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Radio Test report – Radio 4890HP 48B2/25 48B66 M01

Report ID

REP025416

Project ID

PRJ0048690

Applicant:

Ericsson Canada Inc.

Product name:

Radio Unit

Model (PMN):

Radio 4890HP 48B2/B25 48B66 M01

Part number:

KRC 161 983/31

FCC ID:

TA8AKRC161983-3

ISED certification number:

IC: 287AB-AS1619833

HVIN:

AS1619833

Requirements/Summary:

Standard	Environmental phenomenon	Compliance
FCC 47 CFR Part 27	Miscellaneous wireless communications services	Yes
FCC 47 CFR Part 24, Subpart E	Broadband Personal Communications Services (PCS)	Yes
RSS-133 Issue 6 A1, Jan 18, 2018	2 GHz Personal 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: February 5, 2024

Andrey Adelberg, Senior EMC/Wireless Specialist

Prepared by

Signature

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Reviewed by

Signature

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The tests included in this report are within the scope of this accreditation.
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ANAB File Number: AT-3195 (Ottawa/Almonte); AT-3193 (Pointe-Claire); AT-3194 (Cambridge)

www.nemko.com

FCC 27 and RSS-139.docx; Date: Jul 2017



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.

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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 Matters; General Rules and Regulations
FCC 47 CFR Part 24, Subpart E	Broadband Personal Communications Services (PCS)
FCC 47 CFR Part 27	Miscellaneous wireless communications services (2110–2200 MHz)
RSS-133 Issue 6 A1, Jan. 18, 2018	2 GHz Personal Communications Services
RSS-139 Issue 4, September 29, 2022	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710–1780 MHz and 2110–2200 MHz
SRSP-510, Issue 5, February 2009	Technical Requirements for Personal Communications Services (PCS) in the Bands 1850–1915 MHz and 1930–1995 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 (**REP025416**) applies to the *Radio 4890HP 48B2/B25 48B66 M01* with part number *KRC 161 983/31*. See “Summary of test results” for full details.

EUT Configuration(s) SRO/MRO:

B2/B25:

LTE : 5, 10, 15, 20 MHz, Max 6 Carriers
 NR : 5, 10, 15, 20, 25, 30, 40 MHz, Max 6 Carriers
 LTE + NR + WCDMA
 WCDMA : 5 MHz, Max 6 Carriers

B4/B66:

LTE : 5, 10, 15, 20 MHz, Max 6 Carriers
 NR : 5, 10, 15, 20, 25, 30, 40 MHz, Max 6 Carriers
 LTE + NR + WCDMA
 WCDMA : 5 MHz, Max 6 Carriers

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
REP025416	February 5, 2024	Original report issued



Section 2. Summary of test results

2.1 Testing location

Test location (s)	Ottawa
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2.2 Testing period

Test start date	January 23, 2024	Test end date	January 24, 2024
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2.3 Sample information

Receipt date	January 23, 2024	Nemko sample ID number	PRJ00387570001
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2.4 FCC Part 27/24 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	Radiated spurious emissions (conducted and radiated)	Pass
§27.54	Frequency stability	Pass
§24.229	Frequencies	Pass ¹
§24.232(a)(2)	Power and antenna height limits for base stations with BW greater than 1 MHz	Pass
§24.235	Frequency stability	Pass
§24.238(a)	Emission limitations for Broadband PCS equipment – out of band emissions (conducted and radiated)	Pass
§2.1049	Occupied bandwidth	Pass

Notes: Only tests requested by the client have been performed

¹EUT transmits within 1930–1995 MHz frequency range

2.5 RSS-133/139 test results

Table 2.5-1: ISSED results summary

Part	Test description	Verdict
RSS-133, 6.1	Frequency Plan	Pass ¹
RSS-133, 6.2	Types of Modulation	Pass ²
RSS-133, 6.3	Frequency stability	Pass
RSS-133, 6.4	Transmitter Output Power and Equivalent Isotropically Radiated Power	Pass
RSS-133, 6.5	Transmitter Unwanted Emissions (conducted and radiated)	Pass
RSS-139, 5.3	Types of Modulation	Pass ²
RSS-139, 5.4	Frequency stability	Pass
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	Radiated spurious emissions (conducted and radiated)	Pass
RSS-Gen, 6.7	Occupied bandwidth	Pass
RSS-Gen, 7.4	Receiver conducted spurious emissions	Pass

Notes: Only tests requested by the client have been performed

¹EUT transmits within 1930–1995 MHz frequency range

²EUT employs digital modulation (QPSK)

Section 3. Equipment under test (EUT) details



3.1 EUT information

Product name	Radio Unit	
Model	Radio 4890HP 48B2/B25 48B66 M01	
Part number	KRC 161 983/31 (final), KRC 161 983/3 (tested/unlocked)	
Revision	R1B	
Serial number	E23E657242, E23E674486 (for radiated spurious)	
Antenna ports	4 TX/RX Ports for B4/B66 4 TX/RX Ports for B2/B25	
RF BW / IBW	B2/B25 IBW DL: 65 MHz B2/B25 IBW UL: 65 MHz	B66 IBW DL: 90 MHz B66 IBW UL: 70 MHz
FDD	B2/B25: 80 MHz	B66: 400 MHz
Frequency	B2/B25 TX (DL): 1930–1995 MHz B2/B25 RX (UL): 1850–1915 MHz	B66 TX (DL): 2110–2200 MHz B66 RX (UL): 1710–1780 MHz
Nominal O/P per Antenna port	60 W (47.78 dBm)	
Nominal O/P per Antenna port per Band	Single Carrier: 1 × 60 W (47.78 dBm/Carrier) 2 Carrier: 2 × 30 W (44.77 dBm/Carrier) 3 Carrier: 3 × 20 W (43.01 dBm/Carrier) 6 Carrier: 6 × 10 W (40.00 dBm/Carrier)	
Accuracy (nominal)	±0.1 ppm	
Nominal voltage	−48 V _{DC} (−36 to −58.5 VDC, max 40.5 A at 42 V)	
RAT	LTE, NR, WCDMA: SC, MC, MIMO, CA, ESS, NB-IoT (IB, GB)	
Modulation	LTE: QPSK, 16 QAM, 64 QAM, 256 QAM NR: QPSK, 16 QAM, 64 QAM, 256 QAM NB-IoT: QPSK WCDMA: QPSK, 16QAM, 64QAM	
Channel bandwidth	LTE carriers on B2/25 and B66: 5 MHz, 10 MHz, 15 MHz and 20 MHz. NR carriers on B2/25 and B66: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, and 40 MHz. WCDMA: 5 MHz, (3.8 MHz) [B2 and B4 only]	
Channel bandwidth LTE + NB-IoT	LTE+NB-IoT IB: 5, 10, 15, 20 MHz LTE+NB-IoT GB: 10, 15, 20 MHz NB-IoT (GB, IB): 200 kHz	
Maximum combined OBW per port	B2/B25: 65 MHz	B66: 90 MHz
CPRI	2.5–25 Gbps (Data 1, 2)	

Channel raster	LTE: 100 kHz NR: 100 kHz WCDMA: 200 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 IEC/EN 60950-22, UL 50E /CAN/CSA, IEC/EN 60529, Type 3 Enclosure		
Emission Designator	LTE: 5M00W7D, 10M0W7D, 15M0W7D, 20M0W7D NR: 5M00W7D, 10M0W7D, 15M0W7D, 20M0W7D, 25M0W7D, 30M0W7D, 40M0W7D WCDMA: 5M00F9W		
Supported Configurations	Single Antenna, TX Diversity, MIMO, Carrier Aggregation, Ericsson Spectral Sharing (ESS)		
Operating temperature	-40 °C to +55 °C		
Max RF Power	480 W total / radio (= 8 ports × 60W)		
Supported carriers /band/ port SRO/MRO	Up to 6 carriers. LTE: Max 6 NR: Max 6 WCDMA: Max 6 LTE + NB-IoT: GB Max 2, IB Max 2		
Carrier Configuration:	<div> <div>B2/25</div> <div>SRO: LTE, NR, WCDMA</div> <div>MRO: NR+LTE, LTE+WCDMA, NR+WCDMA, NR+LTE+WCDMA</div> </div> <div> <div>B4/66</div> <div>SRO: LTE, NR, WCDMA</div> <div>MRO: NR+LTE, LTE+WCDMA, NR+WCDMA, NR+LTE+WCDMA</div> </div>		
RAT SC Carrier Power (max)	RAT	BW	PWR/Carrier(max)
	LTE/NR/WCDMA	5 MHz	40 W
	LTE/NR	10 MHz	60 W
	LTE/NR	15 MHz	60 W
	LTE/NR	20 MHz	60 W
	NR	25 MHz	60 W
	NR	30 MHz	60 W
	NR	40 MHz	60 W

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	<p>Radio 4890HP 48B2/B25 48B66 M01 is a multi-standard remote Dual Band radio forming part of the Ericsson RBS (Radio Base Station) equipment. Radio 4890HP provides radio access for mobile and fixed devices and is designed for the outdoor environment. Radio 4890HP operates over 2 bands (Band 2/25 and Band 66) via 4 TX/RX ports connected directly into an integrated antenna. Radio 4890HP transmits B2/B25 on 4 ports and B66 on separate 4 ports. Both bands receive on all 8 ports. Radio unit installation is designed for pole, wall or rail mount options. A fiber optic interface (2) provides the RRU/RBS control and digital interface between the Radio and the RBS. Radio 4890HP product is convection cooled and shall be mounted vertically.</p> <p>Output RF Power is rated at 8 × 60 W. Altitude during operation: Below 4000 m.</p> <p>Radio 4890HP is a synthesized Transceiver designed for use in the 3GPP (Third Generation Partnership Project) for LTE (Long Term Evolution) - E-UTRA Base Station, and NR (New Radio), with Multi-RAT capability including WCDMA.</p> <p>Radio product is KRC 161 983/31 which is a SW locked customer deliverable. In some cases, tests were executed on the KRC 161 983/3 which is unlocked for Ericsson convenience.</p>																																
Ports/Interface	<table><tr><th>Port</th><th>Description</th></tr><tr><td>A, B, C, D</td><td>RF Ports B2/B25 TX (B2/B25 B66 RX)</td></tr><tr><td>E, F, G, H</td><td>RF Ports B66 TX (B2/B25 B66 RX)</td></tr><tr><td>Data 1, 2</td><td>Optical Interface</td></tr><tr><td>Alarm / Fan</td><td>Alarm / Fan</td></tr><tr><td>AISG</td><td>AISG communication port</td></tr><tr><td>-48VDC</td><td>DC Input</td></tr><tr><td></td><td></td></tr></table>	Port	Description	A, B, C, D	RF Ports B2/B25 TX (B2/B25 B66 RX)	E, F, G, H	RF Ports B66 TX (B2/B25 B66 RX)	Data 1, 2	Optical Interface	Alarm / Fan	Alarm / Fan	AISG	AISG communication port	-48VDC	DC Input																		
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Physical	<table><tr><td>Dimensions</td><td>Dimensions excl. protruding parts (handles, mounting bosses, radio foot, connectors, etc): 384 × 444 × 174 mm (15.1" × 17.5" × 6.9") Dimensions incl. protruding parts: 398 × 523 × 179 mm (15.7" × 20.6" × 7.0")</td></tr><tr><td>Weight</td><td>Approximately 30.5 kg</td></tr><tr><td>Operating Temperature</td><td>-40 °C to +55 °C</td></tr><tr><td>Mounting</td><td>Vertical: Shelf and portrait, behind antenna</td></tr><tr><td>Cooling</td><td>Convection (Option - forced air)</td></tr></table>	Dimensions	Dimensions excl. protruding parts (handles, mounting bosses, radio foot, connectors, etc): 384 × 444 × 174 mm (15.1" × 17.5" × 6.9") Dimensions incl. protruding parts: 398 × 523 × 179 mm (15.7" × 20.6" × 7.0")	Weight	Approximately 30.5 kg	Operating Temperature	-40 °C to +55 °C	Mounting	Vertical: Shelf and portrait, behind antenna	Cooling	Convection (Option - forced air)																						
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Cooling	Convection (Option - forced air)																																
Software details	CXP2021113/1_R42F12																																
Radio Hardware Configuration	<table><tr><th>Product: KRC 161 983/31 (R1B)</th><th>R1x</th><th>Description</th></tr><tr><td>ROX 128 7221/31</td><td>R1B</td><td>PCB ASSEMB/MOX</td></tr><tr><td>ROR 101 0091/25</td><td>R1C</td><td>CIRCUIT MODULE/PAX 4890 B25</td></tr><tr><td>ROA 128 7221/3</td><td>R1B</td><td>Radio Board Assy (MOX)</td></tr><tr><td>ROZ 104 7050/5</td><td>R1B</td><td>DC-DC Circuit</td></tr><tr><td>ROR 101 0091/25</td><td>R1C</td><td>CIRCUIT MODULE/PAX 4890 B25 (×4)</td></tr><tr><td>ROR 101 0091/66</td><td>R1C</td><td>CIRCUIT MODULE/PAX 4890 B66 (×4)</td></tr><tr><td>KRF 901 686</td><td>R1B</td><td>FILTER UNIT</td></tr><tr><td>NTB 101 1260/1</td><td>R1E</td><td>Mech parts</td></tr><tr><td>NTB 101 1360/5</td><td>R1B</td><td>Mech parts</td></tr></table>	Product: KRC 161 983/31 (R1B)	R1x	Description	ROX 128 7221/31	R1B	PCB ASSEMB/MOX	ROR 101 0091/25	R1C	CIRCUIT MODULE/PAX 4890 B25	ROA 128 7221/3	R1B	Radio Board Assy (MOX)	ROZ 104 7050/5	R1B	DC-DC Circuit	ROR 101 0091/25	R1C	CIRCUIT MODULE/PAX 4890 B25 (×4)	ROR 101 0091/66	R1C	CIRCUIT MODULE/PAX 4890 B66 (×4)	KRF 901 686	R1B	FILTER UNIT	NTB 101 1260/1	R1E	Mech parts	NTB 101 1360/5	R1B	Mech parts		
Product: KRC 161 983/31 (R1B)	R1x	Description																															
ROX 128 7221/31	R1B	PCB ASSEMB/MOX																															
ROR 101 0091/25	R1C	CIRCUIT MODULE/PAX 4890 B25																															
ROA 128 7221/3	R1B	Radio Board Assy (MOX)																															
ROZ 104 7050/5	R1B	DC-DC Circuit																															
ROR 101 0091/25	R1C	CIRCUIT MODULE/PAX 4890 B25 (×4)																															
ROR 101 0091/66	R1C	CIRCUIT MODULE/PAX 4890 B66 (×4)																															
KRF 901 686	R1B	FILTER UNIT																															
NTB 101 1260/1	R1E	Mech parts																															
NTB 101 1360/5	R1B	Mech parts																															
Product Identification / Markings and Labels	<div><div><div></div><div>Radio 4890HP 48B2/B25 48B66 M01</div></div><div><div>B2/B25</div><div>UL 1850-1915 MHz DL 1930-1995 MHz</div></div><div><div>B66</div><div>UL 1710-1780 MHz DL 2110-2200 MHz</div></div></div> <div><div></div><div>FCC ID: TA8AKRC161983-3 IC: 287AB-AS1619833 AS1619833 IP65 / Type 3 Enclosure</div><div>This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device accepts any interference received, including interference that may cause undesired operation. CAN ICES-3 (B)/NMB-3 (B). Ericsson AB, 164 80 Stockholm, Sweden</div></div>																																

