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# Radio Test report – Radio 2212 B2/25

Type of assessment:

Class 2 Permissive Change

Project number:

425703-1TRFWL-R1

Applicant:

Ericsson Canada Inc.

| Product: | Model: | Part number: |
|---|---|---|
| Radio 2212 | Radio 2212 B2/25 | KRC 161 688/1, KRC 161 688/3 |
| **FCC ID:** | **ISED Reg. Number** | **HVIN:** |
| TA8FKRC161688 | 287AB-FS161688 | FS1616881, FS1616883 |

Requirements/Summary:

| Standard | Environmental phenomenon | Compliance |
|---|---|---|
| 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 |

Date of issue: April 21, 2021

Andrey Adelberg, Senior EMC/Wireless Specialist
Tested by

Signature

David Duchesne, Senior EMC/Wireless Specialist
Reviewed by

Signature

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 reAnt Are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

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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 Maters; General Rules and Regulations |
| FCC 47 CFR Part 24, Subpart E | Broadband Personal Communications Services (PCS) |
| RSS-133 Issue 6 A1, Jan. 18, 2018 | 2 GHz Personal Communications Services |
| 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 CIIPC report (425703-1TRFWL-R1) applies to the Radio 2212 B2/25 with model numbers KRC 161 688/1, KRC 161 688/3. See “Summary of test results” for full details.

EUT Configuration(s) SRO/MRO:
SRO: CDMA
MRO: C+L, C+NR, C+L+NR
(LTE includes NB-IoT (IB, GB)
MRO C+L 1.4MHz and 3.0MHz are not supported

CDMA SC SRO RF Power/Port: 43 dBm (20W)
MRO RF Power/Port: 49 dBm (80W)

Notes:
CDMA Carriers: 1/Port
MRO Carriers: 6/Port
Scope: CIIPC to add CDMA SRO/MRO to the existing Radio Approvals SRO/MRO for G, W, L, NR, NB-IoT SA
LTE BW: 1.4, 3, 5, 10, 15, 20MHz
NR BW: 5, 10, 15, 20MHz
(LTE includes NB-IoT (IB, GB); IB Support: LTE 5, 10, 15, 20MHz, GB Support: 10, 15, 20MHz)
Supported: Diversity, MIMO, CA, ESS

## 1.5 Test report revision history

***Table 1.5-1:*** *Test report revision history*

| Revision # | Date of issue | Details of changes made to test report |
|---|---|---|
| TRF | April 21, 2021 | Original report issued |

# **Section 2.** Summary of test results

## 2.1 Testing location

| | |
|---|---|
| Test location (s) | Ottawa |

## 2.2 Testing period

| | | | |
|---|---|---|---|
| Test start date | February 8, 2021 | Test end date | March 31, 2021 |

## 2.3 Sample information

| | | | |
|---|---|---|---|
| Receipt date | February 8, 2021 | Nemko sample ID number | 1 |

## 2.4 FCC Parts 2 and 24 test results

***Table 2.4-1:*** *FCC results summary*

| Part | Test description | Verdict |
|---|---|---|
| §24.229 | Frequencies | Pass[1] |
| §24.232(a)(2) | Power and antenna height limits for base stations with BW greater than 1 MHz | Pass |
| §24.238(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

[1]EUT transmits within 1930–1995 MHz frequency range

## 2.5 RSS-133 test results

***Table 2.5-1:*** *ISED 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, 6.4 | Transmitter Output Power and Equivalent Isotropically Radiated Power | Pass |
| RSS-133, 6.5 | Transmitter Unwanted Emissions (conducted and radiated) | Pass |
| RSS-Gen, 6.7 | Occupied bandwidth | Pass |
| RSS-Gen, 7.4 | Receiver conducted emissions limits | Pass |

Notes: Only tests requested by the client have been performed

[1]EUT transmits within 1930–1995 MHz frequency range

[2]EUT employs digital modulation (QPSK to 256-QAM)

