHz B25 RX (UL): 1850 – 1915 MHz	B66 TX (DL): 2110 – 2200 MHz B66 RX (UL): 1710 – 1780 MHz
Nominal O/P per Antenna port	0.159 W (22 dBm)	
Accuracy (nominal)	±0.1 ppm	
Nominal voltage	110 VAC or -48 VDC	
RAT	B25: LTE (LTE+NB-IoT), NR	B66: LTE (LTE+NB-IoT), NR
Modulation	LTE: QPSK, 16QAM, 64QAM, 256QAM NR: QPSK, 16QAM, 64QAM, 256QAM	
Channel bandwidth	LTE: 5, 10, 15, 20 MHz NR: 5, 10, 15, 20, 25, 30, 35, 40 MHz	
Channel bandwidth LTE + NB-IoT	LTE with NB-IoT GB: 10, 15, 20 MHz	
Maximum combined OBW per port	B25: 65 MHz	B66: 70 MHz
CPRI	10.1 Gbps	
Channel raster	LTE: 100 kHz NR: 100 kHz	
Regulatory requirements	Radio: FCC Part 2, 24, 27, RSS-Gen, RSS-133, RSS-139	
	EMC: FCC Part 15, ICES-003	
	Safety: IEC/EN 62368-1, UL/CSA 62368-1	
Emission Designator	LTE: 5M00W7D, 10M0W7D, 15M00W7D, 20M0W7D NR: 5M00F9W, 10M0F9W, 15M0F9W, 20M0F9W, 25M0F9W, 30M0F9W, 35M0F9W, 40M0F9W	
Supported Configurations	Single Antenna, TX Diversity, MIMO, Carrier Aggregation	
Operating temperature	0 °C to 55 °C	
Max RF Power	8 x 0.159 W (22 dBm)	
Supported carriers /band/ port SRO/MRO	Up to 3 carriers per branch	
Carrier Configuration:	B25: SRO: LTE, NR MRO: NR + LTE	B66: SRO: LTE, NR MRO: NR + LTE

RAT SC Carrier Power (max)	RAT	BW	PWR/Port
	LTE	5, 10, 15, 20 MHz	22 dBm
	NR	5, 10, 15, 20, 25, 30, 35, 40 MHz	22 dBm

3.2 Product description and theory of operation

EUT description of the methods used to exercise the EUT and all relevant ports:

Description/theory of operation	LPRU 4420 B25B66 (KRC 161 906/1) is a Remote Radio Unit forming part of the Ericsson Radio Base Station (RBS) equipment. The LPRU provides radio access for mobile and fixed devices and is intended for the indoor environment. The radio operates over 8 Transmit ports in MRO (LTE, NBIoT, and NR); Single, and Multi-Carrier transmission with a maximum rated RF Output of 0.159W per port over an operational temperature of 0°C to +55°C. The unit is designed to be rack mounted.
Ports/Interface	**Port** / **Description** AC-IN / AC Power Supply DC-IN-A/B / DC Power Supply, A and B feed inputs Alarm / External Alarm Input 1 and 2 Data-1/2 / CPRI 1 & 2 dRDI 1-8 / Proprietary ports 1A / 1B / 1C / 1D / RF I/O ports - Band 25 2A / 2B / 2C / 2D / RF I/O ports - Band 66
Physical	**Dimensions** / 132 x 442 x 366 mm **Weight** / 13.6 kg **Operating Temperature** / 0 °C to 55 °C **Mounting** / Rack mounted
Software details	CXP2030045/28_R18C294
Product Identification / Markings and Labels	 

3.3 EUT test details

EUT setup/configuration rationale for Down link:

RAT	Modulation	Test Model / Configuration
LTE	QPSK	TM1.1
LTE	16QAM	TM3.2
LTE	64QAM	TM3.1
LTE	256QAM	TM3.1a
NR	QPSK	TM1.1
NR	16QAM	TM3.2
NR	64QAM	TM3.1
NR	256QAM	TM3.1a

NR Single Carrier B66

Bandwidth, MHz	Transmit / DL, MHz					
	B	NR-ARFCN	M	NR-ARFCN	T	NR-ARFCN
5	2112.5	*422500*	2155.0	*431000*	2197.5	*439500*
10	2115.0	*423000*	2155.0	*431000*	2195.0	*439000*
15	2117.5	*423500*	2155.0	*431000*	2192.5	*438500*
20	2120.0	*424000*	2155.0	*431000*	2190.0	*438000*
25	2122.5	*424500*	2155.0	*431000*	2187.5	*437500*
30	2125.0	*425000*	2155.0	*431000*	2185.0	*437000*
35	2127.5	*425500*	2155.0	*431000*	2182.5	*436500*
40	2130.0	*426000*	2155.0	*431000*	2180.0	*436000*

Bandwidth, MHz	Receive / UL, MHz					
	B	NR-ARFCN	M	NR-ARFCN	T	NR-ARFCN
5	1712.5	*342500*	1755.0	*351000*	n/a	*n/a*
10	1715.0	*343000*	1755.0	*351000*	n/a	*n/a*
15	1717.5	*343500*	1755.0	*351000*	n/a	*n/a*
20	1720.0	*344000*	1755.0	*351000*	n/a	*n/a*
25	1722.5	*344500*	1755.0	*351000*	n/a	*n/a*
30	1725.0	*345000*	1755.0	*351000*	n/a	*n/a*
35	1727.5	*345500*	1755.0	*351000*	n/a	*n/a*
40	1730.0	*346000*	1755.0	*351000*	n/a	*n/a*

EUT test details, continued

B66 NR Configurations Tested:

Carrier configurations	Transmit / DL, MHz
SC, 25MHz, Bottom	2122.5
SC, 25MHz, Middle	2155.0
SC, 25MHz, Top	2187.5
SC, 30MHz, Bottom	2125.0
SC, 30MHz, Middle	2155.0
SC, 30MHz, Top	2185.0
SC, 35MHz, Bottom	2127.5
SC, 35MHz, Middle	2155.0
SC, 35MHz, Top	2182.5
SC, 40MHz, Bottom	2130.0
SC, 40MHz, Middle	2155.0
SC, 40MHz, Top	2180.0
2C, 25MHz, Bottom	2122.5+2147.5
2C, 25MHz, Middle	2142.5+2167.5
2C, 25MHz, Top	2162.5+2187.5