3.3 EUT test details

EUT setup/configuration rationale for Down link:

RAT	Modulation	Performance Requirement	Test Model / Configuration
LTE	QPSK	N/A	TM1.1
LTE	16QAM	N/A	TM3.2
LTE	64QAM	N/A	TM3.1
LTE	256QAM	N/A	TM3.1a
NR	QPSK	N/A	TM1.1
NR	16QAM	N/A	TM3.2
NR	64QAM	N/A	TM3.1
NR	256QAM	N/A	TM3.1a
WCDMA	QPSK	N/A	TM1
WCDMA	16QAM	N/A	TM5
WCDMA	64QAM	N/A	TM6

LTE Single Carrier B25

Bandwidth, MHz	LTE Transmit / DL, MHz					
	B	EARFCN	M	EARFCN	T	EARFCN
5	1932.5	8065	1962.5	8365	1992.5	8665
10	1935.0	8090	1962.5	8365	1990.0	8640
15	1937.5	8115	1962.5	8365	1987.5	8615
20	1940.0	8140	1962.5	8365	1985.0	8590

Bandwidth, MHz	LTE Receive / UL, MHz					
	B	EARFCN	M	EARFCN	T	EARFCN
5	1852.5	26065	1882.5	26365	1912.5	26665
10	1855.0	26090	1882.5	26365	1910.0	26640
15	1857.5	26115	1882.5	26365	1907.5	26615
20	1860.0	26140	1882.5	26365	1905.0	26590

NR Single Carrier B25

Bandwidth, MHz	Transmit / DL, MHz					
	B	NR-ARFCN	M	NR-ARFCN	T	NR-ARFCN
5	1932.5	386500	1962.5	392500	1992.5	398500
10	1935.0	387000	1962.5	392500	1990.0	398000
15	1937.5	387500	1962.5	392500	1987.5	397500
20	1940.0	388000	1962.5	392500	1985.0	397000
25	1942.5	388500	1962.5	392500	1982.5	396500
30	1945.0	389000	1962.5	392500	1980.0	396000
40	1950.0	390000	1962.5	392500	1975.0	395000

Bandwidth, MHz	Receive / UL, MHz					
	B	NR-ARFCN	M	NR-ARFCN	T	NR-ARFCN
5	1852.5	370500	1882.5	376500	1912.5	382500
10	1855.0	371000	1882.5	376500	1910.0	382000
15	1857.5	371500	1882.5	376500	1907.5	381500
20	1860.0	372000	1882.5	376500	1905.0	381000
25	1862.5	372500	1882.5	376500	1902.5	380500
30	1865.0	373000	1882.5	376500	1900.0	380000
40	1870.0	374000	1882.5	376500	1895.0	379000

EUT test details, continued

WCDMA Single Carrier B2

Bandwidth, MHz	Transmit / DL, MHz					
	B	UARFCN	M	UARFCN	T	UARFCN
5	1932.4	9662	1960	9800	1987.6	9938

Bandwidth, MHz	Receive / UL, MHz					
	B	UARFCN	M	UARFCN	T	UARFCN
5	1852.4	9262	1880.0	9400	1907.6	9538

LTE Single Carrier B66

Bandwidth, MHz	LTE Transmit / DL, MHz					
	B	EARFCN	M	EARFCN	T	EARFCN
5	2112.5	66461	2155.0	66886	2197.5	67311
10	2115.0	66486	2155.0	66886	2195.0	67286
15	2117.5	66511	2155.0	66886	2192.5	67261
20	2120.0	66536	2155.0	66886	2190.0	67236

Bandwidth, MHz	LTE Receive / UL, MHz					
	B	EARFCN	M	EARFCN	T	EARFCN
5	1712.5	131997	1745.0	132322	n/a	n/a
10	1715.0	132022	1745.0	132322	n/a	n/a
15	1717.5	132047	1745.0	132322	n/a	n/a
20	1720.0	132072	1745.0	132322	n/a	n/a

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
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
40	1730.0	346000	1755.0	351000	n/a	n/a

EUT test details, continued

WCDMA Single Carrier B4

Bandwidth, MHz	Transmit / DL, MHz					
	B	UARFCN	M	UARFCN	T	UARFCN
5	2112.4	1537	2132.4	1637	2152.6	1738

Bandwidth, MHz	Receive / UL, MHz					
	B	UARFCN	M	UARFCN	T	UARFCN
5	1712.4	1312	1732.4	1412	1752.6	1513

B2 WCDMA 5MHz Test Configurations:

Carrier configurations	Transmit / DL, MHz
SC, Bottom	1932.4
SC, Middle	1960.0
SC, Top	1987.6
2C, Bottom+Bottom	1932.4+1937.4
2C, Middle+Middle	1957.4+1962.4
2C, Top+Top	1982.6+1987.6
3C, Bottom+Bottom+Bottom	1932.4+1937.4+1942.4
3C, Middle+Middle+Middle	1955.0+1960.0+1965.0
3C, Top+Top+Top	1977.6+1982.6+1987.6
6C, Bottom+Bottom+Bottom+Bottom+Bottom+Bottom	1932.4+1937.4+1942.4+1947.4+1952.4+1957.4
6C, Middle+Middle+Middle+Middle+Middle+Middle	1947.4+1952.4+1957.4+1962.4+1967.4+1972.4
6C, Top+Top+Top+Top+Top+Top	1962.6+1967.6+1972.6+1977.6+1982.6+1987.6
2C, Bottom + Top	(1932.4) + (1987.6)
3C, Bottom+Bottom + Top	(1932.4+1937.4) + (1987.6)
6C, Bottom+Bottom+Bottom + Top+Top+Top	(1932.4+1937.4+1942.4) + (1977.6+1982.6+1987.6)

B25 Mixed Mode Test Configurations:

Carrier configurations	Transmit / DL, MHz
2C, W5+L5(iot1), Bottom+Bottom	1932.4+1937.4
2C, W5+L5(iot1), Middle+Middle	1960.0+1965.0
2C, W5+L5(iot1), Top+Top	1987.6+1992.5
2C, W5+N5, Bottom+Bottom	1932.4+1937.4
2C, W5+N5, Middle+Middle	1960.0+1965.0
2C, W5+N5, Top+Top	1987.6+1992.5
2C, W5 + L5(iot1), Bottom + Top	(1932.4) + (1992.5)
2C, W5 + N5, Bottom + Top	(1932.4) + (1992.5)
3C, W5+N5 + L5(iot1), Bottom+Bottom + Top	(1932.4+1937.4) + (1992.5)
3C, N5 + W5+L5(iot1), Bottom + Top+Top	(1932.5) + (1987.6+1992.5)
6C, W5+W5+N5+N5 + L5(iot1)+L5, Bottom+Bottom+Bottom+Bottom + Top+Top	(1932.4+1937.4+1942.4+1947.4) + (1987.5+1992.5)
6C, N5+N5 + W5+W5+L5(iot1)+L5, Bottom+Bottom + Top+Top+Top+Top	(1932.5+1937.5) + (1977.6+1982.6+1987.5+1992.5)

EUT test details, continued

B4 WCDMA 5MHz Test Configurations:

Carrier configurations	Transmit / DL, MHz
SC, Bottom	2112.4
SC, Middle	2132.4
SC, Top	2152.6
2C, Bottom+Bottom	2112.4+2117.4
2C, Middle+Middle	2130.0+2135.0
2C, Top+Top	2147.6+2152.6
3C, Bottom+Bottom+Bottom	2112.4+2117.4+2122.4
3C, Middle+Middle+Middle	2127.4+2132.4+2137.4
3C, Top+Top+Top	2142.6+2147.6+2152.6
6C, Bottom+Bottom+Bottom+Bottom+Bottom+Bottom	2112.4+2117.4+2122.4+2127.4+2132.4+2137.4
6C, Middle+Middle+Middle+Middle+Middle+Middle	2120.0+2125.0+2130.0+2135.0+2140.0+2145.0
6C, Top+Top+Top+Top+Top+Top	2127.6+2132.6+2137.6+2142.6+2147.6+2152.6
2C, Bottom + Top	(2112.4) + (2152.6)
3C, Bottom+Bottom + Top	(2112.4+2117.4) + (2152.6)

B66 Mixed Mode Test Configurations:

Carrier configurations	Transmit / DL, MHz
2C, W5+L5(iot1), Bottom+Bottom	2112.4+2117.4
2C, W5+L5(iot1), Middle+Middle	2152.6+2157.6
2C, W5+L5(iot1), Top+Top	(2152.6) + (2197.5)
2C, W5+N5, Bottom+Bottom	2112.4+2117.4
2C, W5+N5, Middle+Middle	2152.6+2157.6
2C, W5+N5, Top+Top	(2152.6) + (2197.5)
2C, W5 + L5(iot1), Bottom + Top	(2112.4) + (2197.5)
2C, W5 + N5, Bottom + Top	(2112.4) + (2197.5)
3C, W5+N5 + L5(iot1), Bottom+Bottom + Top	(2112.4+2117.4) + (2197.5)
3C, N5 + W5+L5(iot1), Bottom + Top+Top	(2112.4) + (2152.6) + (2197.5)
6C, W5+W5+N5+N5 + L5(iot1)+L5, Bottom+Bottom+Bottom+Bottom + Top+Top	(2112.4+2117.4+2122.4+2127.4) + (2192.5+2197.5)
6C, N5+N5 + W5+W5+L5(iot1)+L5, Bottom+Bottom + Top+Top+Top+Top	(2112.5+2117.5) + (2147.6+2152.6) + (2192.5+2197.5)

Configurations Tested for Radiated Spurious Emissions:

Carrier configurations	Transmit / DL, MHz
B66(EFGH)1xM _{10NR} + B25(ABCD)1xM _{10NR}	B66: 2155MHz; B25: 1962.5MHz
B66(EF)1xM _{10LTE(GB-IOT)} + B66(GH)1xM _{10LTE} + B25(AB)1xM _{10LTE(GB-IOT)} + B25(CD)1xM _{10LTE}	B66: 2155MHz; B25: 1962.5MHz
B66(EFGH)1xB _{10NR} + B25(ABCD)1xB _{10NR}	B66: 2115MHz; B25: 1935MHz
B66(EFGH)1xT _{10NR} + B25(ABCD)1xT _{10NR}	B66: 2195MHz (DL only) / 2175MHz (UL only); B25: 1990MHz
B66(EFGH)2xNC _{10NR} + B25(ABCD)2xNC _{10NR}	B66: 2115MHz, 2195MHz; B25: 1935MHz, 1990MHz
B66(E)1xB _{10LTE(GB-IOT)} + B66(FGH)1xB _{10LTE} + B66(EFGH)1xT _{10NR} + B25(A)1xB _{10LTE(GB-IOT)} + B25(BCD)1xB _{10LTE} + B25(ABCD)1xT _{10NR}	B66: 2115MHz (LTE), 2195MHz (NR); B25: 1935MHz (LTE), 1990MHz (NR)