# **Section 3.** Equipment under test (EUT) details

## 3.1 EUT information

| | | | |
|---|---|---|---|
| Product name | Radio 2212 B2/25 | | |
| Model | Radio 2212 | | |
| Part number | KRC 161 688/1, KRC 161 688/3 | | |
| Revision | R5K | | |
| Serial number | CF88307953 | | |
| Antenna ports | 2 TX/RX Ports | | |
| RF BW / IBW | B2/25 IBW DL: 65 MHz<br>B2/25 IBW UL: 65 MHz | | |
| FDD | B2/25: 80 MHz | | |
| Frequency | B2/25<br>TX (DL): 1930–1995 MHz<br>RX (UL): 1850–1915 MHz | B2<br>CDMA TX (DL): 1931.25-1988.75<br>CDMA RX (UL): 1851.25-1908.75<br>GSM TX (DL): 1930.4-1989.6MHz<br>GSM RX (UL): 1850.4-1909.6MHz | B2/25<br>LTE, NR, WCDMA, NB-IoT SA |
| Nominal O/P per Antenna port | 80 W (49 dBm) /Port | | |
| Nominal O/P (Max) | WCDMA, LTE, NR:<br>SRO: 80 W (49 dBm)<br>MC/MRO: 80W (49 dBm total) | CDMA: SRO 20W (43dBm)<br>GSM: SRO 60W (47.8dBm)<br>NB-IoT SA: SRO 20W (43dBm) | |
| Accuracy (nominal) | ±0.1 ppm | | |
| Nominal voltage | −48 $V_{DC}$ @ 20 A | | |
| RAT | B2 GSM: SC/MC/SRO/MRO<br>CDMA: SC/SRO/MRO | B2/25 WCDMA: SC/MC/SRO/MRO<br>NB-IoT SA: SC/SRO/MRO<br>LTE: SC/MC/SRO/MRO (LTE+NB-IoT (GB, IB))<br>NR: SC/MC/SRO/MRO | |
| Modulation | LTE/NR: QPSK, 16 QAM, 64 QAM, 256 QAM<br>WCDMA: QPSK, 16 QAM, 64 QAM | | |
| Channel bandwidth | CDMA: 1.25MHz<br>LTE: 1.4, 3, 5, 10, 15, 20 MHz<br>NR: 5, 10, 15, 20 MHz<br>WCDMA: 5MHz<br>GSM: 245kHz<br>NB-IoT SA: 200kHz | | |
| Channel bandwidth LTE + NB-IoT | LTE + NB-IoT: GB, IB (200 kHz) | LTE BW: 5, 10, 15, 20 MHz | |
| Maximum combined OBW per port | B2/25: 65 MHz | | |
| CPRI | 10 Gbps | | |
| Channel raster | LTE/NR/NB-IoT SA: 100 kHz; WCDMA/GSM: 200 kHz; CDMA: 50kHz | | |
| Regulatory requirements<br>FCC/IC ID: | Radio: FCC Part 2, 24,<br>FCC ID: TA8FKRC161688 | RSS-133, RSS-GEN<br>IC ID: 287AB-FS161688 | HVIN: FS1616881, FS1616883 |
| | EMC: FCC Part 15, ICES-003 | | |
| | Safety: IEC/EN 62368-1, UL/CSA 62368-1<br>IEC/EN 60950-22, UL 50E /CAN/CSA, IEC/EN 60529, Type 3 Enclosure | | |

## EUT information, continued

| | |
|---|---|
| Emission Designator | CDMA: 1M25F9W<br>WCDMA: 5M00F9W<br>GSM: 245KG7W, 242KGXW<br>NB-IoT SA: 210KG7D, 205KG7D<br>LTE: 1M40F9W, 3M00F9W, 5M00W7D, 10M0W7D, 15M0W7D, 20M0W7D<br>NR: 5M00W7D, 10M0W7D, 15M0W7D, 20M0W7D |
| Supported Configurations | Single Antenna, TX Diversity, MIMO, Carrier Aggregation, Ericsson Spectral Sharing (ESS) |
| Operating temperature | –40 °C to +55 °C |
| Total Power based on IBW | 80W /Port – Total / Radio: 160W |
| Supported carrier / Port | CDMA: 1<br>GSM: 4<br>NB-IoT SA: 1<br>WCDMA: 1-6<br>NR: 1-6 (5, 10MHz), 1-3 (15, 20MHz)<br>LTE: 1-6 (1.4, 3, 5, 10MHz), 1-3 (15, 20MHz)<br>LTE + NB-IoT: GB (1–2), IB (1–2) |