3.4 EUT setup diagram

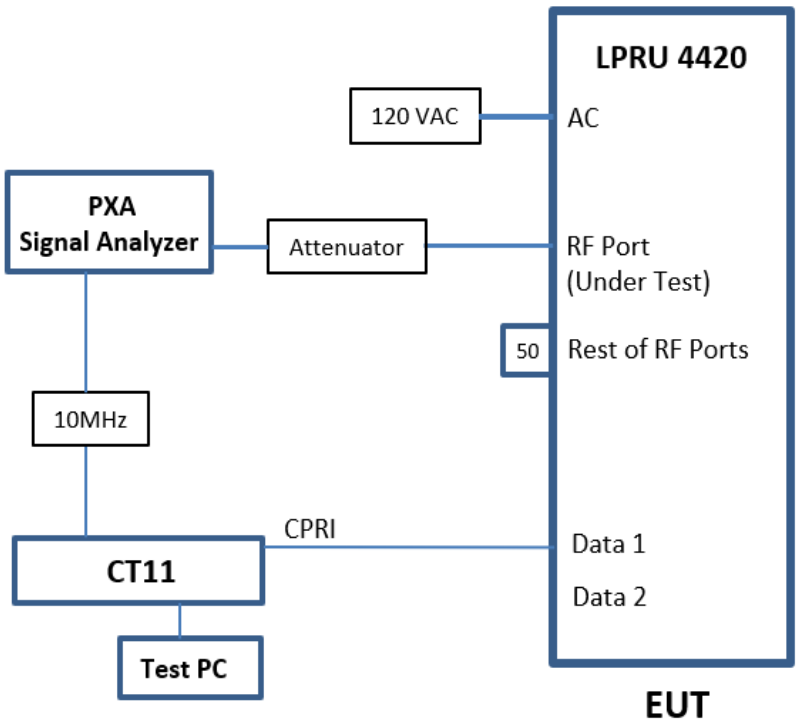

Figure 3.4-1: *Setup diagram – Radio Compliance*

3.5 Setup photographs

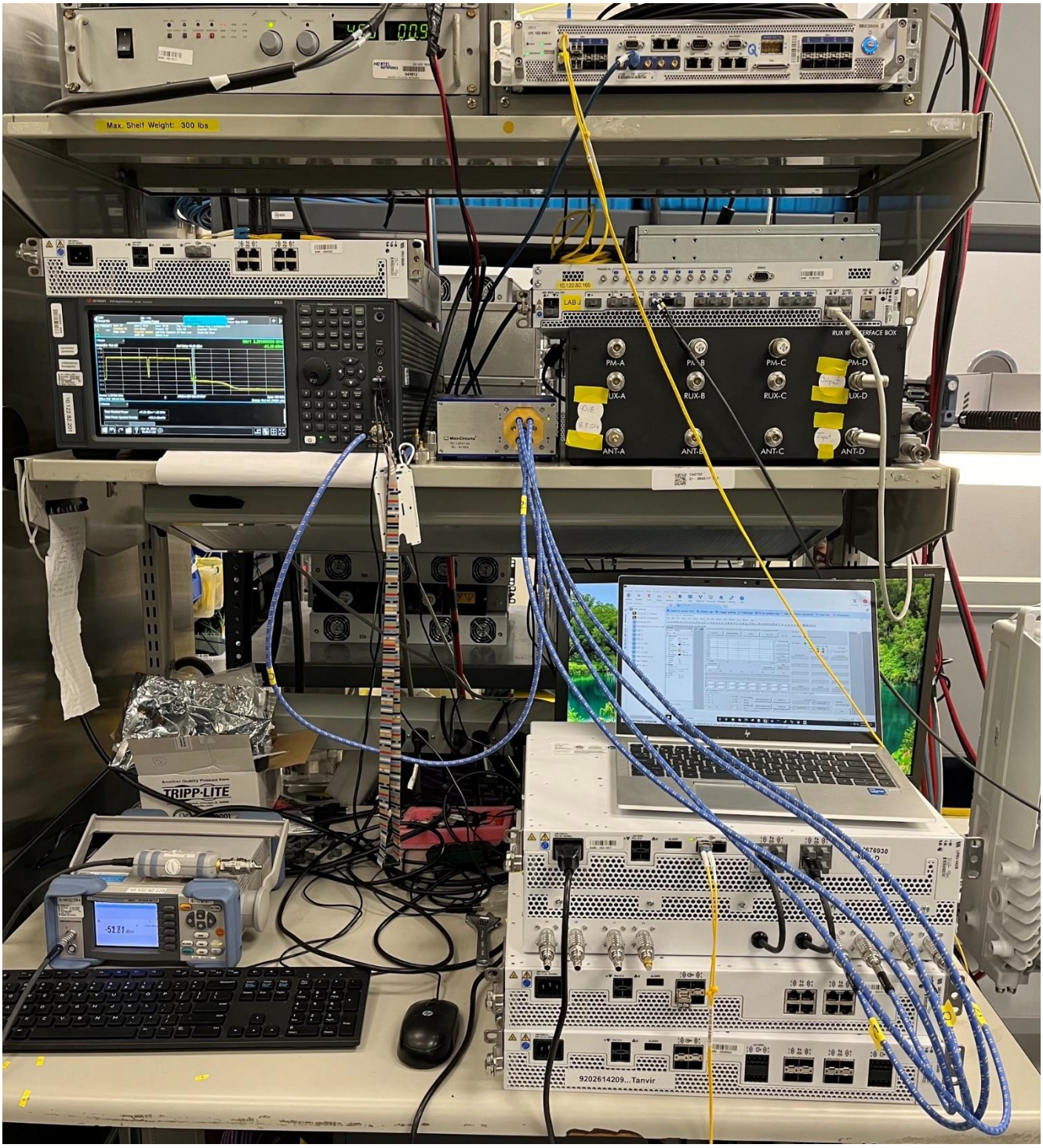

Figure 3.5-1: *Set up photo for Radio Compliance Testing*

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
PXA Signal Analyzer	Keysight	N9030B	MY57144347	1 year	30-Mar-24
Power Meter	Rohde & Schwarz	NRP2	101814	1 year	21-Mar-25
Power Sensor	Rohde & Schwarz	NRP-Z11	100070	1 year	31-Mar-25
CT11*	Ericsson	LPC 102 494/1	T01G495060	—	NCR

Notes: NCR - no calibration required.

* CT11 is the test equipment that drives the radios traffic.

Section 8. Testing data

8.1 Maximum output power at RF antenna connector (Band 66)

8.1.1 Definitions and limits

FCC §27.50(d) Operation within the bands: 2110–2155 MHz and 2155–2180 MHz.

(1) The power of each fixed or base station transmitting in the 1995–2000 MHz, 2110–2155 MHz, 2155–2180 MHz or 2180–2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 3280 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(2) The power of each fixed or base station transmitting in the 1995–2000 MHz, the 2110–2155 MHz 2155–2180 MHz band, or 2180–2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(3) A licensee operating a base or fixed station in the 2110–2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025–2110 MHz band. A licensee operating a base or fixed station in the 2110–2180 MHz band utilizing power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with the following licensees authorized to operate within 120 kilometers (75 miles) of the base or fixed station operating in this band: All Broadband Radio Service (BRS) licensees authorized under this part in the 2155–2160 MHz band and all advanced wireless services (AWS) licensees authorized to operate on adjacent frequency blocks in the 2110–2180 MHz band.

(5) Equipment employed must be authorized in accordance with the provisions of §24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

(6) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

8.1.1 Definitions and limits, continued

RSS-139, Section 5.5

The transmitter power shall be measured in terms of a root-mean-square (RMS) average value.

RSS-139, Section 5.5

Consult SRSP-513 and SRSP-519 for e.i.r.p. limits on fixed and base stations operating in the band 2110–2180 MHz and 2180-2200 MHz respectively.

In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

SRSP-513, Section 6

6.1 Fixed and base stations using non-active antenna systems

6.1.3 E.i.r.p. limits and antenna height limits for non-AAS systems.

20. For fixed and base stations operating within the frequency range 2110–2180 MHz with a channel bandwidth equal to or less than 1 MHz, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 62 dBm with an antenna height above average terrain (HAAT) up to 300 metres.

21. For fixed and base stations operating within the frequency range 2110–2180 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 62 dBm/MHz e.i.r.p. (i.e. no more than 62 dBm e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres.