3.4 EUT setup diagram

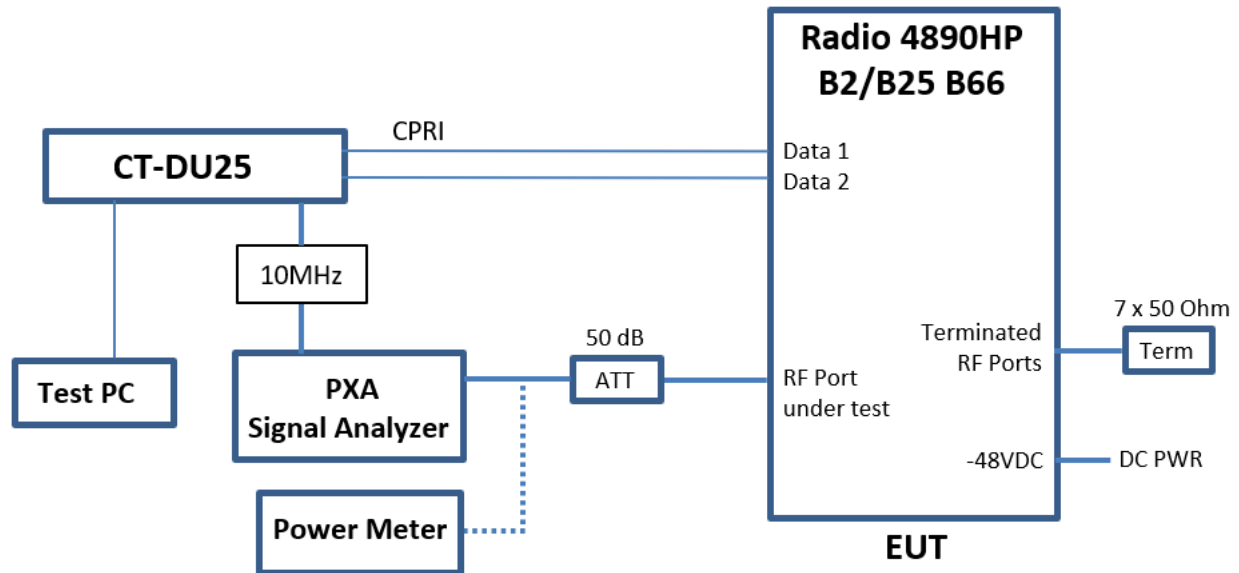


Figure 3.4-1: Setup diagram – Radio Compliance

3.5 Setup photographs

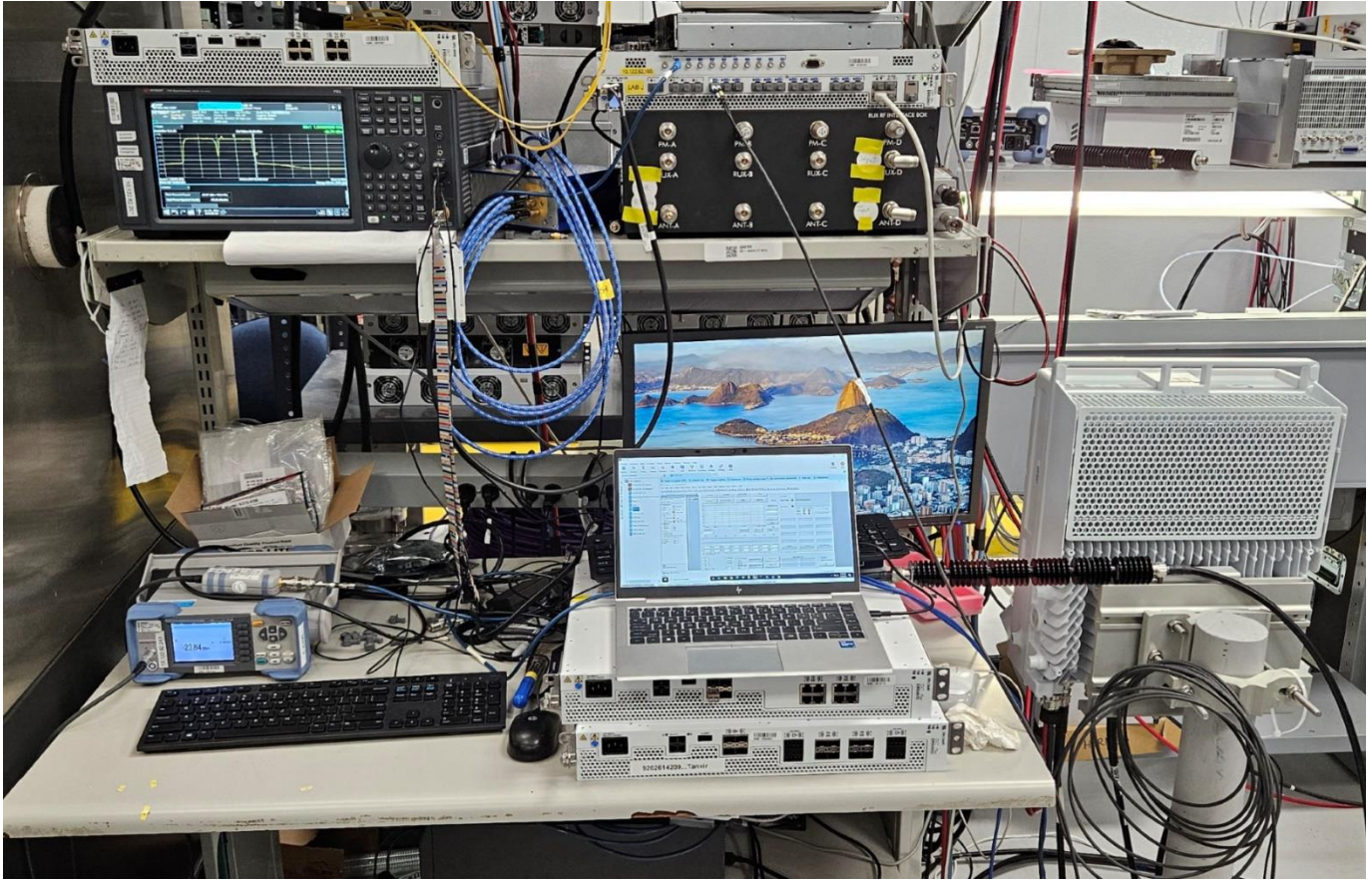


Figure 3.5-1: Set up photo for Radio Compliance Testing

Setup photographs, continued

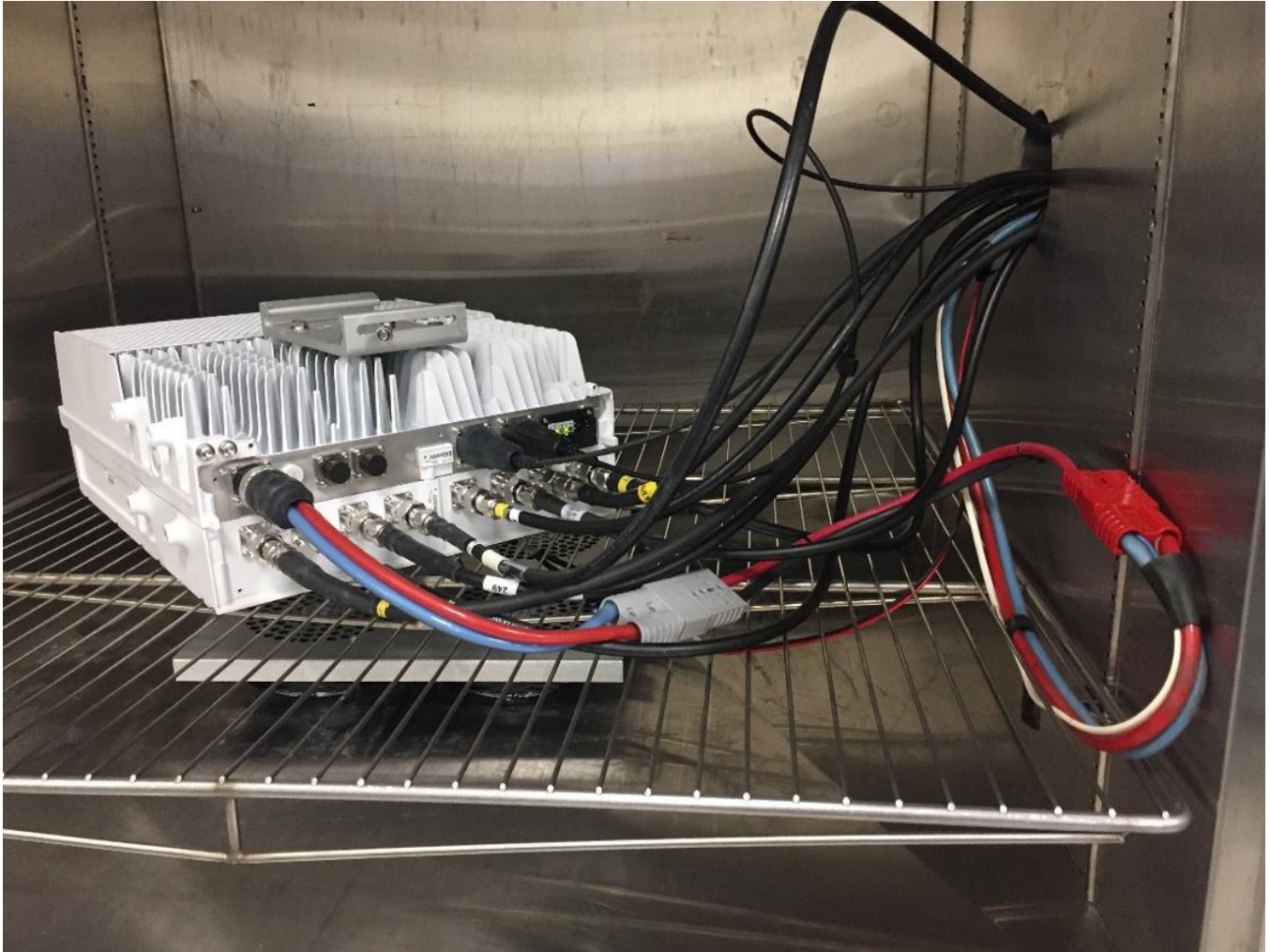


Figure 3.5-2: EUT Set-up photo for Frequency stability Compliance Testing

Setup photographs, continued

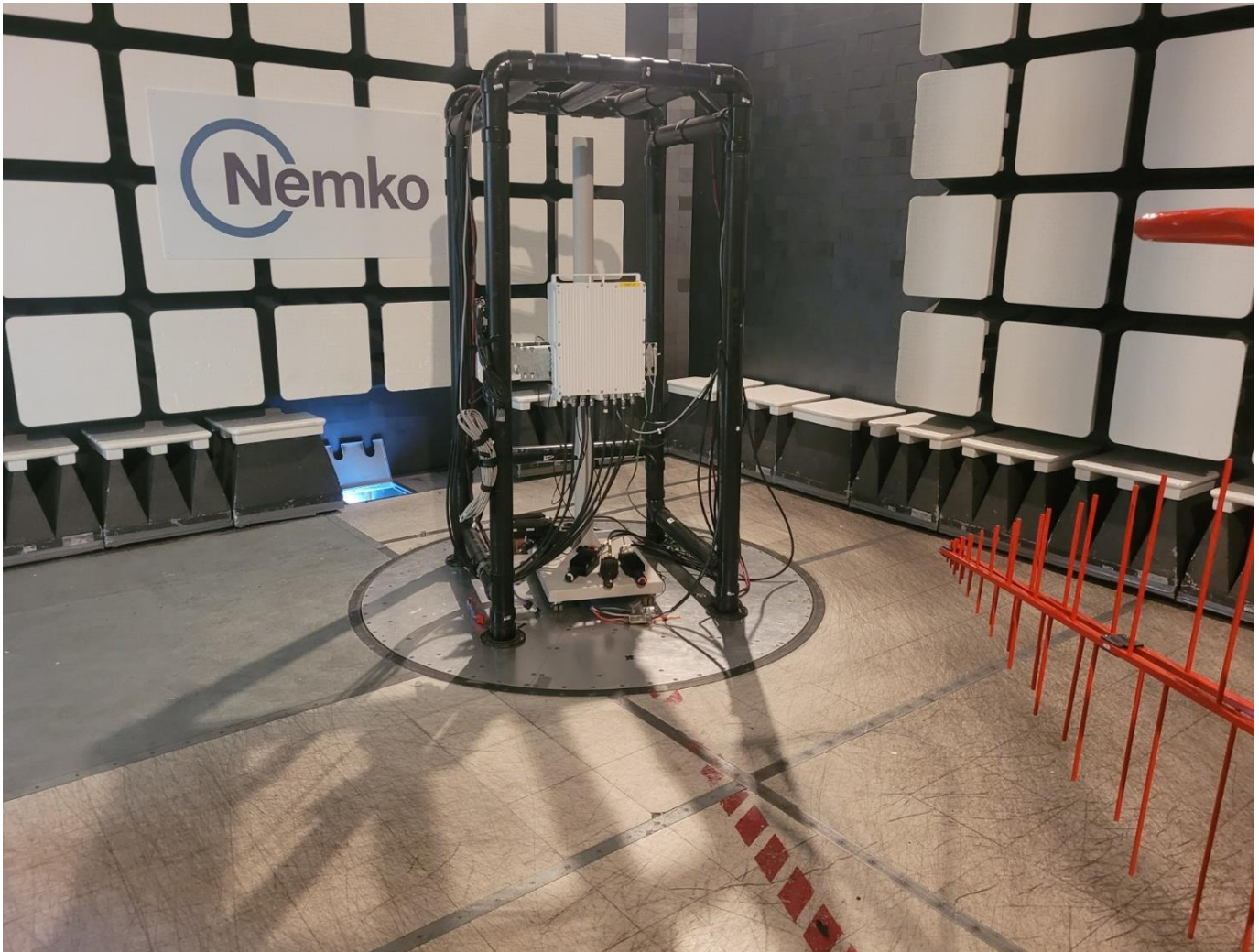


Figure 3.5-3: EUT Set-up photo for Radiated Emissions [30 MHz to 1000 MHz]

Setup photographs, continued

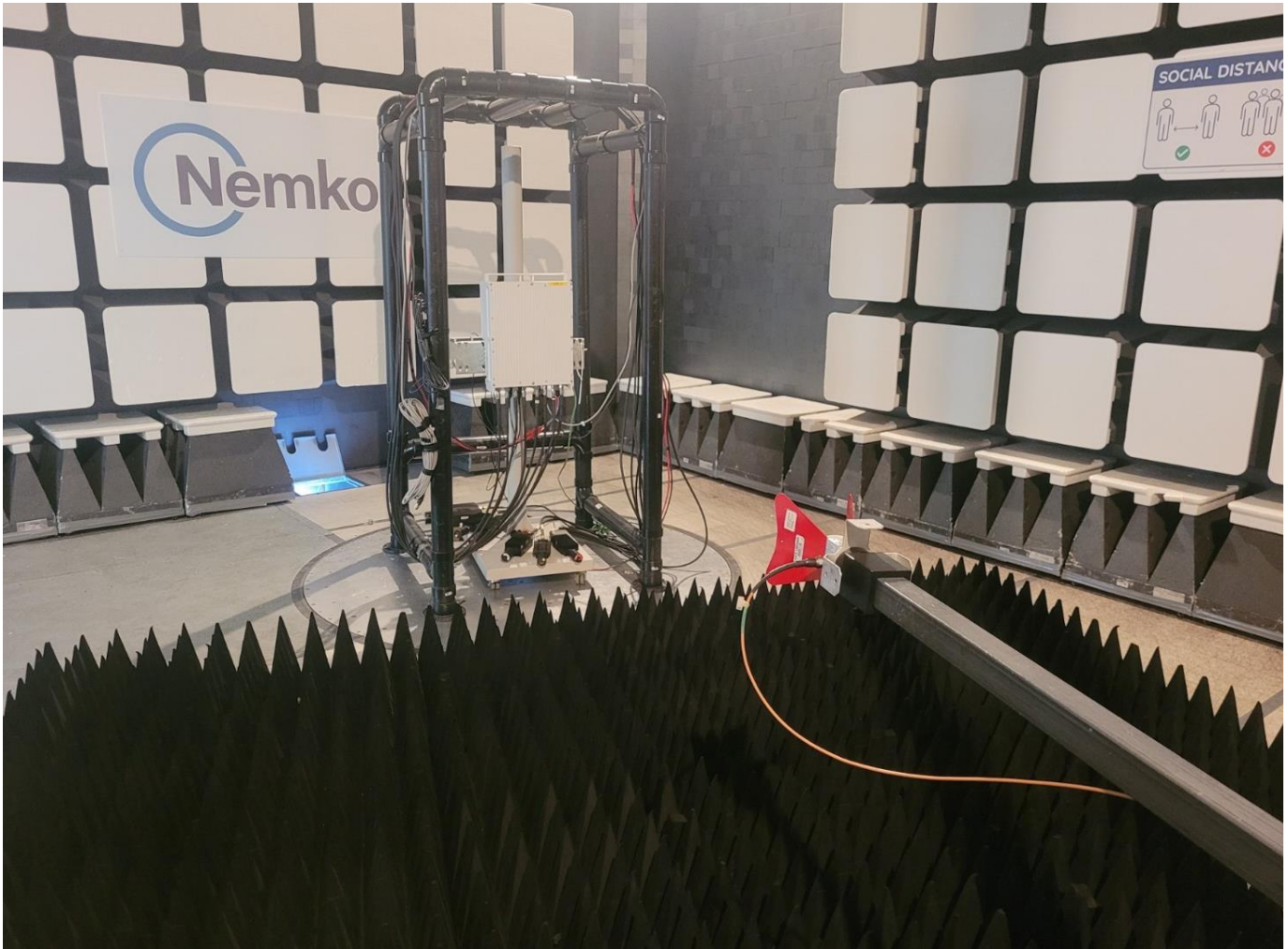


Figure 3.5-4: EUT Set-up photo for Radiated Emissions [1-3 GHz]

Setup photographs, continued

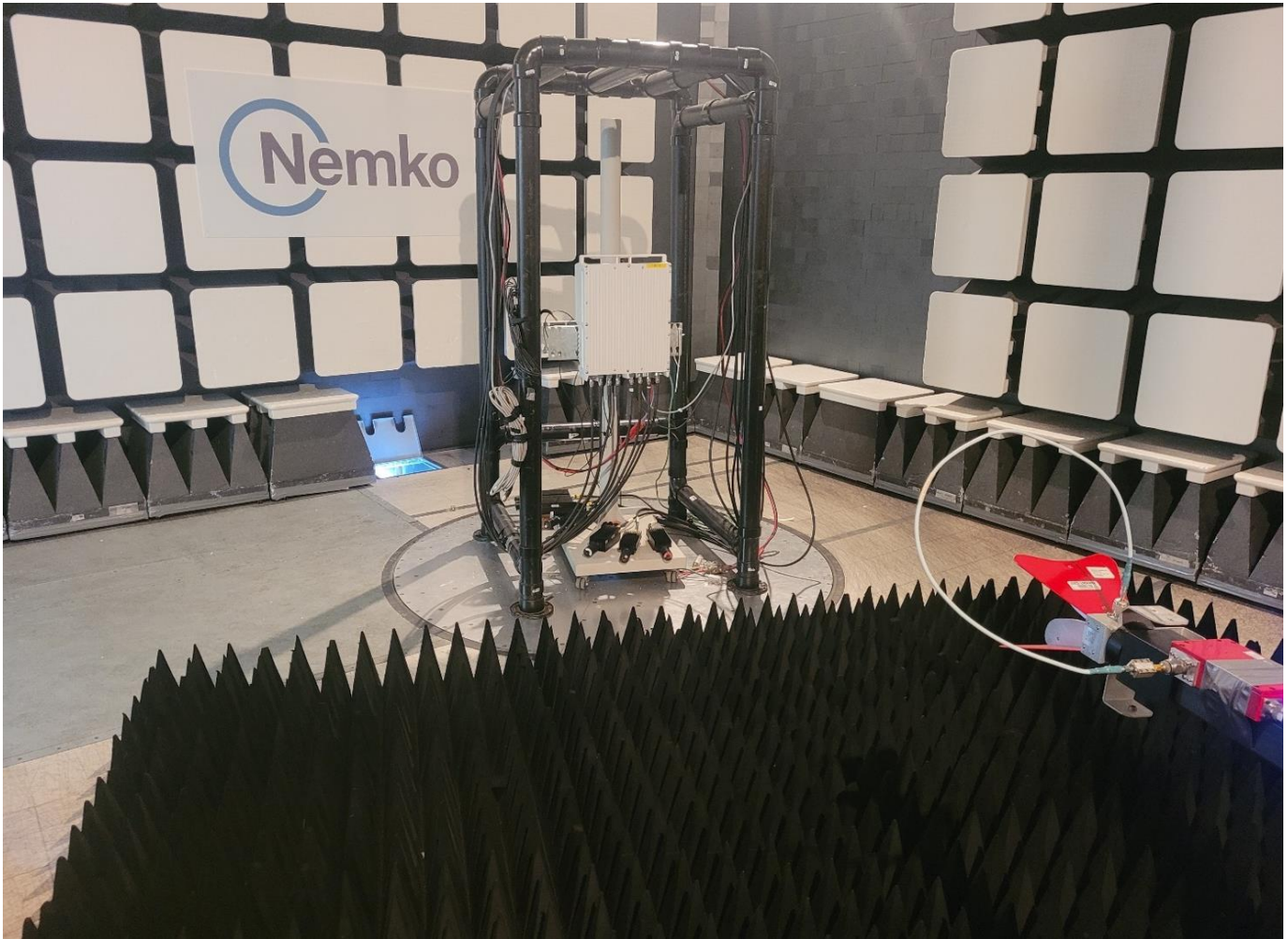


Figure 3.5-5: EUT Set-up photo for Radiated Emissions [3-18 GHz]