## 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 | The Radio 2212 B2/25 (KRC 161 688/1, KRC 161 688/3) is a multi-standard remote radio forming part of the Ericsson RBS (Radio Base Station) equipment. The Radio 2212 provides radio access for mobile and fixed devices and is designed for the outdoor environment. Radio unit installation is designed for pole, wall or mast mount options intended for co-location near the antenna. A fiber optic interface provides the RRU/RBS control and digital interface between the Radio and the RBS. The Radio 2212 product is convection cooled and shall be mounted vertically.<br>The KRC 161 688/3 is physically and electrically identical to KRC 161 688/1. The KRC 161 688/3 product is subject to additional product integrity testing qualified against NEBS.<br>Horizontal mounting is supported with forced air cooling with an optional fan tray assembly NTB 101 879/1 consisting of BKV 106 208/1 (Fan Assembly) and SXK 125 3359/1 (Cover Assembly).<br>Output RF Power is rated at 2 × 80 W.<br>Altitude during operation: Below 3000 m |

Radio I/O Description

| Port | Description |
|---|---|
| ANT A | RF Out A |
| ANT B | RF Out B |
| RET | Antenna Line Device |
| Alarm | Alarm and DC for Optional Fan Tray |
| Data 1 | Optical Interface Data 1 |
| Data 2 | Optical Interface Data 2 |
| DC Input | −48 $V_{DC}$ |
| MMI | Display - Radio Status |
| GND | Ground |

Physical

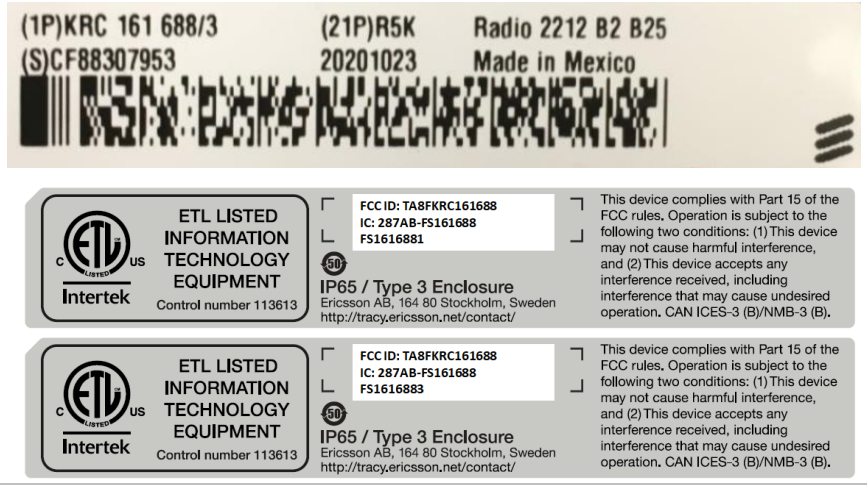
| | |
|---|---|
| **Dimensions** | 420 × 342 × 149 mm (H × W × D) [420 × 342 × 160 mm with fan unit] |
| **Weight** | 17.0 kg [18.5 kg with fan unit] |
| **Operating Temperature** | −40 to +55 °C |
| **Mounting** | Pole, Wall Mount |
| **Cooling** | Convection (optional fan tray - forced air) |

Software details: CXP9013268_15-R85MA

Radio Hardware Configuration

| Product: KRC 161 688/1 (R5K) | Revision | Product: KRC 161 688/3 (R5K) | Revision | Description |
|---|---|---|---|---|
| ROA 128 6601/25 | RIF | ROA 128 6601/25 | RIF | PBA |
| ROR 101 6080/25 | R1D | ROR 101 6080/25 | R1D | Circuit Module |
| KRF 901 350/2 | R1A | KRF 901 350/2 | R1A | FU |
| SXA 103 0094/1 | R1 | SXA 103 0094/1 | R1 | Mechanical Component |
| NTB 101 0085/2 | R3C | NTB 101 0366/1 | R3C | Parts |

Product Identification Label
KRC 161 688/1
KRC 161 688/3



## 3.3 EUT test details

**EUT setup/configuration rationale for Down link:**

| RAT | Modulation | Performance Requirement | Test Model / Configuration |
|---|---|---|---|
| LTE/NR | QPSK | N/A | E-TM1.1 |
| LTE/NR | 16QAM | N/A | E-TM3.2 |
| LTE/NR | 64QAM | N/A | E-TM3.1 |
| LTE/NR | 256QAM | N/A | E-TM3.1a |