22. Fixed and base stations in the band 2110-2180 MHz and located in geographic areas at a distance greater than 26 km from large or medium population centres, may increase their e.i.r.p. up to a maximum of 65 dBm/MHz (i.e. no more than 65 dBm e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 300 metres.

23. Within 26 km of any large or medium population centre, fixed and base stations may operate at increased e.i.r.p. if more than 50% of the population within a particular sector's coverage is located outside these large and medium population centres.

24. Fixed and base stations operating with an with increased e.i.r.p. as speciofied above, must not be used to provide coverage to large and medium population centres. However, some incidental coverage of these large and medium population centres by stations with increased e.i.r.p. is permitted.

25. The above provisions to allow increased e.i.r.p. limits also apply to fixed and base stations with a channel bandwidth equal to or less than 1 MHz. The e.i.r.p. may be increased up to a maximum of 65 dBm.

26. Fixed and base stations with an antenna HAAT exceeding 300 m shall apply a reduction in e.i.r.p. according to the following formula:

$$\text{e.i.r.p.}_{\text{reduction}} = 20\log_{10}(\text{HAAT}/300)\ \text{dB}$$

27. The HAAT of a fixed or base station with multiple antennas shall be calculated based on the measurements of the highest antenna.

8.1.1 Definitions and limits, continued

SRSP-519, Section 6

6.1 Base stations using non-active antenna systems

6.1.3 E.i.r.p. limits and antenna height limits for non-AAS systems.

21. For base stations operating in the bands 2000-2020 MHz and 2180-2200 MHz with an antenna height above average terrain (HAAT) of up to 300 m, the e.i.r.p. shall not exceed 62 dBm when transmitting with an emission bandwidth of 1 MHz or less.

22. For base stations operating in the bands 2000-2020 MHz and 2180-2200 MHz with an antenna HAAT of up to 300 m, the e.i.r.p.shall not exceed 62 dBm/MHz when transmitting with an emission bandwidth greater than 1 MHz.

23. Base stations located in geographic areas at a distance greater than 26 km from large or medium population centres may increase their e.i.r.p. to a maximum of 65 dBm when transmitting with an emission bandwidth of 1 MHz or less, and 65 dBm/MHz when transmitting with an emission bandwidth greater than 1 MHz, with an antenna HAAT of up to 300 m

24. Within 26 km of any large or medium population centre, base stations may operate with an increased e.i.r.p. if more than 50% of the population within a particular sector's coverage is located outside a large or medium population centre.

25. Base stations operating with an increased e.i.r.p., as specified above (i.e. up to 65 dBm/MHz), must not be used to provide coverage to large and medium population centres. However, some incidental coverage of these population centres by stations operating with an increased e.i.r.p. is permitted.

26. A licensee operating a base station with an e.i.r.p. greater than 62 dBm/MHz must coordinate in advance with all AWS-4 licensees authorized to operate on adjacent frequency blocks within the same band.

27. Base stations with an antenna HAAT exceeding 300 m shall apply a reduction in e.i.r.p. according to the following formula:

e.i.r.p.reduction = $20\log_{10}$ (HAAT(M)⁄300) dB

28. The HAAT of a base station with multiple antennas shall be calculated based on the measurements of the highest antenna.

8.1.2 Test summary

Test date	March 20, 2024
Test engineer	Nimish Kapoor

8.1.3 Observations, settings, and special notes

Output power was measured with RMS power meter per ANSI C63.26 Paragraph 5.2.4.2 method. PSD was measured using method described in paragraph 5.2.4.4.

- Randomly selected sample plots provided for information and settings only
- Total MIMO PSD was calculated as follows: PSD from one antenna port + 10 × Log_{10} (4)
- RBS (Radio Base Station) EIRP Limits are deployment dependent. To ensure compliance with legal limits detailed in section 8.1.1, RBS set up and carrier configurations are addressed during site commissioning.
- Report results are compiled for the maximum output rated power for worst case emission assessment. EIRP, based on possible beam configuration, indicate the maximum power / worst case beam configuration based on ideal antenna parameters. Customer carrier configuration and power will be limited to comply with legal limits of 1640 W/MHz or 3280 W/MHz during RBS site set up and commissioning. Non-compliant configurations will be restricted to lower carrier power to ensure compliance.
- The LPRU 4420 B25B66 product will only be installed with its RF output ports connected to Active Distributed Antenna Systems (DAS). The product will not be directly connected to antennas.
- **To ensure compliance under worst case conditions with maximum output power based on a MIMO configuration, the maximum antenna gain for an RBS (Radio Base Station) system with LPRU 4420 B25B66 is 0.00 dBi with 2.50 dB path loss. Maximum measured PSD to EIRP margin 48.65 dB.**

Observations, settings, and special notes, continued

Spectrum analyzer settings for PSD:

Detector mode	RMS
Resolution bandwidth	1 MHz
Video bandwidth	>RBW
Measurement mode	Power over emission bandwidth
Trace mode	Averaging
Measurement time	Auto

8.1.4 Test data

Table 8.1-1: *EIRP calculation based on the* ***worst-case PSD measurement***

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	Cable loss, dB	Antenna gain, dBi	EIRP PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2122.5	9.98	16.00	2.50	0.00	13.50	62.15	48.65

Table 8.1-2: *RF power density measurement results of a single-carrier operation for NR on 25 MHz channel*

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2122.5	**9.98**	16.00	62.15	46.15
2155.0	9.90	15.92	62.15	46.23
2187.5	9.91	15.93	62.15	46.22

Table 8.1-3: *RF power density measurement results of a single-carrier operation for NR on 30 MHz channel*

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2125.0	8.86	14.88	62.15	47.27
2155.0	8.78	14.80	62.15	47.35
2185.0	**9.03**	15.05	62.15	47.10

Table 8.1-4: *RF power density measurement results of a single-carrier operation for NR on 35 MHz channel*

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2127.5	8.30	14.32	62.15	47.83
2155.0	**8.45**	14.47	62.15	47.68
2182.5	8.40	14.42	62.15	47.73

Table 8.1-5: *RF power density measurement results of a single-carrier operation for NR on 40 MHz channel*

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2130.0	7.59	13.61	62.15	48.54
2155.0	7.73	13.75	62.15	48.40
2180.0	**7.86**	13.88	62.15	48.27

Table 8.1-6: *RF power density measurement results of a multi-carrier operation for NR on 25 MHz channel [Contiguous]*

Notes	Channel	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers	Bottom	6.65	12.67	62.15	49.48
	Middle	6.88	12.90	62.15	49.25
	Top	**7.12**	13.14	62.15	49.01

Test data, continued

Table 8.1-7: *RF total channel power measurement results for NR [25 MHz]*

Remarks	25 MHz channel (0.159 W)
Low channel, QPSK	22.04
Mid channel, QPSK	22.18
Top channel, QPSK	22.08

Note: all results in the table are in dBm units

Table 8.1-8: *RF total channel power measurement results for NR [30 MHz]*

Remarks	30 MHz channel (0.159 W)
Low channel, QPSK	22.00
Mid channel, QPSK	22.20
Top channel, QPSK	22.16

Note: all results in the table are in dBm units

Table 8.1-9: *RF total channel power measurement results for NR [35 MHz]*

Remarks	35 MHz channel (0.159 W)
Low channel, QPSK	22.00
Mid channel, QPSK	22.17
Top channel, QPSK	22.12