Setup photographs, continued



Figure 3.5-6: EUT Set-up photo for Radiated Emissions [18-40 GHz]

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 $\pm 5\%$, 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
Radiated spurious emissions	3.78

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.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	January 19, 2024
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	March 2, 2024
Horn (1–18 GHz)	ETS Lindgren	3117	FA002840	1 year	March 7, 2024
Preamp (1–18 GHz)	ETS Lindgren	124334	FA002873	1 year	August 16, 2023
Horn antenna (18–40 GHz)	EMCO	3116	FA001847	1 year	June 15, 2024
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
Pre-amplifier (26–40 GHz)	Narda	DBL-2640N610	FA001556	—	VOU
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	March 7, 2024
High pass filter (3-18 GHz)	Thilithic Inc.	6HC3000/18000-1.3-KK	FA002231	1 year	June 9, 2024
50 Ω coax cable	Carlisle	WHU18-1818-072	FA002391	1 year	October 17, 2023
PXA Signal Analyzer	Keysight	N9030B	MY57144347	1 year	March 30, 2024
Power Meter	Rohde & Schwarz	NRP2	101123	2 years	May 11, 2025
Power Sensor	Rohde & Schwarz	NRP-Z11	100070	2 years	March 31, 2025
Radio Supporting Equipment*	Ericsson	CT-DU25	T01G525053	—	NCR

Notes: NCR - no calibration required, VOU - verify on use.

* Radio Supporting equipment (CT-DU25) is the test equipment that drives the radios traffic.

Section 8. Testing data

8.1 Maximum output power at RF antenna connector (Band 4/66)

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 specified 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:

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

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:

$$\text{e.i.r.p. reduction} = \lfloor 20 \log \rfloor _10 (\text{HAAT}/300) \text{ dB}$$
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	January 23, 2024
Test engineer	Andrey Adelberg

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 + $10 \times \log_{10}(4)$
- 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.
- **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 Radio Radio 4890HP 48B2/B25 48B66 M01 is 17.0 dBi with 2.50 dB path loss. Maximum measured PSD to EIRP margin 0.42 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
2112.4	41.21	47.23	2.50	17.00	61.73	62.15	0.42

Table 8.1-2: RF power density measurement results of a single-carrier operation for WCDMA

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2112.4	41.21	47.23	62.15	14.92
2132.4	41.13	47.15	62.15	15.00
2152.6	41.07	47.09	62.15	15.06

Table 8.1-3: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.61	45.63	62.15	16.52
2 carriers - mid	39.83	45.85	62.15	16.30
2 carriers - top	39.75	45.77	62.15	16.38

Table 8.1-4: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
3 carriers - low	37.82	43.84	62.15	18.31
3 carriers - mid	37.96	43.98	62.15	18.17
3 carriers - top	37.94	43.96	62.15	18.19

Table 8.1-5: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
6 carriers - low	34.94	40.96	62.15	21.19
6 carriers - mid	34.99	41.01	62.15	21.14
6 carriers - top	34.94	40.96	62.15	21.19

Test data, continued

Table 8.1-6: RF power density measurement results of a multi-carrier operation for WCDMA [non-Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers	39.42	45.44	62.15	16.71
3 carriers	37.81	43.83	62.15	18.32
6 carriers	34.96	40.98	62.15	21.17

Table 8.1-7: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA and LTE 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.66	45.68	62.15	16.47
2 carriers - mid	40.19	46.21	62.15	15.94
2 carriers - top	39.42	45.44	62.15	16.71
2 carriers - non cont.	39.12	45.14	62.15	17.01

Table 8.1-8: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA and NR 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.43	45.45	62.15	16.70
2 carriers - mid	39.74	45.76	62.15	16.39
2 carriers - top	39.42	45.44	62.15	16.71
2 carriers - non cont.	39.41	45.43	62.15	16.72

Table 8.1-9: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA, LTE 5 MHz and NR 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
3 carriers WCDMA, LTE, NR	37.78	43.80	62.15	18.35
6 carriers WCDMA, LTE, NR	34.81	40.83	62.15	21.32
3 carriers NR, WCDMA, LTE	37.36	43.38	62.15	18.77
6 carriers NR, WCDMA, LTE	34.66	40.68	62.15	21.47

Test data, continued

Table 8.1-10: RF total channel power measurement results for WCDMA

Remarks	Total power, dBm	Total power, W
Low channel, single carrier	46.19	41.591
Mid channel, single carrier	46.12	40.926
Top channel, single carrier	46.03	40.087
Low channel, 2 carriers - contiguous	47.64	58.076
Mid channel, 2 carriers - contiguous	47.88	61.376
Top channel, 2 carriers - contiguous	47.84	60.814
Low channel, 3 carriers - contiguous	47.71	59.020
Mid channel, 3 carriers - contiguous	47.88	61.376
Top channel, 3 carriers - contiguous	47.83	60.674
Low channel, 6 carriers - contiguous	47.78	59.979
Mid channel, 6 carriers - contiguous	47.85	60.954
Top channel, 6 carriers - contiguous	47.85	60.954
2 carriers - noncontiguous	47.58	57.280
3 carriers - noncontiguous	47.62	57.810
6 carriers - noncontiguous	47.72	59.156

Table 8.1-11: RF total channel power measurement results for multi-RAT operation

Remarks	Total power, dBm	Total power, W
Low channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	47.62	57.810
Mid channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	47.83	60.674
Top channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	47.36	54.450
Low channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	47.63	57.943
Mid channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	47.84	60.814
Top channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	47.37	54.576
2 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.19	52.360
2 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.18	52.240
3 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.36	54.450
3 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.33	54.075
6 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.52	56.494
6 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.47	55.847

Table 8.1-12: Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for WCDMA

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
Low channel	2112.4	7.76	13.00	5.24
Mid channel	2132.4	7.11	13.00	5.89
Top channel	2152.6	7.13	13.00	5.87