**CIIPC Configurations:**
**SRO CDMA: B, M, T**
**MRO: C+L, C+NR, C+L+NR**

**CDMA Single Carrier B2**

| Bandwidth, MHz | CDMA Transmit / DL, MHz | | | | | |
|---|---|---|---|---|---|---|
| | B | ARFCN | M | ARFCN | T | ARFCN |
| 1.25 | 1931.25 | *25* | 1960 | *600* | 1988.75 | *1175* |

| Bandwidth, MHz | CDMA Transmit / UL, MHz | | | | | |
|---|---|---|---|---|---|---|
| | B | ARFCN | M | ARFCN | T | ARFCN |
| 1.25 | 1851.250 | *25* | 1880.000 | *600* | 1908.750 | *1175* |

**LTE Single Carrier B25**

| Bandwidth, MHz | LTE Transmit / DL, MHz | | | | | |
|---|---|---|---|---|---|---|
| | B | EARFCN | M | EARFCN | T | EARFCN |
| 1.4 | 1930.7 | *8047* | 1962.5 | *8365* | 1994.3 | *8683* |
| 3 | 1931.5 | *8055* | 1962.5 | *8365* | 1993.5 | *8575* |
| 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 | NR 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* |

## EUT test details, continued

| Bandwidth, MHz | NR 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* |

**B25 LTE Multi-Carrier for Band Edge Emissions:**

| Bandwidth, MHz | LTE Transmit / DL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | EARFCN | B2 | EARFCN | | T2 | EARFCN | T1 | EARFCN |
| 5 | 1932.5 | *8065* | 1937.5 | *8115* | | 1987.5 | *8615* | 1992.5 | *8665* |
| 10 | 1935.0 | *8090* | 1945.0 | *8190* | | 1980.0 | *8540* | 1990.0 | *8640* |
| 15 | 1937.5 | *8115* | 1952.5 | *8265* | | 1972.5 | *8465* | 1987.5 | *8615* |
| 20 | 1940.0 | *8140* | 1960.0 | *8340* | | 1965.0 | *8390* | 1985.0 | *8590* |

| Bandwidth, MHz | LTE Receive / UL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | EARFCN | B2 | EARFCN | | T2 | EARFCN | T1 | EARFCN |
| 5 | 1852.5 | *26065* | 1857.5 | *26115* | | 1907.5 | *26615* | 1912.5 | *26665* |
| 10 | 1855.0 | *26090* | 1865.0 | *26190* | | 1900.0 | *26540* | 1910.0 | *26640* |
| 15 | 1857.5 | *26115* | 1872.5 | *26265* | | 1892.5 | *26465* | 1907.5 | *26615* |
| 20 | 1860.0 | *26140* | 1880.0 | *26340* | | 1885.0 | *26390* | 1905.0 | *26590* |

**B25 NR Multi-Carrier for Band Edge Emissions:**

| Bandwidth, MHz | NR Transmit / DL, MHz | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | B1 | NR-ARFCN | B2 | NR-ARFCN | | T2 | NR-ARFCN | T1 | NR-ARFCN |
| 5 | 1932.5 | *386500* | 1937.5 | *387500* | | 1987.5 | *397500* | 1992.5 | *398500* |
| 10 | 1935.0 | *387000* | 1945.0 | *389000* | | 1980.0 | *396000* | 1990.0 | *398000* |
| 15 | 1937.5 | *387500* | 1952.5 | *390500* | | 1972.5 | *394500* | 1987.5 | *397500* |
| 20 | 1940.0 | *388000* | 1960.0 | *392000* | | 1965.0 | *393000* | 1985.0 | *397000* |

| Bandwidth, MHz | NR Receive / UL, MHz | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | B1 | NR-ARFCN | B2 | NR-ARFCN | | T2 | NR-ARFCN | T1 | NR-ARFCN |
| 5 | 1852.5 | *370500* | 1857.5 | 1852.5 | | 1907.5 | *381500* | 1912.5 | *382500* |
| 10 | 1855.0 | *371000* | 1865.0 | 1855.0 | | 1900.0 | *380000* | 1910.0 | *382000* |
| 15 | 1857.5 | *371500* | 1872.5 | 1857.5 | | 1892.5 | *378500* | 1907.5 | *381500* |
| 20 | 1860.0 | *372000* | 1880.0 | 1860.0 | | 1885.0 | *377000* | 1905.0 | *381000* |