Note: all results in the table are in dBm units

Table 8.1-10: *RF total channel power measurement results for NR [40 MHz]*

Remarks	40 MHz channel (0.159 W)
Low channel, QPSK	22.01
Mid channel, QPSK	22.17
Top channel, QPSK	22.10

Note: all results in the table are in dBm units

Table 8.1-11: *RF total channel power measurement results for NR Multi-carrier [25 MHz bandwidth Contiguous]*

Carriers	Channel	25 MHz channel (0.159 W)
2 Carriers, QPSK	Low Channel	22.04
	Middle Channel	22.21
	Top Channel	22.18

Note: all results in the table are in dBm units

Test data, continued

Figure 8.1-1: *PSD of NR 25 MHz channel bandwidth, single carrier operation, sample plot*

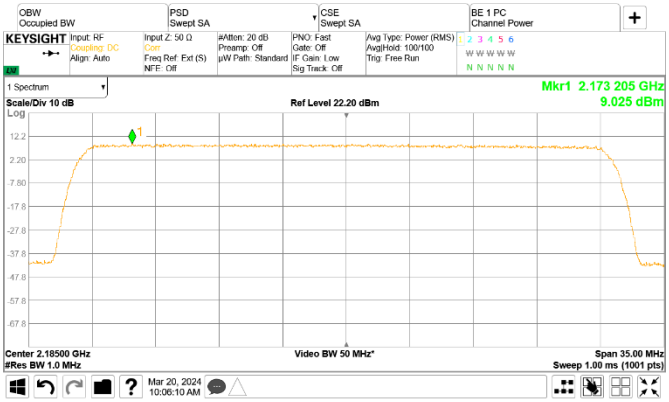

Figure 8.1-2: *PSD of NR 30 MHz channel bandwidth, single carrier operation, sample plot*

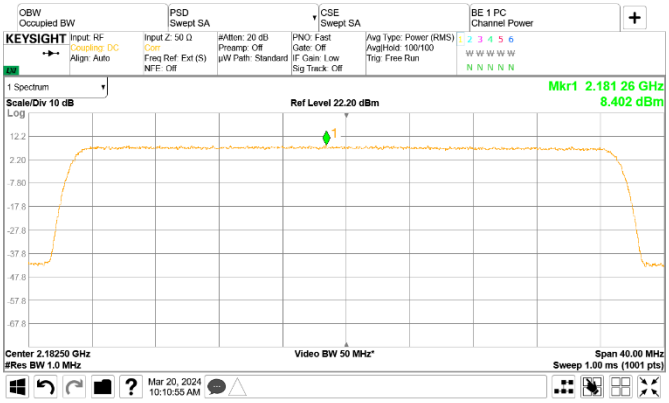

Figure 8.1-3: *PSD of NR 35 MHz channel bandwidth, single carrier operation, sample plot*

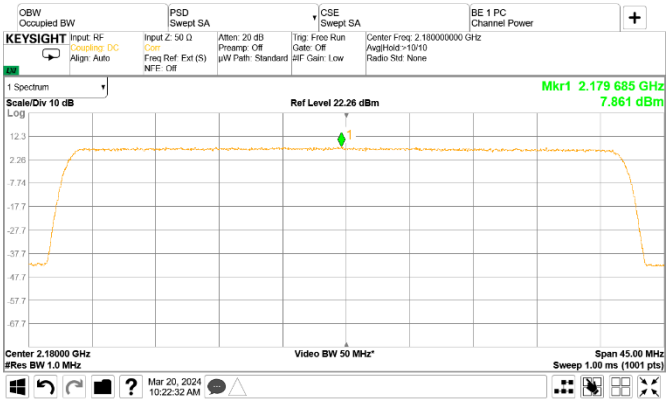

Figure 8.1-4: *PSD of NR 40 MHz channel bandwidth, single carrier operation, sample plot*

Test data, continued

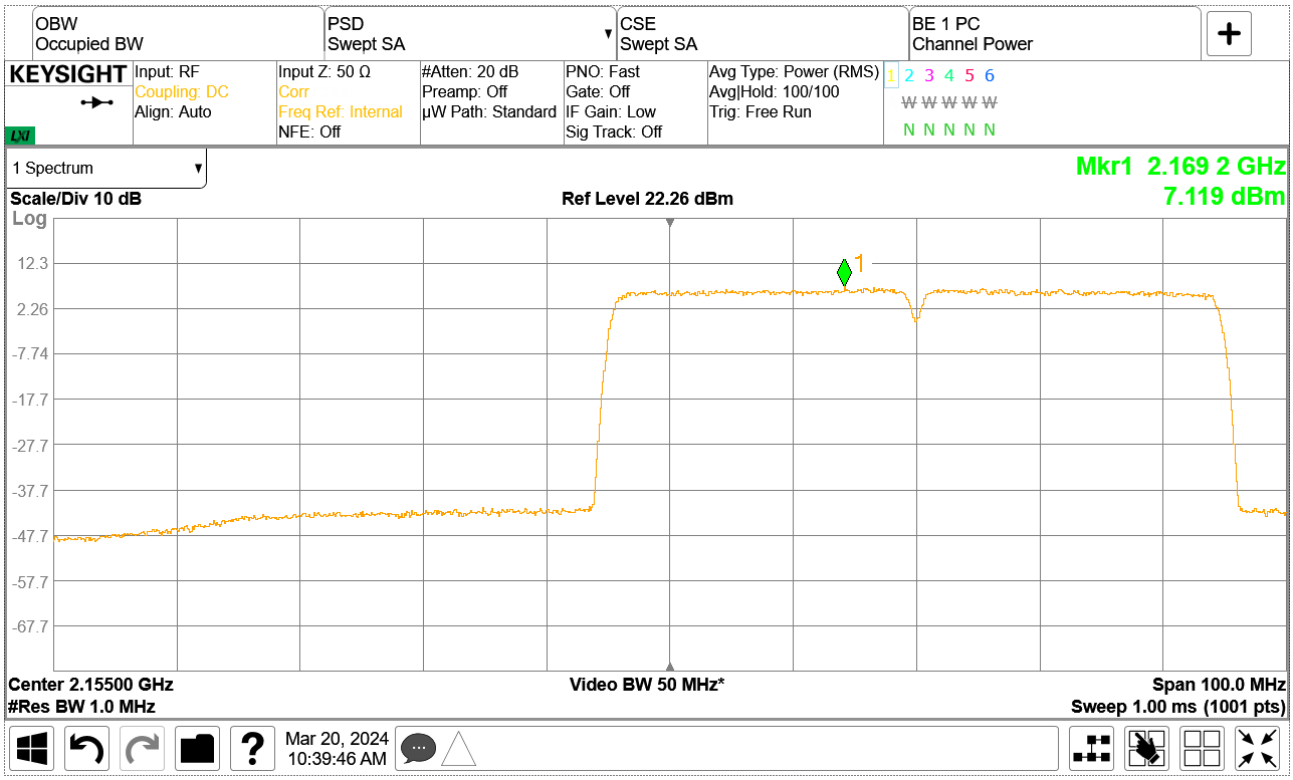

Figure 8.1-5: *PSD of NR 25 MHz channel bandwidth, multi-carrier operation, sample plot, Contiguous*

Test data, continued

Table 8.1-12: *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single carrier operation for NR 25 MHz*