Test data, continued

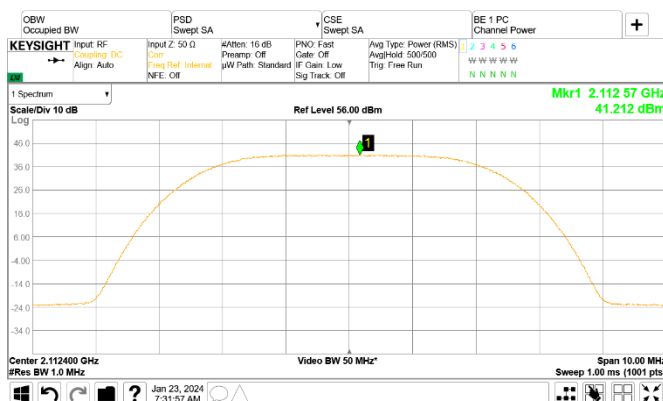


Figure 8.1-1: PSD of WCDMA, single carrier operation, sample plot

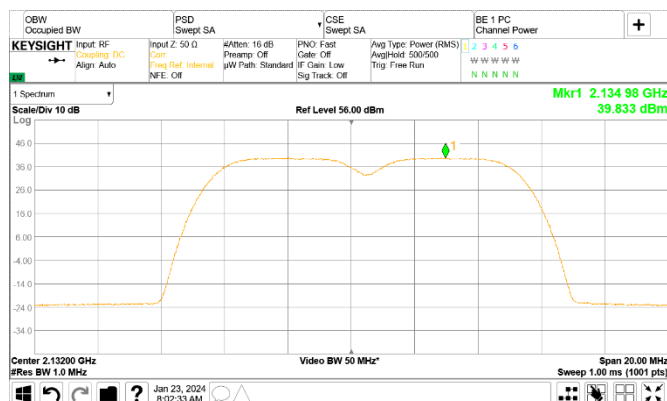


Figure 8.1-2: PSD of WCDMA, 2 carrier contiguous operation, sample plot

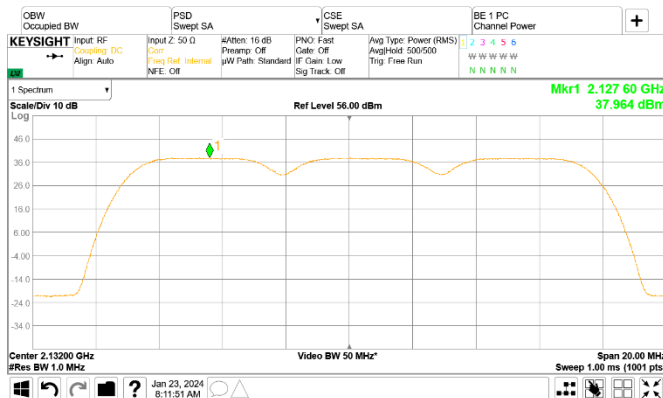


Figure 8.1-3: PSD of WCDMA, 3 carrier contiguous operation, sample plot

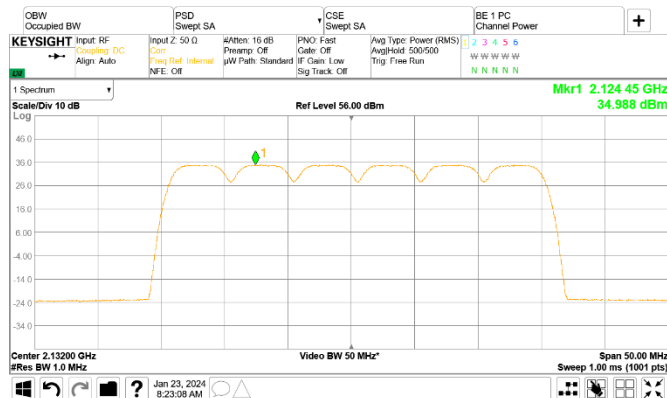


Figure 8.1-4: PSD of WCDMA, 6 carrier contiguous operation, sample plot

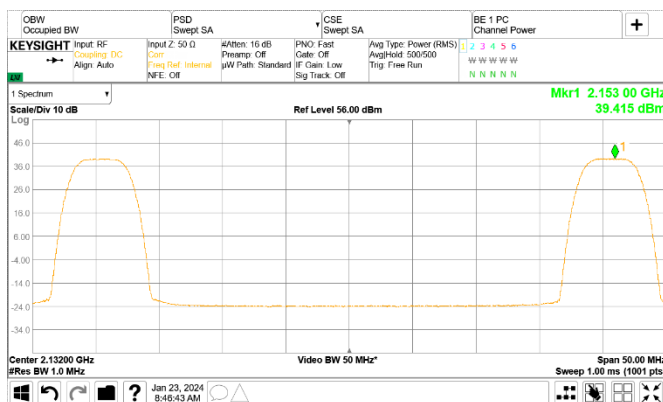


Figure 8.1-5: PSD of WCDMA, 2 carrier noncontiguous operation

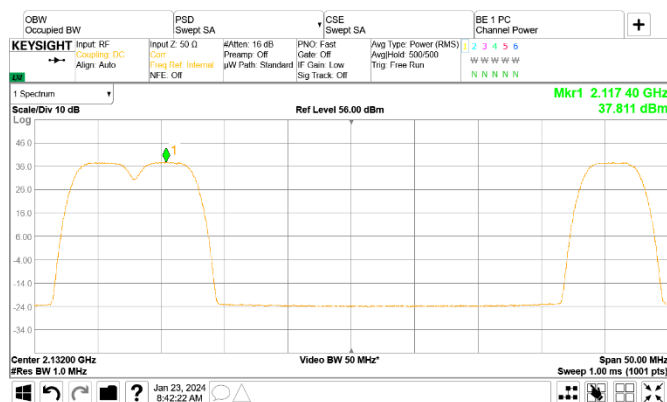


Figure 8.1-6: PSD of WCDMA, 3 carrier noncontiguous operation

Test data, continued



Figure 8.1-7: PSD of WCDMA, 6 carrier noncontiguous operation

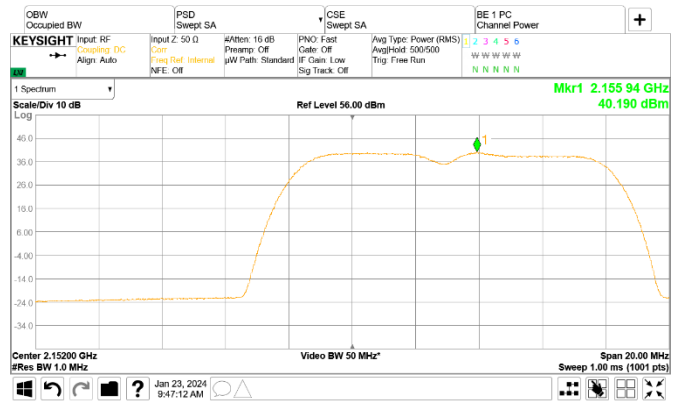


Figure 8.1-8: PSD of WCDMA and LTE, 2 carrier contiguous operation, sample plot

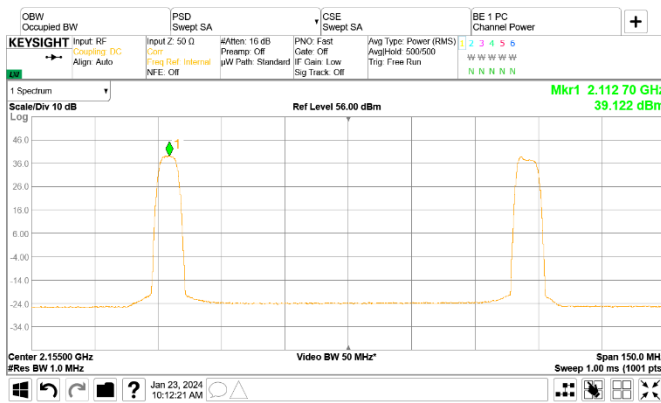


Figure 8.1-9: PSD of WCDMA and LTE, 2 carrier noncontiguous operation

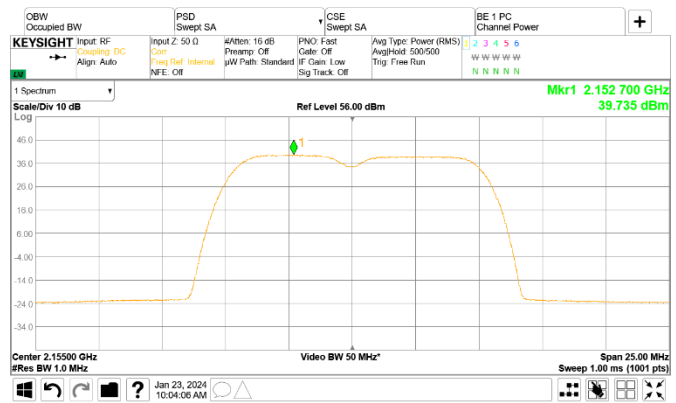


Figure 8.1-10: PSD of WCDMA and NR, 2 carrier contiguous operation, sample plot

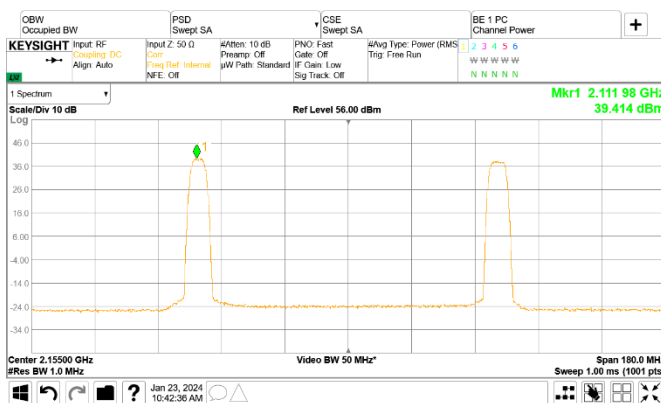


Figure 8.1-11: PSD of WCDMA and NR, 2 carrier noncontiguous operation

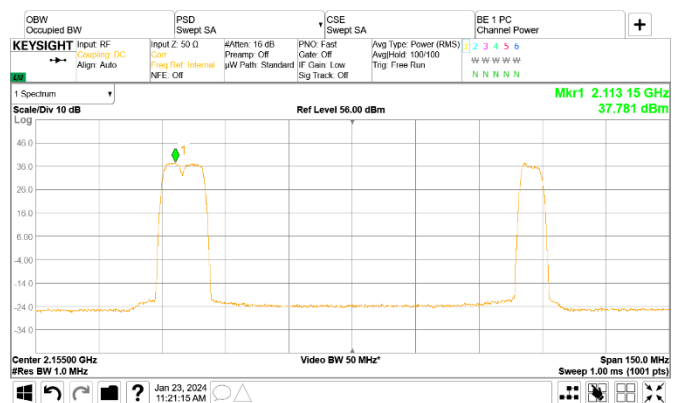


Figure 8.1-12: PSD of WCDMA, NR and LTE, 3 carrier operation



Test data, continued

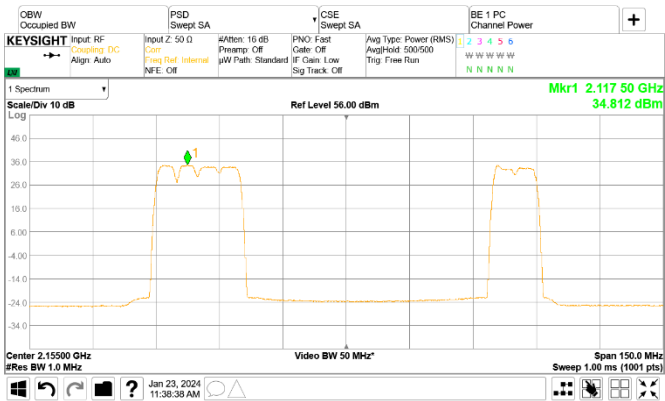


Figure 8.1-13: PSD of WCDMA, NR and LTE, 6 carrier operation

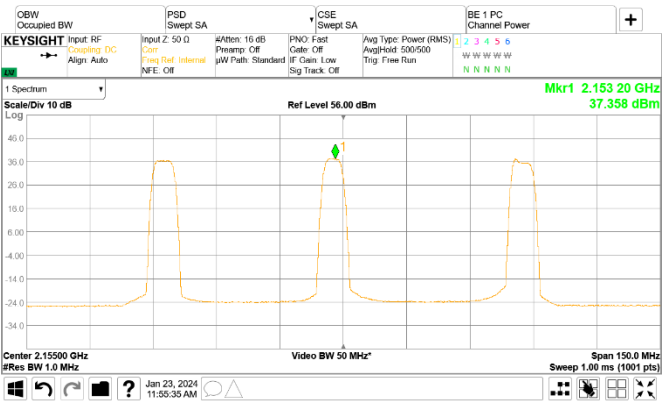


Figure 8.1-14: PSD of NR, WCDMA and LTE, 3 carrier operation

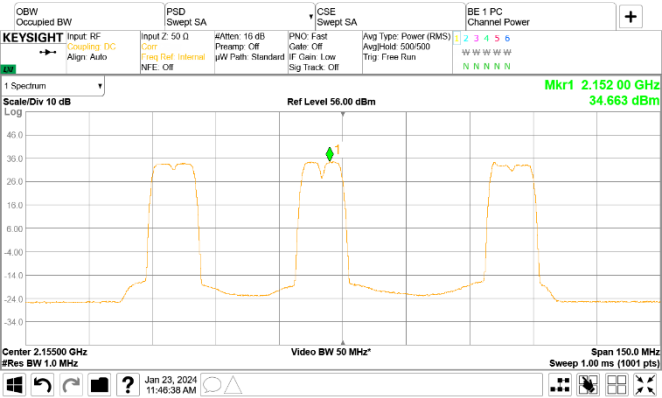


Figure 8.1-15: PSD of NR, WCDMA and LTE, 6 carrier operation

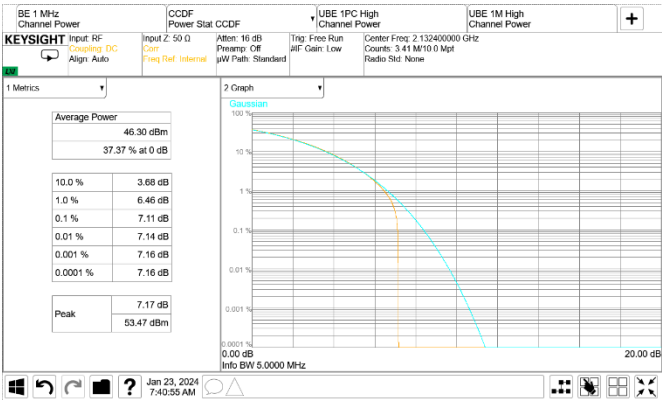


Figure 8.1-16: CCDF sample plot

8.2 Transmitter output power (EIRP) and antenna height (Band 2/25)

8.2.1 Definitions and limits

FCC §24.232(a)(2):

Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see table below.

(b)(1) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth of 1 MHz or less are limited to 3280 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(d) 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 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. 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.

RSS-133, Section 6.4

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

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

SRSP-510, Section 5.1

5.1.1 Base stations

For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table.

Table 8.2-1: Reduction to Maximum Allowable E.I.R.P. for HAAT > 300 m

HAAT (m)	Maximum EIRP, W/MHz
HAAT ≤ 300	1640
300 < HAAT ≤ 500	1070
500 < HAAT ≤ 1000	490
1000 < HAAT ≤ 1500	270
1500 < HAAT ≤ 2000	160

8.2.2 Test summary

Test date	January 23, 2024
Test engineer	Andrey Adelberg

8.2.3 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 + $10 \times \log_{10}(4)$
- RBS (Radio Base Station) EIRP Limits are deployment dependent. To ensure compliance with legal limits detailed in section 8.1.2, 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.
- **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 Radio Radio 4890HP 48B2/B25 48B66 M01 is 17.0 dBi with 2.50 dB path loss. Maximum measured PSD to EIRP margin 0.52 dB.**

Spectrum analyzer settings for PSD:

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

8.2.1 Test data

Table 8.2-2: 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
1932.4	41.11	47.13	2.50	17.00	61.63	62.15	0.52

Table 8.2-3: RF power density measurement results of a single-carrier operation for WCDMA

Frequency, MHz	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
1932.4	41.11	47.13	62.15	15.02
1960.0	40.77	46.79	62.15	15.36
1987.6	40.85	46.87	62.15	15.28

Table 8.2-4: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.10	45.12	62.15	17.03
2 carriers - mid	39.52	45.54	62.15	16.61
2 carriers - top	39.47	45.49	62.15	16.66

Table 8.2-5: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
3 carriers - low	37.44	43.46	62.15	18.69
3 carriers - mid	37.73	43.75	62.15	18.40
3 carriers - top	37.74	43.76	62.15	18.39

Table 8.2-6: RF power density measurement results of a multi-carrier operation for WCDMA [Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
6 carriers - low	34.55	40.57	62.15	21.58
6 carriers - mid	34.67	40.69	62.15	21.46
6 carriers - top	34.73	40.75	62.15	21.40

Test data, continued

Table 8.2-7: RF power density measurement results of a multi-carrier operation for WCDMA [non-Contiguous]

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers	39.17	45.19	62.15	16.96
3 carriers	37.30	43.32	62.15	18.83
6 carriers	34.50	40.52	62.15	21.63

Table 8.2-8: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA and LTE 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.65	45.67	62.15	16.48
2 carriers - mid	40.10	46.12	62.15	16.03
2 carriers - top	40.07	46.09	62.15	16.06
2 carriers - non cont.	39.27	45.29	62.15	16.86

Table 8.2-9: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA and NR 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
2 carriers - low	39.38	45.40	62.15	16.75
2 carriers - mid	39.76	45.78	62.15	16.37
2 carriers - top	39.58	45.60	62.15	16.55
2 carriers - non cont.	38.74	44.76	62.15	17.39

Table 8.2-10: RF power density measurement results of a multi-carrier and multi-RAT operation for WCDMA, LTE 5 MHz and NR 5 MHz

Notes	RF power density, dBm/MHz	Total MIMO PSD, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
3 carriers WCDMA, LTE, NR	37.73	43.75	62.15	18.40
6 carriers WCDMA, LTE, NR	34.79	40.81	62.15	21.34
3 carriers NR, WCDMA, LTE	37.70	43.72	62.15	18.43
6 carriers NR, WCDMA, LTE	34.84	40.86	62.15	21.29

Test data, continued

Table 8.2-11: RF total channel power measurement results for WCDMA

Remarks	Total power, dBm	Total power, W
Low channel, single carrier	46.65	46.238
Mid channel, single carrier	46.29	42.560
Top channel, single carrier	46.39	43.551
Low channel, 2 carriers - contiguous	47.65	58.210
Mid channel, 2 carriers - contiguous	48.03	63.533
Top channel, 2 carriers - contiguous	48.00	63.096
Low channel, 3 carriers - contiguous	47.69	58.749
Mid channel, 3 carriers - contiguous	47.98	62.806
Top channel, 3 carriers - contiguous	47.95	62.373
Low channel, 6 carriers - contiguous	47.70	58.884
Mid channel, 6 carriers - contiguous	47.95	62.373
Top channel, 6 carriers - contiguous	47.96	62.517
2 carriers - noncontiguous	47.41	55.081
3 carriers - noncontiguous	47.44	55.463
6 carriers - noncontiguous	47.63	57.943

Table 8.2-12: RF total channel power measurement results for multi-RAT operation

Remarks	Total power, dBm	Total power, W
Low channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	47.64	58.076
Mid channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	48.02	63.387
Top channel, 2 carriers (WCDMA and LTE 5 MHz) - contiguous	47.87	61.235
Low channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	47.66	58.345
Mid channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	48.04	63.680
Top channel, 2 carriers (WCDMA and NR 5 MHz) - contiguous	47.89	61.518
2 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.18	52.240
2 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.20	52.481
3 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.30	53.703
3 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.36	54.450
6 carriers (WCDMA and LTE 5 MHz) - noncontiguous	47.57	57.148
6 carriers (WCDMA and NR 5 MHz) - noncontiguous	47.59	57.412

Table 8.2-13: Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for WCDMA

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
Low channel	1932.4	7.11	13.00	5.89
Mid channel	1960.0	7.13	13.00	5.87
Top channel	1987.6	7.12	13.00	5.88