**B25 LTE Multiple-Carriers for spurious emissions (IBW=65MHz):**

| Bandwidth (MHz) | LTE Transmit / DL (MHz) | | | |
|---|---|---|---|---|
| | C1 | *EARFCN* | C2 | *EARFCN* |
| 5 | 1932.5 | *8065* | 1992.5 | *8665* |
| 10 | 1935.0 | *8090* | 1990.0 | *8640* |
| 15 | 1937.5 | *8115* | 1987.5 | *8615* |
| 20 | 1940.0 | *8140* | 1985.0 | *8590* |

| Bandwidth (MHz) | LTE Receive / UL (MHz) | | | |
|---|---|---|---|---|
| | C1 | *EARFCN* | C2 | *EARFCN* |
| 5 | 1852.5 | *26065* | 1912.5 | *26665* |
| 10 | 1855.0 | *26090* | 1910.0 | *26640* |
| 15 | 1857.5 | *26115* | 1907.5 | *26615* |
| 20 | 1860.0 | *26140* | 1905.0 | *26590* |

## EUT test details, continued

**B25 LTE Multi-Carrier for Band Edge Emissions:**

| Bandwidth, MHz | Transmit / DL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | EARFCN | B2 | EARFCN | | T2 | EARFCN | T1 | EARFCN |
| 5 | 1932.5 | *66461* | 1937.5 | *66511* | | 1987.5 | *67011* | 1992.5 | *67061* |
| 10 | 1935.0 | *66486* | 1945.0 | *66586* | | 1980.0 | *66936* | 1990.0 | *67036* |
| 15 | 1937.5 | *66511* | 1952.5 | *66661* | | 1972.5 | *66861* | 1987.5 | *67011* |
| 20 | 1940.0 | *66536* | 1960.0 | *66736* | | 1965.0 | *66786* | 1985.0 | *66986* |

| Bandwidth, MHz | Receive / UL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | EARFCN | B2 | EARFCN | | T2 | EARFCN | T1 | EARFCN |
| 5 | 1852.5 | *131997* | 1857.5 | *132047* | | 1907.5 | *132547* | 1912.5 | *132597* |
| 10 | 1855.0 | *132022* | 1865.0 | *132122* | | 1900.0 | *132472* | 1910.0 | *132572* |
| 15 | 1857.5 | *132047* | 1872.5 | *132197* | | 1892.5 | *132397* | 1907.5 | *132547* |
| 20 | 1860.0 | *132072* | 1880.0 | *132272* | | 1885.0 | *132322* | 1905.0 | *132522* |

**B25 NR Multi-Carrier for Band Edge Emissions:**

| Bandwidth, MHz | Transmit / DL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | NR-ARFCN | B2 | NR-ARFCN | | T2 | NR-ARFCN | T1 | NR-ARFCN |
| 5 | 1932.5 | *386500* | 1937.5 | *387500* | | 1987.5 | *397500* | 1992.5 | *398500* |
| 10 | 1935.0 | *387000* | 1945.0 | *389000* | | 1980.0 | *396000* | 1990.0 | *398000* |
| 15 | 1937.5 | *387500* | 1952.5 | *390500* | | 1972.5 | *394500* | 1987.5 | *397500* |
| 20 | 1940.0 | *388000* | 1960.0 | *392000* | | 1965.0 | *393000* | 1985.0 | *397000* |

| Bandwidth, MHz | Receive / UL, MHz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B1 | NR-ARFCN | B2 | NR-ARFCN | | T2 | NR-ARFCN | T1 | NR-ARFCN |
| 5 | 1852.5 | *370500* | 1857.5 | 1852.5 | | 1907.5 | *381500* | 1912.5 | *382500* |
| 10 | 1855.0 | *371000* | 1865.0 | 1855.0 | | 1900.0 | *380000* | 1910.0 | *382000* |
| 15 | 1857.5 | *371500* | 1872.5 | 1857.5 | | 1892.5 | *378500* | 1907.5 | *381500* |
| 20 | 1860.0 | *372000* | 1880.0 | 1860.0 | | 1885.0 | *377000* | 1905.0 | *381000* |