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
25 MHz, Low channel	2122.5	8.27	13.00	4.73
25 MHz, Mid channel	2155.0	8.27	13.00	4.73
25 MHz, Top channel	2187.5	8.27	13.00	4.73

Table 8.1-13: *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single carrier operation for NR 30 MHz*

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
30 MHz, Low channel	2125.0	8.35	13.00	4.65
30 MHz, Mid channel	2155.0	8.33	13.00	4.67
30 MHz, Top channel	2185.0	8.33	13.00	4.67

Table 8.1-14: *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single carrier operation for NR 35 MHz*

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
35 MHz, Low channel	2127.5	8.30	13.00	4.70
35 MHz, Mid channel	2155.0	8.28	13.00	4.72
35 MHz, Top channel	2182.5	8.33	13.00	4.67

Table 8.1-15: *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single carrier operation for NR 40 MHz*

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
40 MHz, Low channel	2130.0	8.28	13.00	4.72
40 MHz, Mid channel	2155.0	8.28	13.00	4.72
40 MHz, Top channel	2180.0	8.29	13.00	4.71

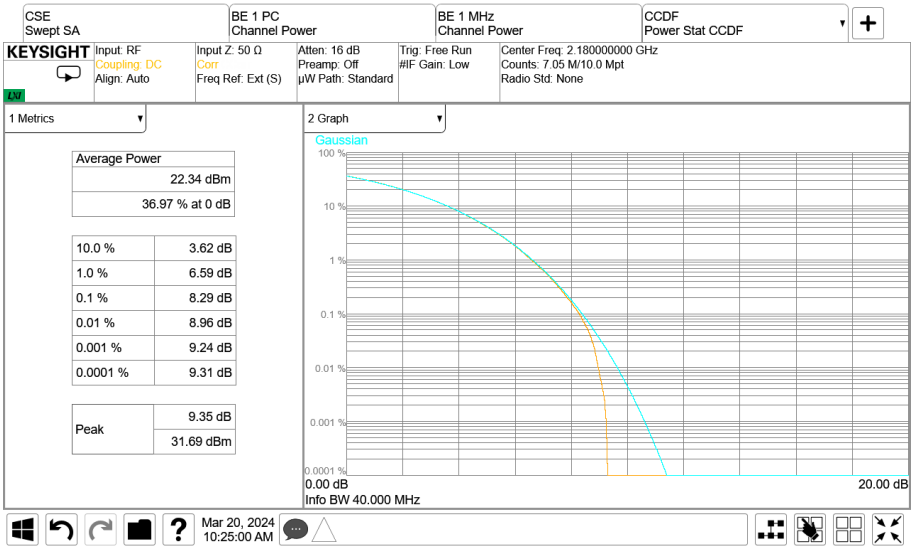

Figure 8.1-6: *CCDF sample plot, NR*

8.2 Spurious emissions at RF antenna connector (Band 66)

8.2.1 Definitions and limits

FCC §27.53:
(h) AWS emission limits
(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1-megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

RSS-139, Section 5.6:
Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table below:

Table 8.2-1: *Unwanted emissions limits*

Offset from the edge of the frequency block or frequency group	Unwanted emission limits
1 MHz	-13 dBm/(1% of OB*)
> 1 MHz	-13 dBm/MHz

Notes: *OB is the occupied bandwidth

In addition to complying with the above limits, equipment operating in the band 2180-2200 MHz may require additional filtering (see SRSP-519).

8.2.2 Test summary

Test date	March 20, 2024
Test engineer	Nimish Kapoor

8.2.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- All measurements were performed using an average (RMS) detector per ANSI C63.26 Paragraph 5.7.2 method.
- Limit line ($43 + 10 \log_{10}(P)$ or −13 dBm) was adjusted for MIMO operation by 6 dB*: −13 dBm – 6 dB = −19 dBm
  *MIMO correction factor for 4 antenna ports: $10 \times \text{Log}_{10}(4) = 6$ dB
- RBW 1 MHz, VBW was wider than RBW.

8.2.4 Test data

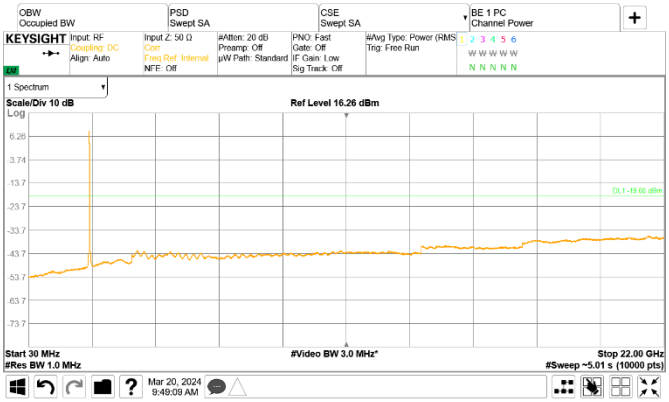

Figure 8.2-1: *Conducted spurious emissions of NR 25 MHz low channel, single-carrier operation*

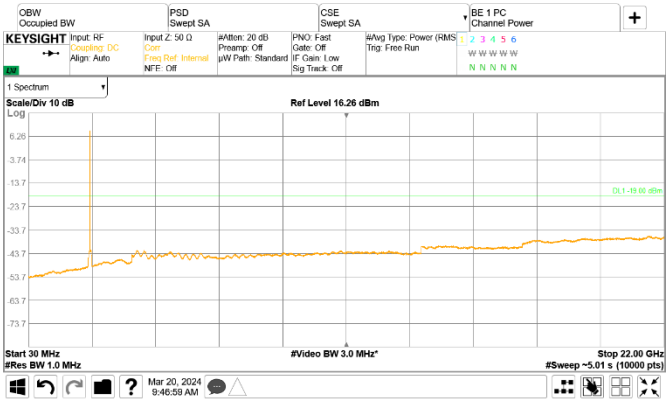

Figure 8.2-2: *Conducted spurious emissions of NR 25 MHz mid channel, single-carrier operation*

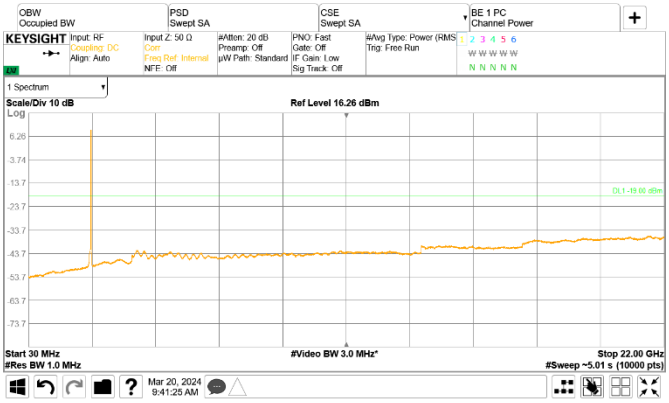

Figure 8.2-3: *Conducted spurious emissions of NR 25 MHz top channel, single-carrier operation*