Test data, continued

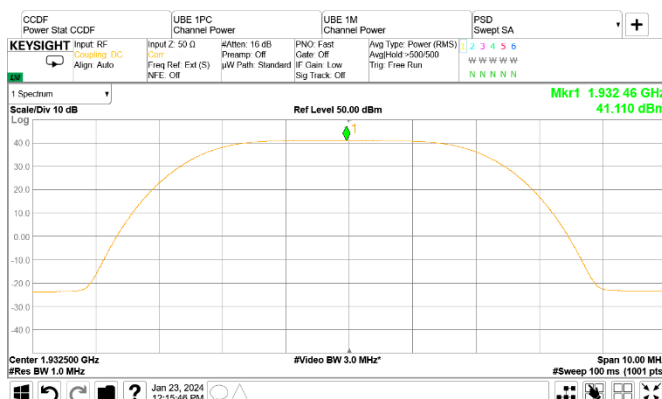


Figure 8.2-1: PSD of WCDMA, single carrier operation, sample plot

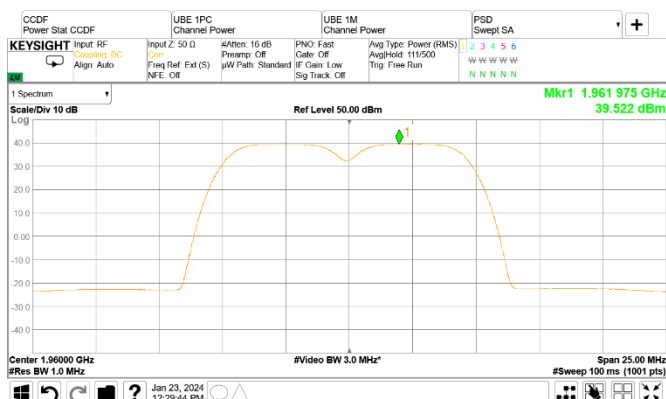


Figure 8.2-2: PSD of WCDMA, 2 carrier contiguous operation, sample plot

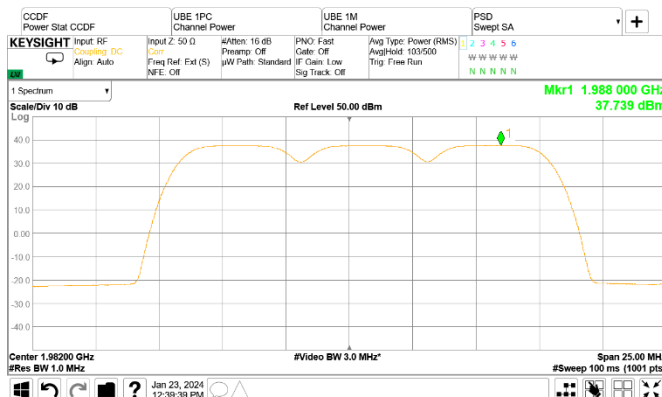


Figure 8.2-3: PSD of WCDMA, 3 carrier contiguous operation, sample plot

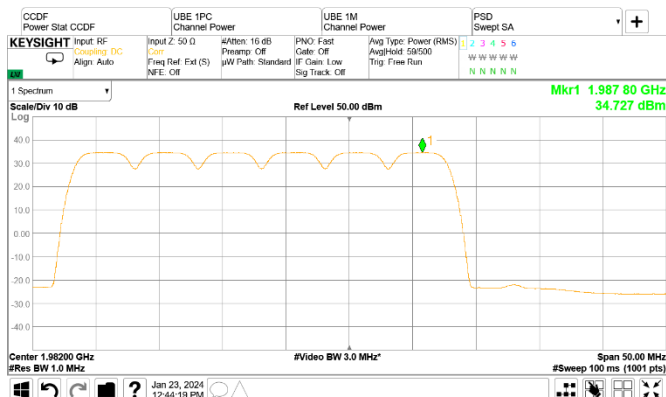


Figure 8.2-4: PSD of WCDMA, 6 carrier contiguous operation, sample plot

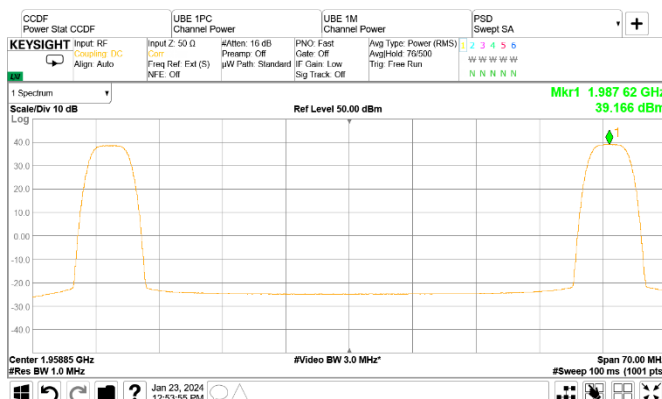


Figure 8.2-5: PSD of WCDMA, 2 carrier noncontiguous operation

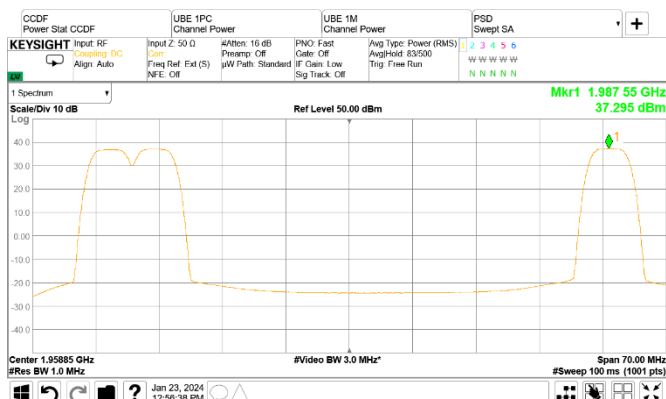


Figure 8.2-6: PSD of WCDMA, 3 carrier noncontiguous operation

Section 8
Test name
Specification

Testing data
Transmitter output power (EIRP) and antenna height (Band 2/25)
FCC Part 24 and RSS-133 Issue 6



Test data, continued

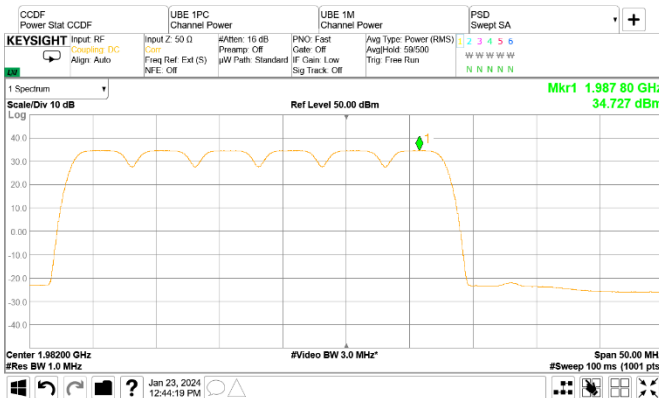


Figure 8.2-7: PSD of WCDMA, 6 carrier noncontiguous operation

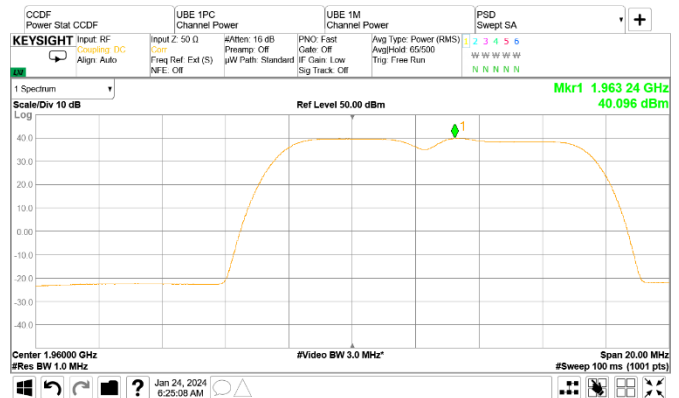


Figure 8.2-8: PSD of WCDMA and LTE, 2 carrier contiguous operation, sample plot



Figure 8.2-9: PSD of WCDMA and LTE, 2 carrier noncontiguous operation

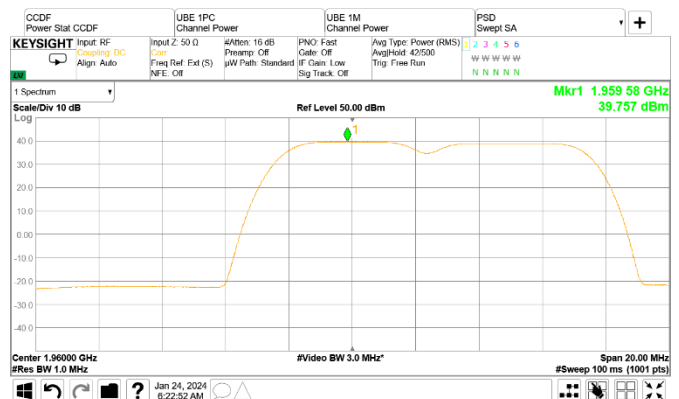


Figure 8.2-10: PSD of WCDMA and NR, 2 carrier contiguous operation, sample plot

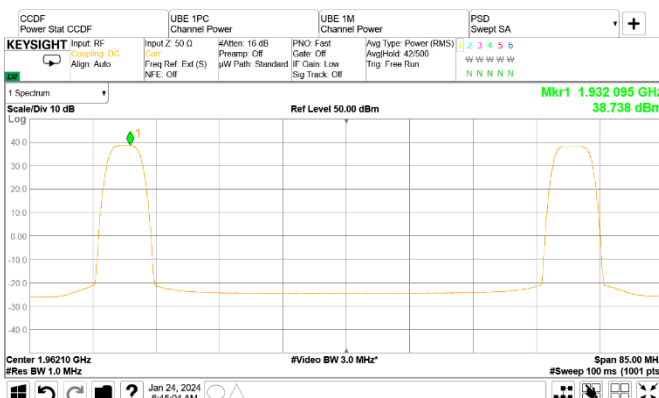


Figure 8.2-11: PSD of WCDMA and NR, 2 carrier noncontiguous operation

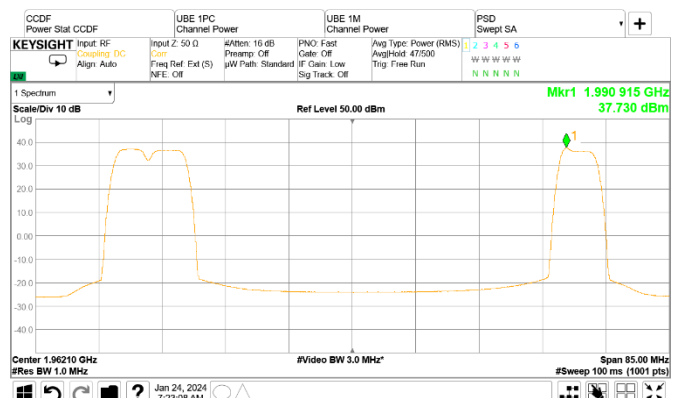


Figure 8.2-12: PSD of WCDMA, NR and LTE, 3 carrier operation

Test data, continued

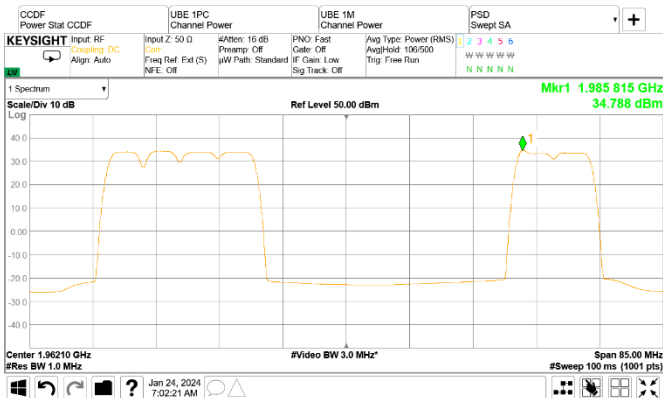


Figure 8.2-13: PSD of WCDMA, NR and LTE, 6 carrier operation

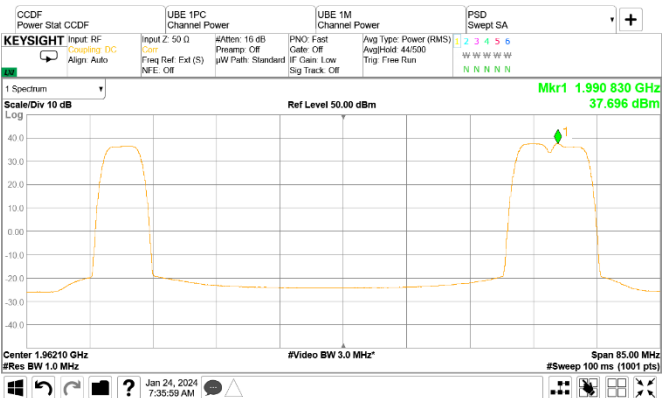


Figure 8.2-14: PSD of NR, WCDMA and LTE, 3 carrier operation

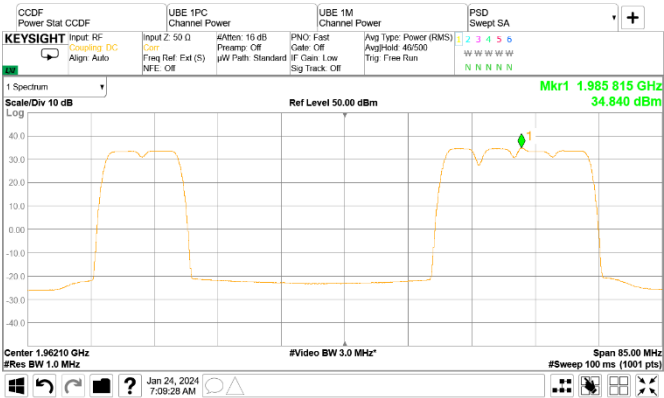


Figure 8.2-15: PSD of NR, WCDMA and LTE, 6 carrier operation

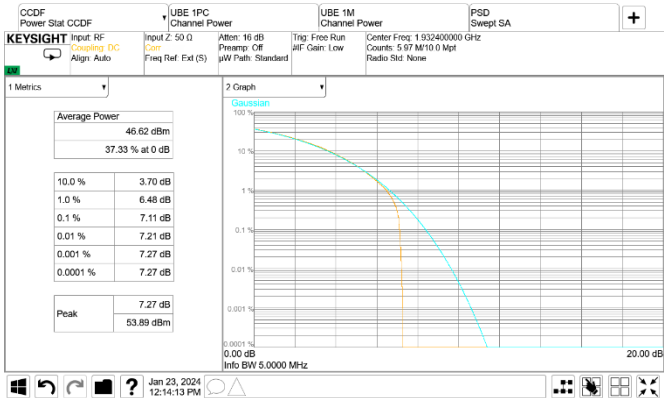


Figure 8.2-16: CCDF sample plot

8.3 Spurious emissions at RF antenna connector (Band 4/66)

8.3.1 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 8.3-1: 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).

8.3.2 Test summary

Test date	June 26 and 27, 2023
Test engineer	Nimish Kapoor

8.3.3 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: $10 \times \log_{10}(4) = 6$ dB
- RBW 1 MHz, VBW was wider than RBW.

8.3.4 Test data

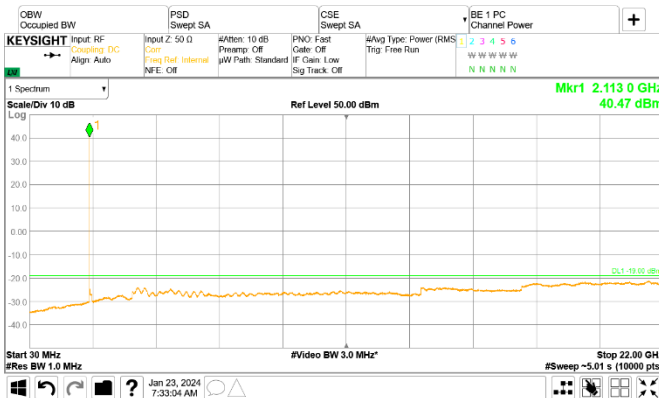


Figure 8.3-1: Conducted spurious emissions of WCDMA low channel, single carrier operation

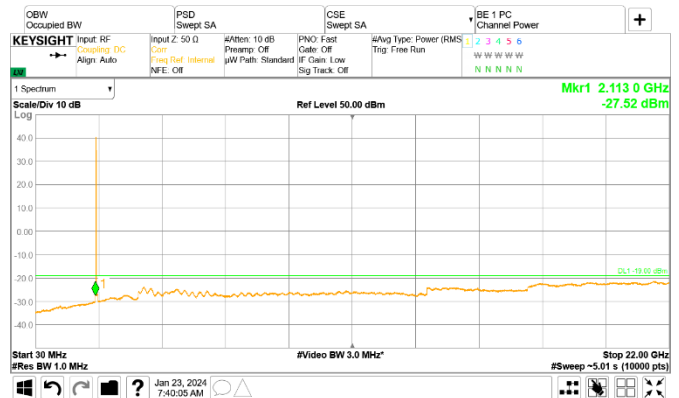


Figure 8.3-2: Conducted spurious emissions of WCDMA mid channel, single carrier operation

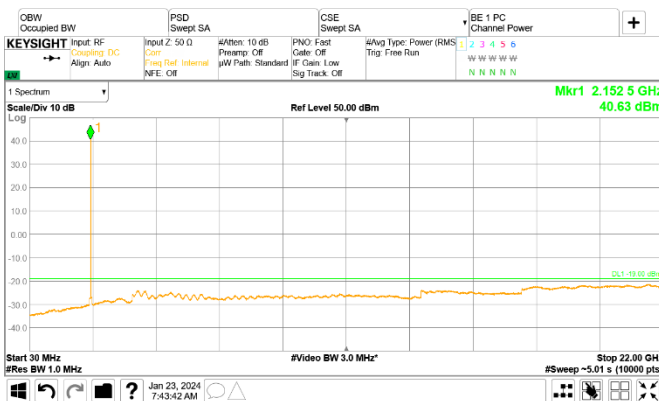


Figure 8.3-3: Conducted spurious emissions of WCDMA top channel, single carrier operation