**B25 NR Multiple-Carriers for spurious emissions (IBW=65MHz):**

| Bandwidth (MHz) | NR Receive / UL (MHz) | | | | | |
|---|---|---|---|---|---|---|
| | C1 | *NR-ARFCN* | C2 | *NR-ARFCN* | C3 | *NR-ARFCN* |
| **5** | 1712.5 | *342500* | 1717.5 | *343500* | 1797.5 | *359500* |
| **10** | 1715.0 | *343000* | 1725.0 | *345000* | 1795.0 | *359000* |
| **15** | 1717.5 | *343500* | 1732.5 | *346500* | 1792.5 | *358500* |
| **20** | 1720.0 | *344000* | 1740.0 | *348000* | 1790.0 | *358000* |

## 3.4 EUT setup diagram

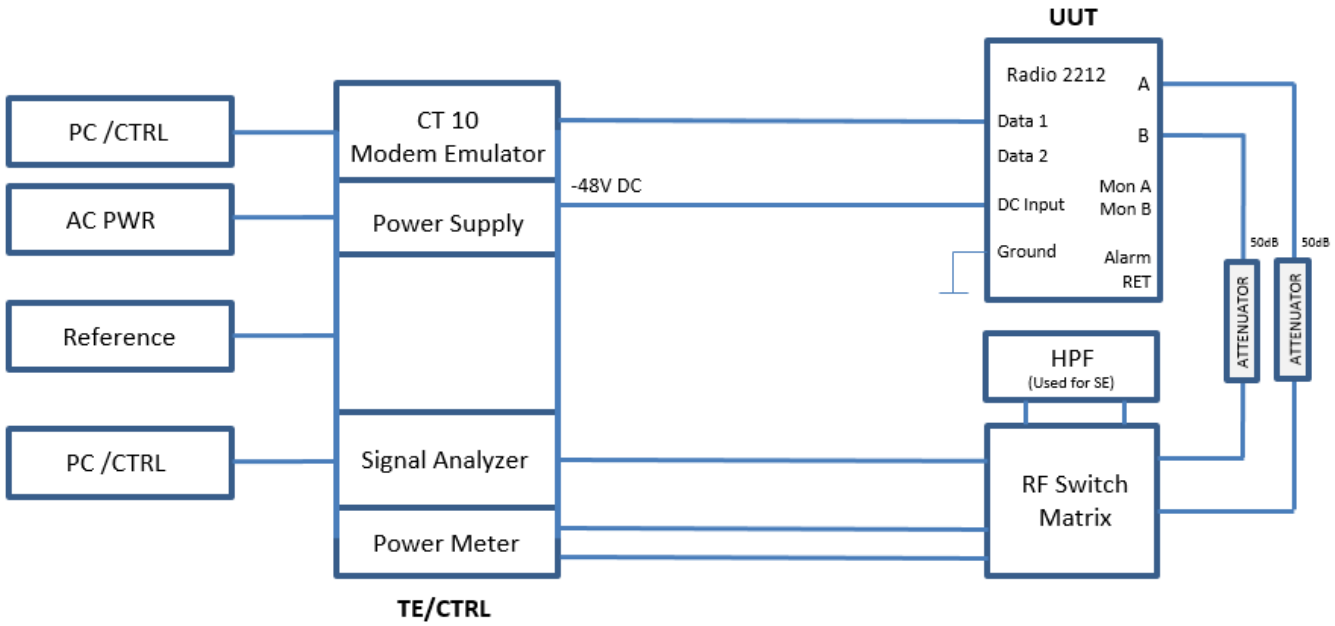



***Figure 3.4-1:*** *Setup diagram – Radio Compliance*

## 3.5 Setup photographs, continued

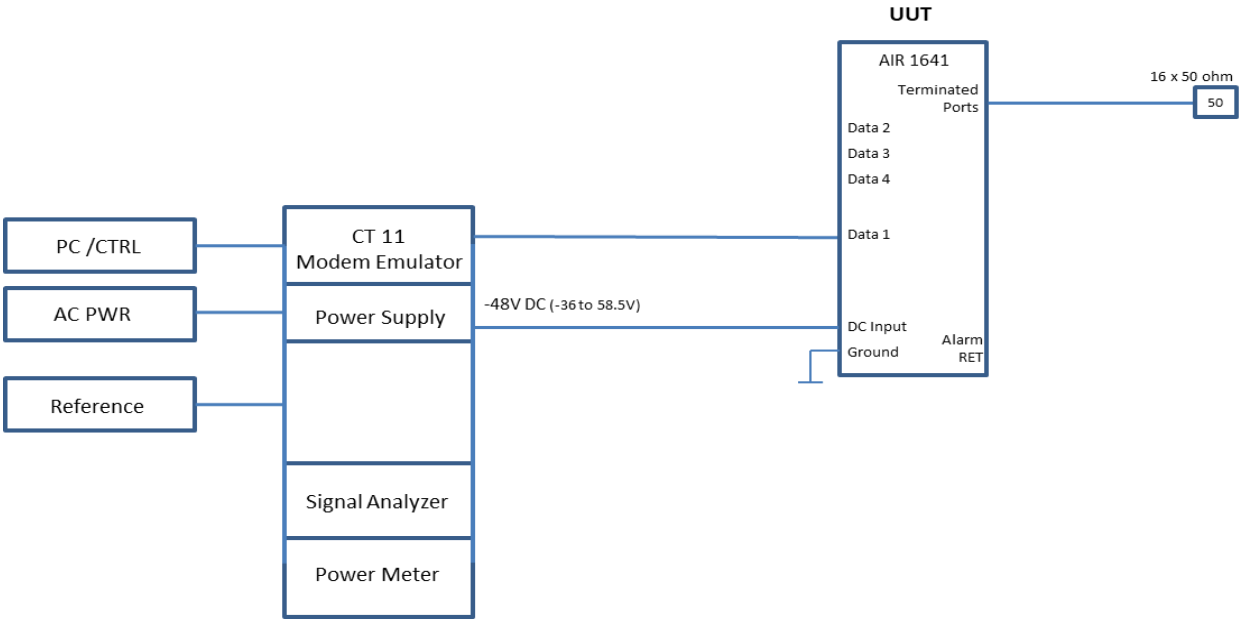



***Figure 3.5-1:*** *EUT Set-up diagram for Radiated Compliance Testing*

***Figure 3.5-2:*** *EUT Set-up photo for Radiated 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

The KRC 161 688/3 is physically and electrically identical to KRC 161 688/1. The KRC 161 688/3 product is subject to additional product integrity testing qualified against NEBS.

## 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 |
| 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 | April 24, 2021 |
| Flush mount turntable | Sunol | FM2022 | FA002082 | — | NCR |
| Controller | Sunol | SC104V | FA002060 | — | NCR |
| Antenna mast | Sunol | TLT2 | FA002061 | — | NCR |