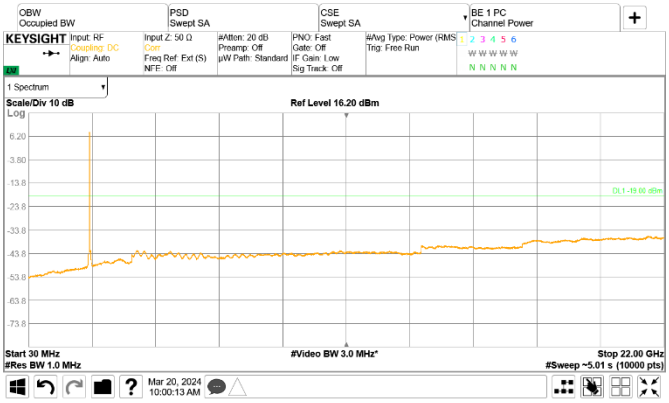

Figure 8.2-4: *Conducted spurious emissions of NR 30 MHz low channel, single-carrier operation*

Test data, continued

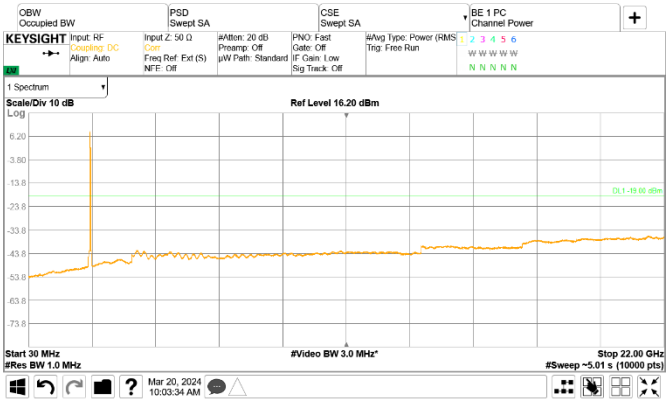

Figure 8.2-5: *Conducted spurious emissions of NR 30 MHz mid channel, single-carrier operation*

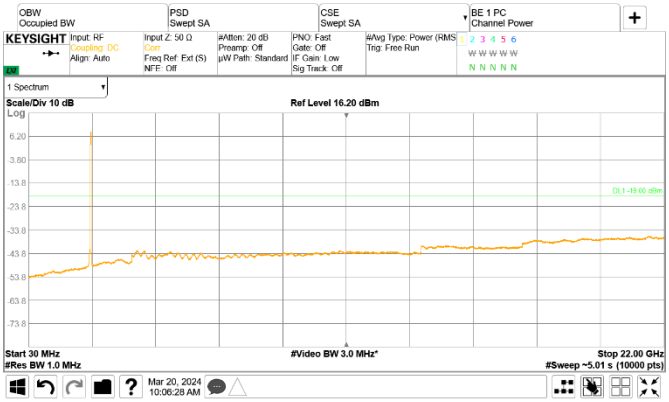

Figure 8.2-6: *Conducted spurious emissions of NR 30 MHz top channel, single-carrier operation*

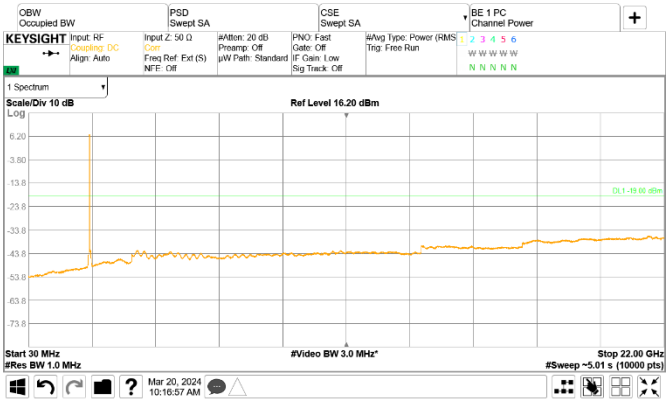

Figure 8.2-7: *Conducted spurious emissions of NR 35 MHz low channel, single-carrier operation*

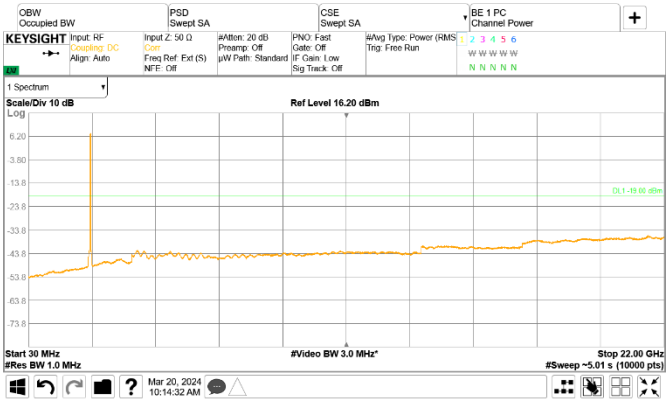

Figure 8.2-8: *Conducted spurious emissions of NR 35 MHz mid channel, single-carrier operation*

Test data, continued

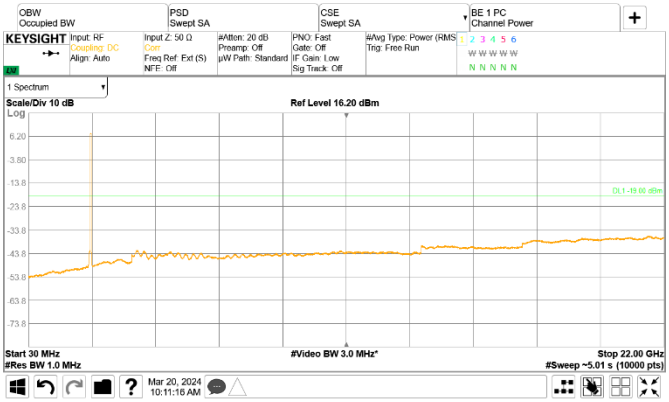

Figure 8.2-9: *Conducted spurious emissions of NR 35 MHz top channel, single-carrier operation*

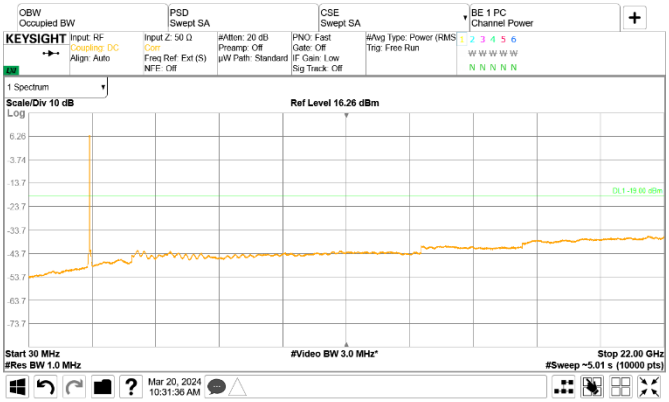

Figure 8.2-10: *Conducted spurious emissions of NR 40 MHz low channel, single-carrier operation*

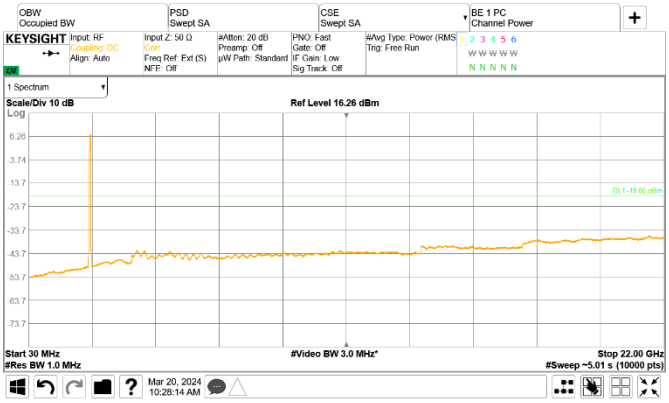

Figure 8.2-11: *Conducted spurious emissions of NR 40 MHz mid channel, single-carrier operation*