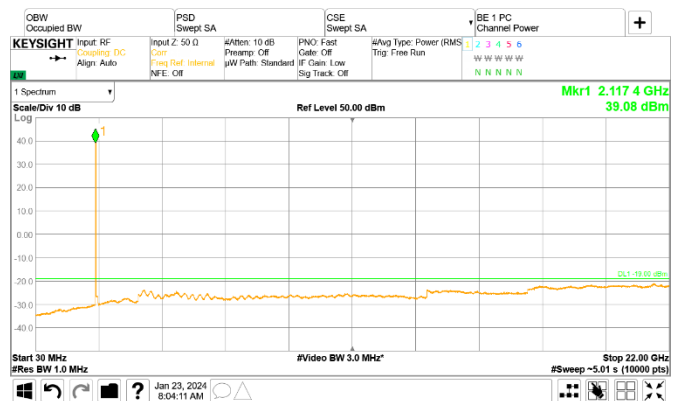


Figure 8.3-4: Conducted spurious emissions of WCDMA low channels, 2 carrier operation

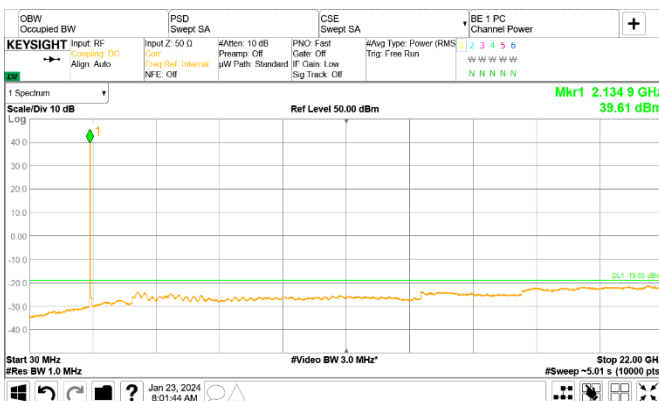


Figure 8.3-5: Conducted spurious emissions of WCDMA mid channels, 2 carrier operation

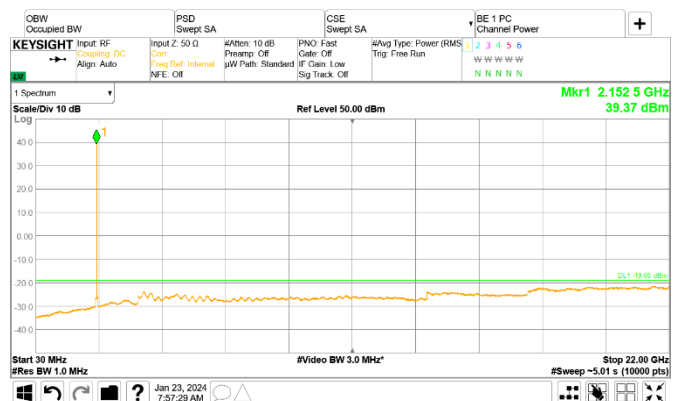


Figure 8.3-6: Conducted spurious emissions of WCDMA top channels, 2 carrier operation

Test data, continued

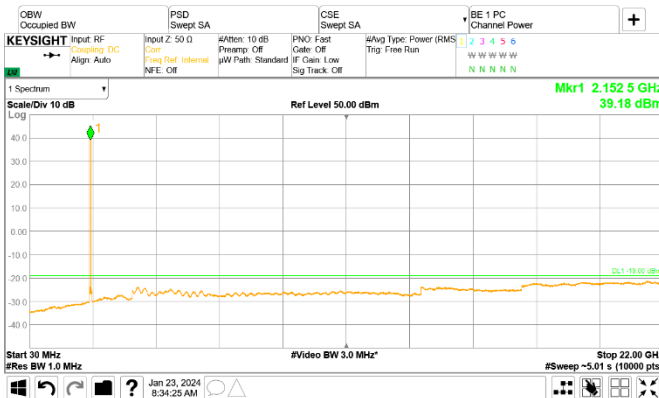


Figure 8.3-7: Conducted spurious emissions of WCDMA noncontiguous, 2 carrier operation

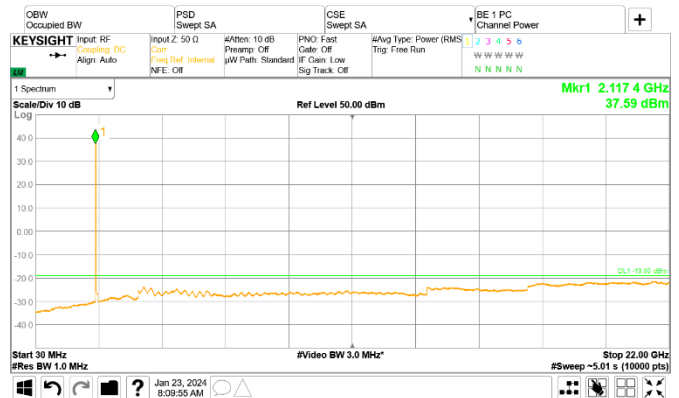


Figure 8.3-8: Conducted spurious emissions of WCDMA low channels, 3 carrier operation

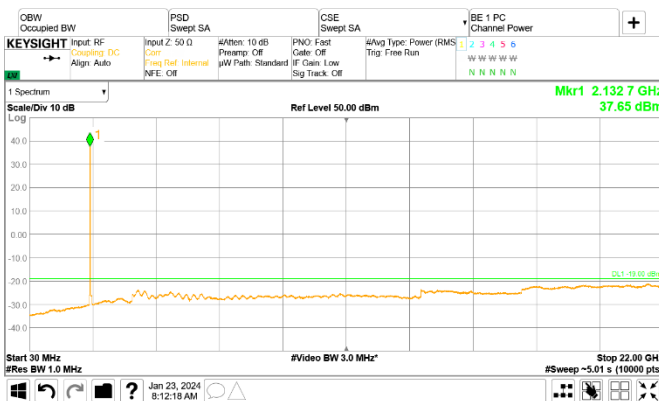


Figure 8.3-9: Conducted spurious emissions of WCDMA mid channels, 3 carrier operation

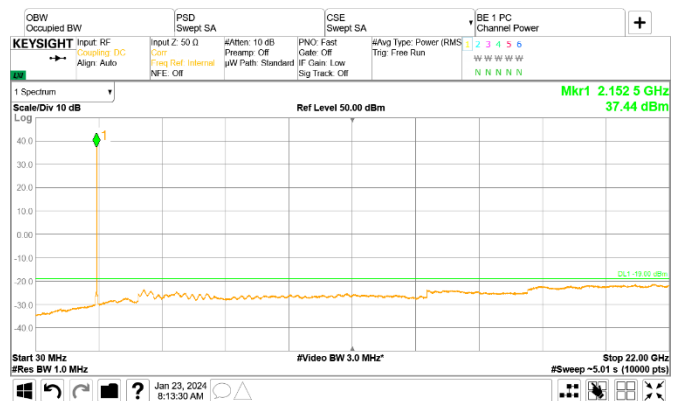


Figure 8.3-10: Conducted spurious emissions of WCDMA top channels, 3 carrier operation

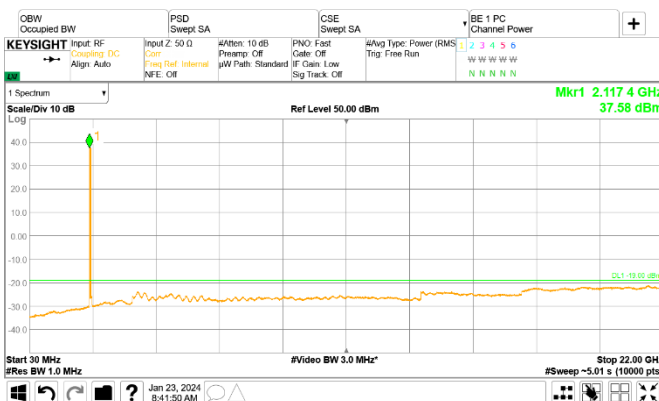


Figure 8.3-11: Conducted spurious emissions of WCDMA noncontiguous, 3 carrier operation

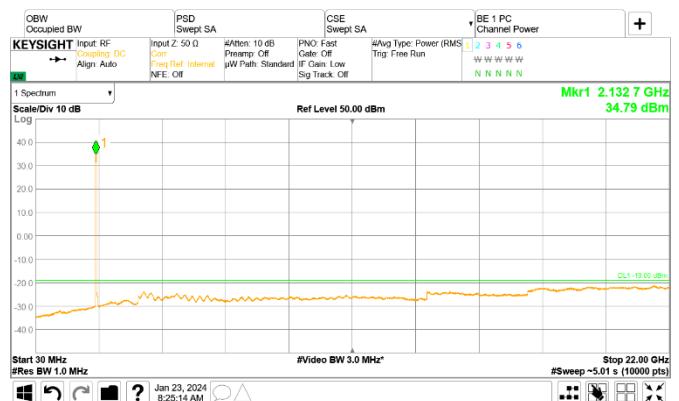


Figure 8.3-12: Conducted spurious emissions of WCDMA low channels, 6 carrier operation

Test data, continued

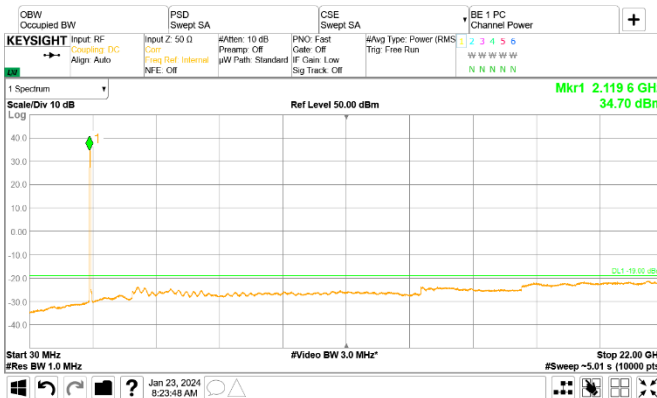


Figure 8.3-13: Conducted spurious emissions of WCDMA mid channels, 6 carrier operation

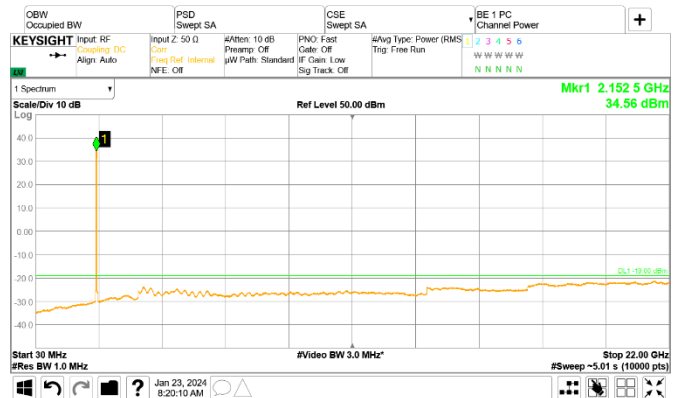


Figure 8.3-14: Conducted spurious emissions of WCDMA top channels, 6 carrier operation

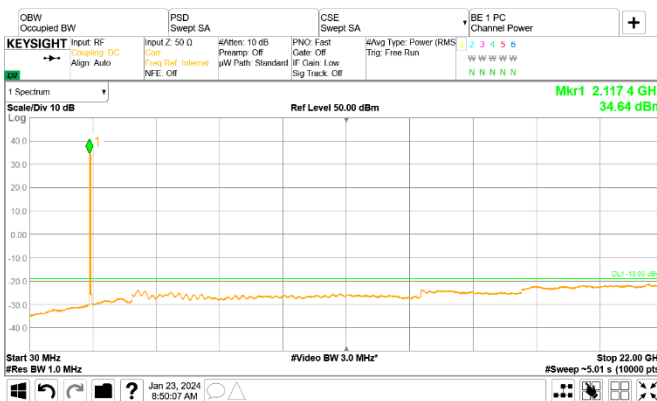


Figure 8.3-15: Conducted spurious emissions of WCDMA noncontiguous, 6 carrier operation

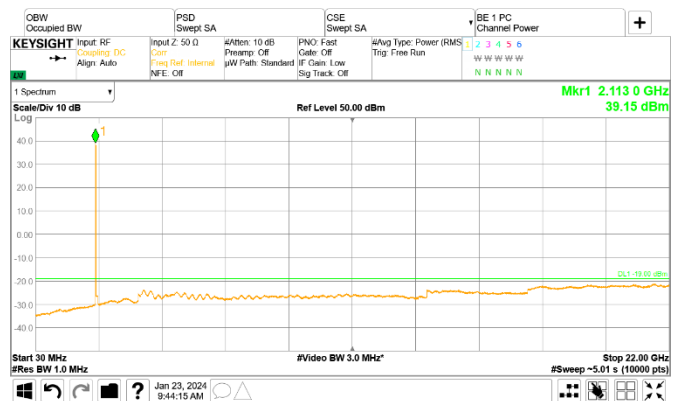


Figure 8.3-16: Conducted spurious emissions of WCDMA and LTE 5 MHz, low channels, 2 carrier operation

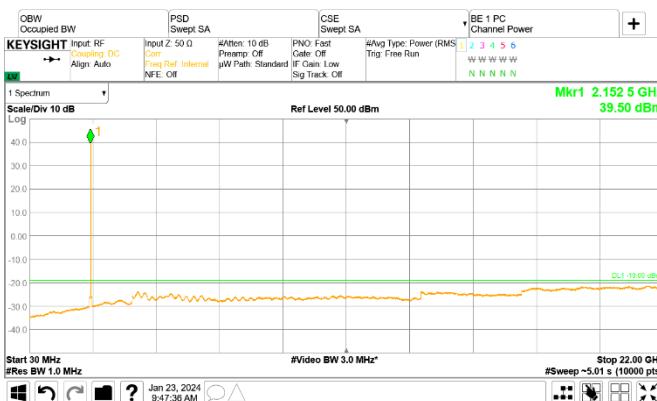


Figure 8.3-17: Conducted spurious emissions of WCDMA and LTE 5 MHz, mid channels, 2 carrier operation

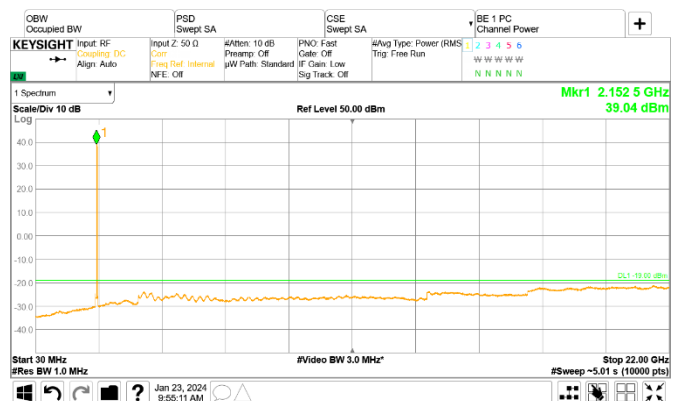


Figure 8.3-18: Conducted spurious emissions of WCDMA and LTE 5 MHz, top channels, 2 carrier operation