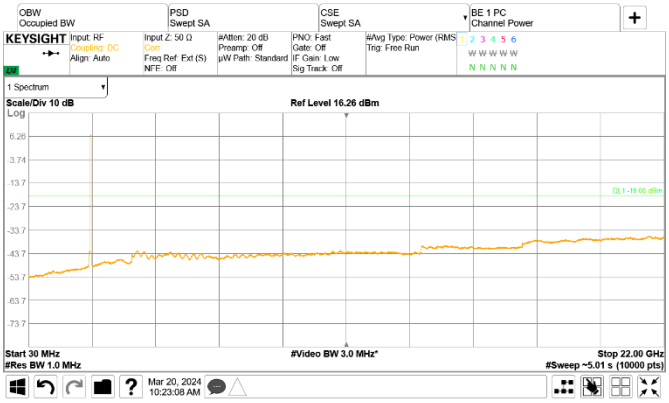

Figure 8.2-12: *Conducted spurious emissions of NR 40 MHz top channel, single-carrier operation*

Test data, continued

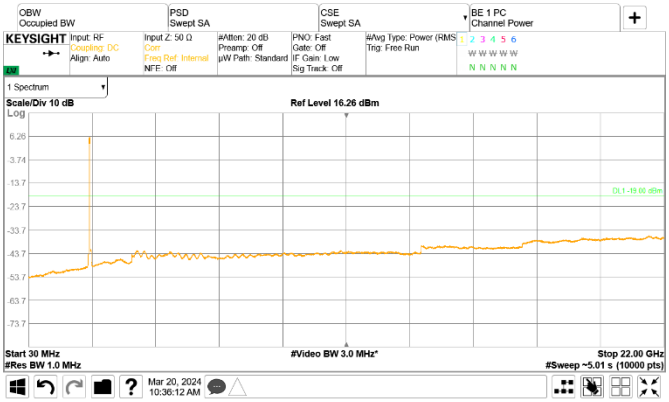

Figure 8.2-13: *Conducted spurious emissions of NR 25 MHz two contiguous low channels, two-carrier operation*

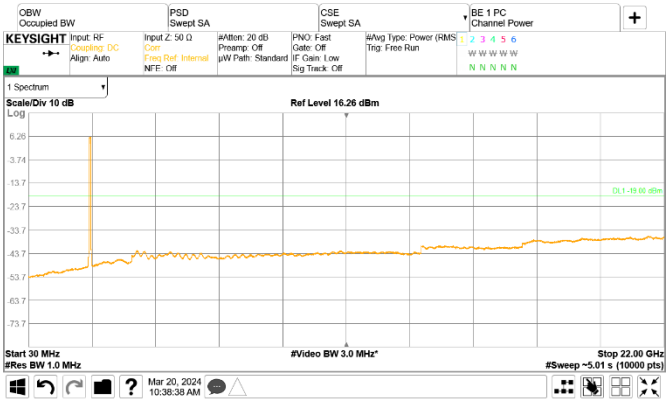

Figure 8.2-14: *Conducted spurious emissions of NR 25 MHz two contiguous mid channels, two-carrier operation*

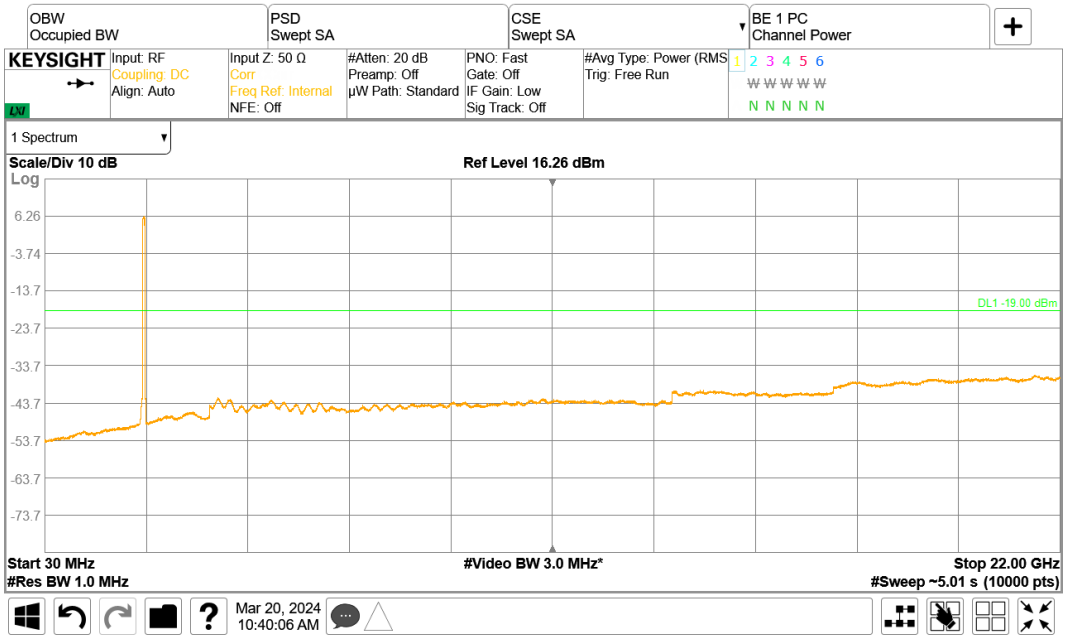

Figure 8.2-15: *Conducted spurious emissions of NR 25 MHz two contiguous top channels, two-carrier operation*

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

Figure 8.2-16: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 25 MHz*
Limit:	*−19 dBm/250 kHz*	*Notes:*	*None*

Figure 8.2-17: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 25 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Figure 8.2-18: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 25 MHz*
Limit:	*−19 dBm/250 kHz*	*Notes:*	*None*

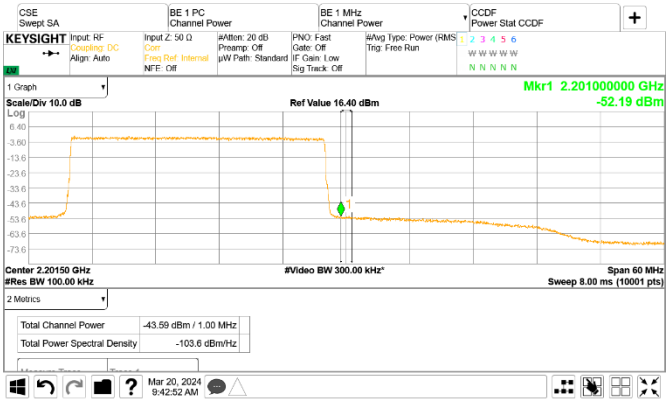

Figure 8.2-19: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 25 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

Figure 8.2-20: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 30 MHz*
Limit:	*−19 dBm/300 kHz*	*Notes:*	*None*

Figure 8.2-21: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 30 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Figure 8.2-22: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 30 MHz*
Limit:	*−19 dBm/300 kHz*	*Notes:*	*None*

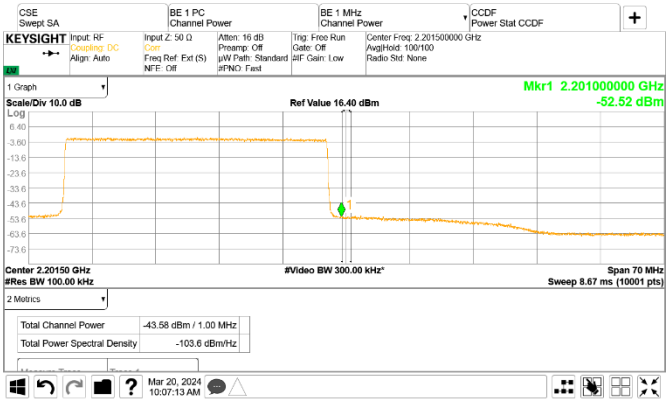

Figure 8.2-23: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 30 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

Figure 8.2-24: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 35 MHz*
Limit:	*−19 dBm/30 kHz*	*Notes:*	*None*

Figure 8.2-25: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 35 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Figure 8.2-26: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 35 MHz*
Limit:	*−19 dBm/350 kHz*	*Notes:*	*None*

Figure 8.2-27: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 35 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

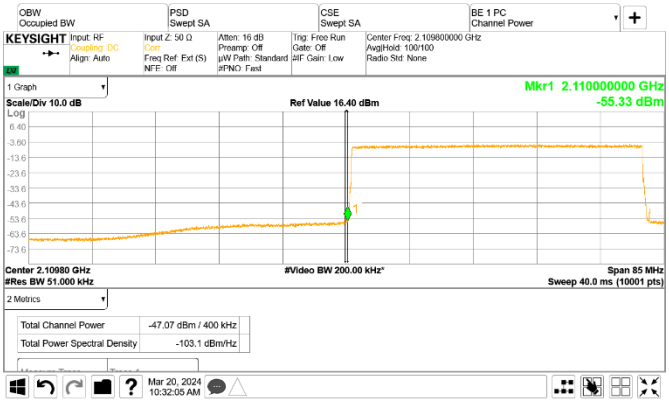

Figure 8.2-28: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 40 MHz*
Limit:	*−19 dBm/400 kHz*	*Notes:*	*None*

Figure 8.2-29: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 40 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

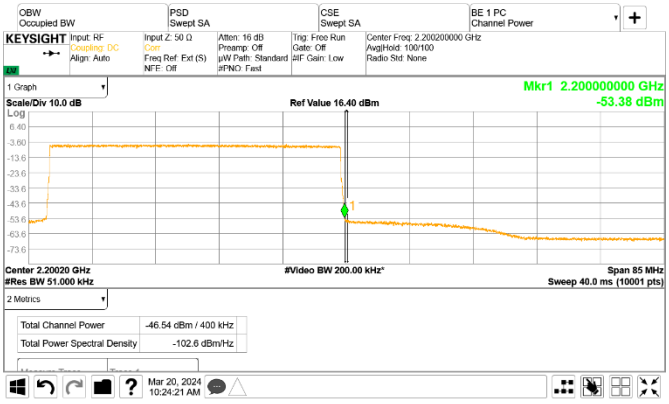

Figure 8.2-30: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*NR 40 MHz*
Limit:	*−19 dBm/400 kHz*	*Notes:*	*None*

Figure 8.2-31: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Single-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*NR 40 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Test data, continued

On the plots below the measured *Channel Power* value in the "*Total Channel Power*" column must be −19 dBm and lower.

Figure 8.2-32: *Conducted emission at the lower band edge*

Frequency:	*2110 MHz*	*Mode:*	*Multi-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*2 × NR 25 MHz*
Limit:	*−19 dBm/250 kHz*	*Notes:*	*None*

Figure 8.2-33: *Conducted emission 1 MHz away from the lower band edge*

Frequency:	*2109 MHz*	*Mode:*	*Multi-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*2 × NR 25 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

Figure 8.2-34: *Conducted emission at the upper band edge*

Frequency:	*2200 MHz*	*Mode:*	*Multi-carrier operation*
Meas. BW:	*1% of EBW*	*Tech.:*	*2 × NR 25 MHz*
Limit:	*−19 dBm/250 kHz*	*Notes:*	*None*

Figure 8.2-35: *Conducted emission 1 MHz away from the upper band edge*

Frequency:	*2201 MHz*	*Mode:*	*Multi-carrier operation*
Meas. BW:	*1 MHz*	*Tech.:*	*2 × NR 25 MHz*
Limit:	*−19 dBm/MHz*	*Notes:*	*None*

8.3 Occupied bandwidth (Band 66)

8.3.1 Definitions and limits

FCC §2.1049:
The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-Gen, 6.7
The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.3.2 Test summary

Test date	March 20, 2024
Test engineer	Nimish Kapoor

8.3.3 Observations, settings and special notes

Testing was performed per ANSI C63.26 Paragraphs 5.4.3 and 5.4.4 methods.

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1 % of EBW
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.3.4 Test data

Table 8.3-1: *Occupied bandwidth results for NR 25 MHz channel*

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
25 MHz, Low channel	2122.5	24.770	23.683
25 MHz, Mid channel	2155.0	24.790	23.701
25 MHz, Top channel	2187.5	24.800	23.739

Table 8.3-2: *Occupied bandwidth results for NR 30 MHz channel*

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
30 MHz, Low channel	2125.0	29.660	28.498
30 MHz, Mid channel	2155.0	29.650	28.546
30 MHz, Top channel	2185.0	29.640	28.521

Table 8.3-3: *Occupied bandwidth results for NR 35 MHz channel*

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
25 MHz, Low channel	2127.5	34.760	33.524
25 MHz, Mid channel	2155.0	34.780	33.481
25 MHz, Top channel	2182.5	34.750	33.426

Table 8.3-4: *Occupied bandwidth results for NR 40 MHz channel*

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
40 MHz, Low channel	2130.0	39.950	38.410
40 MHz, Mid channel	2155.0	39.910	38.540
40 MHz, Top channel	2180.0	39.910	38.391

Test data, continued

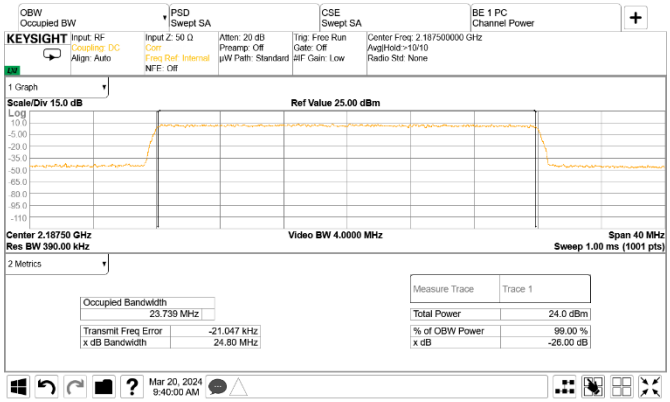

Figure 8.3-1: *Sample plot for NR 25 MHz channel*

Figure 8.3-2: *Sample plot for NR 30 MHz channel*

Figure 8.3-3: *Sample plot for NR 35 MHz channel*

Figure 8.3-4: *Sample plot for NR 40 MHz channel*

End of report