Test data, continued

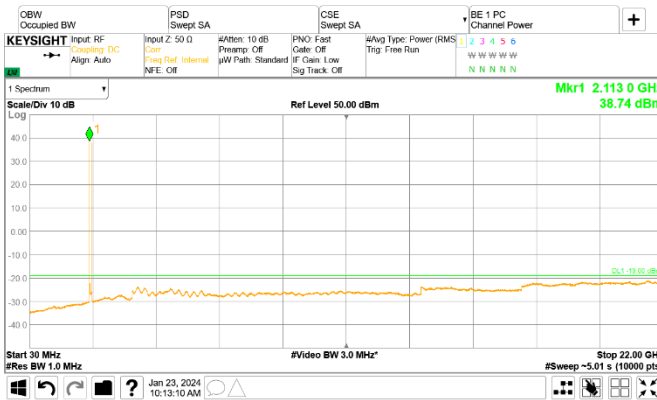


Figure 8.3-19: Conducted spurious emissions of WCDMA and LTE 5 MHz, noncontiguous, 2 carrier operation

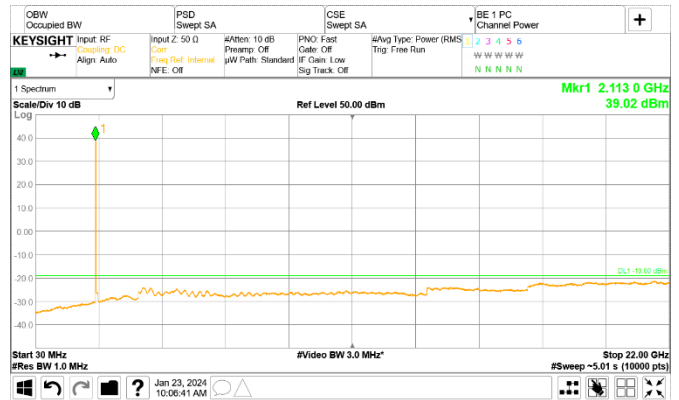


Figure 8.3-20: Conducted spurious emissions of WCDMA and NR 5 MHz, low channels, 2 carrier operation

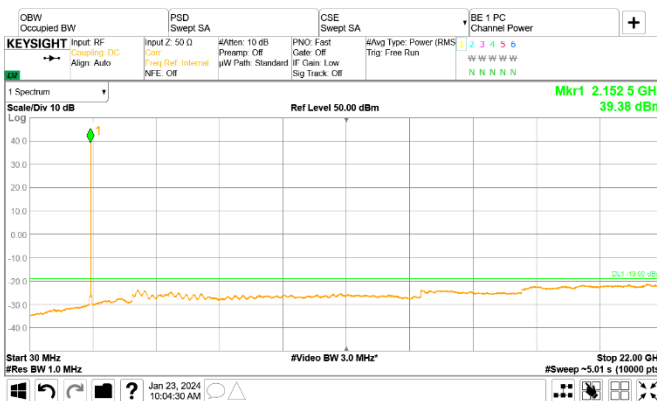


Figure 8.3-21: Conducted spurious emissions of WCDMA and NR 5 MHz, mid channels, 2 carrier operation

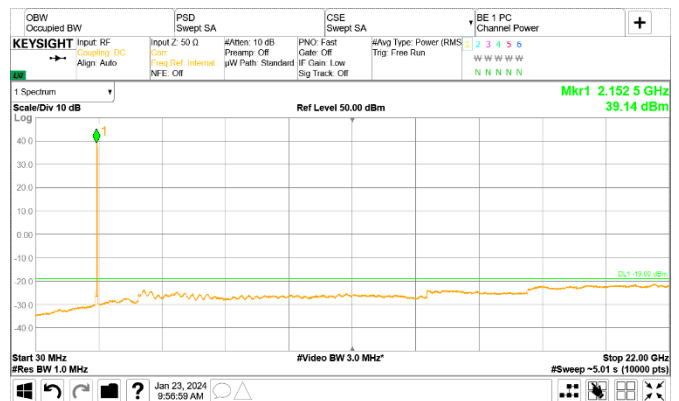


Figure 8.3-22: Conducted spurious emissions of WCDMA and NR 5 MHz, top channels, 2 carrier operation

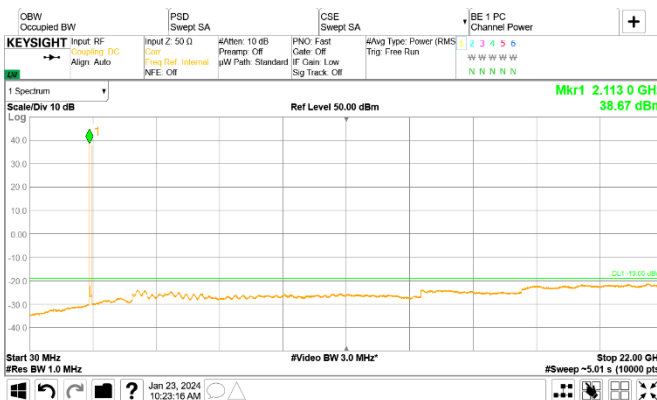


Figure 8.3-23: Conducted spurious emissions of WCDMA and NR 5 MHz, noncontiguous, 2 carrier operation

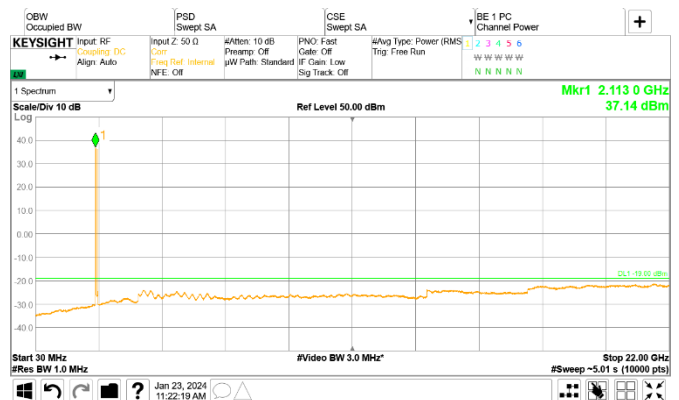


Figure 8.3-24: Conducted spurious emissions of WCDMA, NR 5 MHz and LTE 5 MHz, noncontiguous, 3 carrier operation

Test data, continued



Figure 8.3-25: Conducted spurious emissions of WCDMA, NR 5 MHz and LTE 5 MHz, noncontiguous, 6 carrier operation



Figure 8.3-26: Conducted spurious emissions of NR 5 MHz, WCDMA and LTE 5 MHz, noncontiguous, 3 carrier operation



Figure 8.3-27: Conducted spurious emissions of NR 5 MHz, WCDMA and LTE 5 MHz, noncontiguous, 6 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.

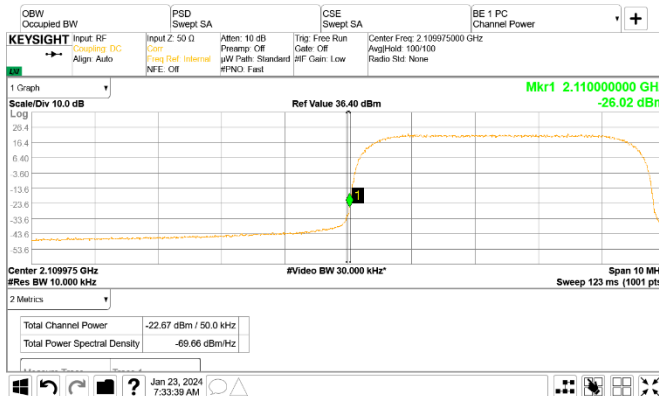


Figure 8.3-28: Conducted emission at the lower band edge

Frequency: 2110 MHz
Meas. BW: 1% of EBW
Limit: -19 dBm/50 kHz

Mode: Single-carrier operation
Tech.: WCDMA
Notes: None

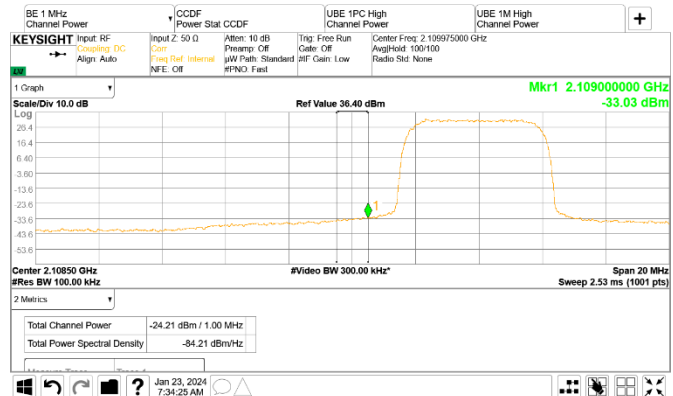


Figure 8.3-29: Conducted emission 1 MHz away from the lower band edge

Frequency: 2109 MHz
Meas. BW: 1 MHz
Limit: -19 dBm/MHz

Mode: Single-carrier operation
Tech.: WCDMA
Notes: None

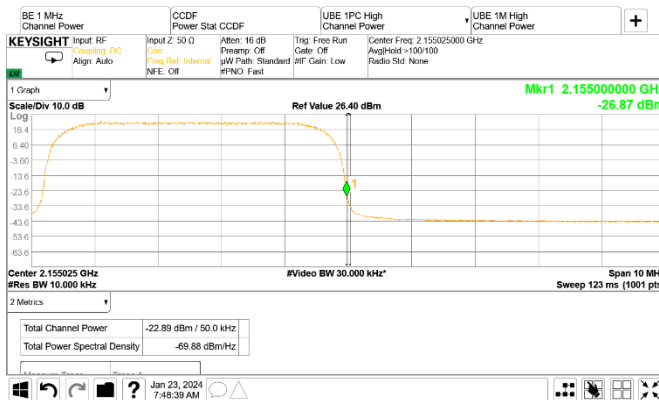


Figure 8.3-30: Conducted emission at the upper band edge

Frequency: 2155 MHz
Meas. BW: 1% of EBW
Limit: -19 dBm/50 kHz

Mode: Single-carrier operation
Tech.: WCDMA
Notes: None

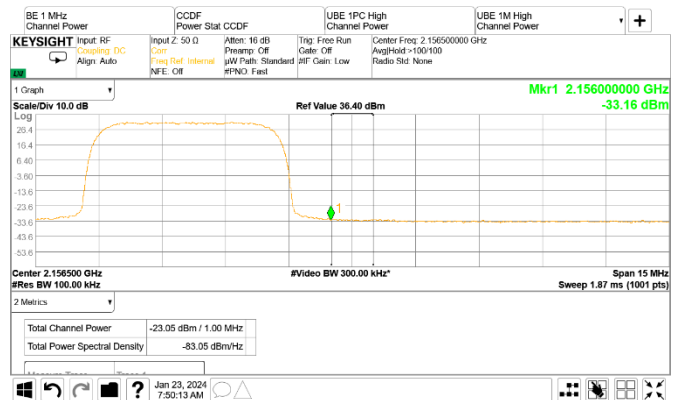


Figure 8.3-31: Conducted emission 1 MHz away from the upper band edge

Frequency: 2156 MHz
Meas. BW: 1 MHz
Limit: -19 dBm/MHz

Mode: Single-carrier operation
Tech.: WCDMA
Notes: None

Test data, continued

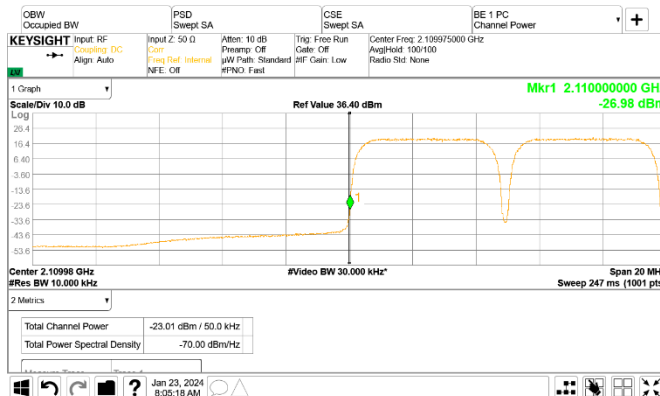


Figure 8.3-32: Conducted emission at the lower band edge

Frequency: 2110 MHz
Meas. BW: 1% of EBW
Limit: -19 dBm/50 kHz

Mode: 2-carrier operation
Tech.: WCDMA
Notes: None

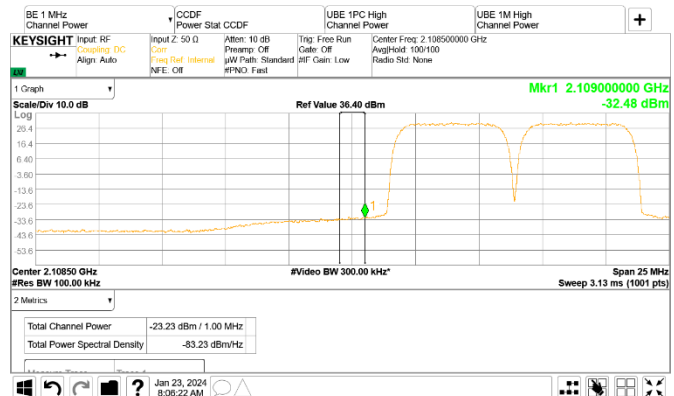


Figure 8.3-33: Conducted emission 1 MHz away from the lower band edge

Frequency: 2109 MHz
Meas. BW: 1 MHz
Limit: -19 dBm/MHz

Mode: 2-carrier operation
Tech.: WCDMA
Notes: None

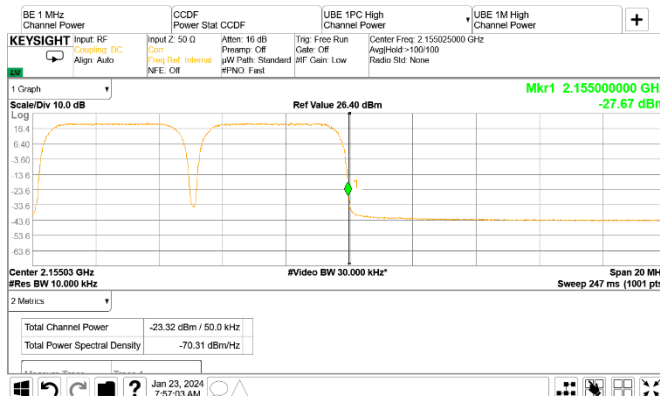


Figure 8.3-34: Conducted emission at the upper band edge

Frequency: 2155 MHz
Meas. BW: 1% of EBW
Limit: -19 dBm/50 kHz

Mode: 2-carrier operation
Tech.: WCDMA
Notes: None

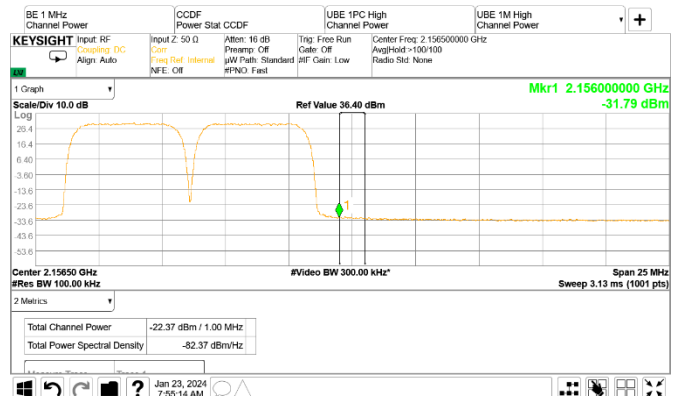


Figure 8.3-35: Conducted emission 1 MHz away from the upper band edge

Frequency: 2156 MHz
Meas. BW: 1 MHz
Limit: -19 dBm/MHz

Mode: 2-carrier operation
Tech.: WCDMA
Notes: None