| DC Power source | Ametek | SGA80X125C-0AAA | FA002737 | — | VOU |
| Receiver/spectrum analyzer | Rohde & Schwarz | ESU 26 | FA002043 | 1 year | November 6, 2021 |
| Biconical antenna (30–300 MHz) | Sunol | BC2 | FA002078 | 1 year | April 30, 2021 |
| Log periodic antenna (200–5000 MHz) | Sunol | LP5 | FA002077 | 1 year | April 30, 2021 |
| Horn antenna (18–40 GHz) | EMCO | 3116 | FA001847 | 1 year | May 7, 2021 |
| Pre-amplifier (18–26 GHz) | Narda | BBS-1826N612 | FA001550 | — | VOU |
| Horn antenna (1–18 GHz) | EMCO | 3115 | FA000825 | 1 year | April 30, 2021 |
| Preamp (1–18 GHz) | ETS Lindgren | 124334 | FA002873 | 1 year | October 13, 2021 |
| 50 Ω coax cable | C.C.A. | None | FA002556 | 1 year | April 9, 2021 |
| High pass filter (3-18 GHz) | Thilithic Inc. | 6HC3000/18000-1.3-KK | FA002231 | — | VOU |
| Spectrum signal analyzer (Ericsson) | Keysight | PXA N9030B | BAMS1002036362 | 1 year | 24 April 2021 |
| Testing Equipment* | Ericsson | CT11 | T01G495060 | — | NCR |

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

* Testing equipment (CT11) is the test equipment that drives the radios traffic.

# Section 8. Testing data

## 8.1 Transmitter output power (EIRP) and antenna height

### 8.1.1 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 8.1-1:*** *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 |

### 8.1.2 Test summary

| | |
|---|---|
| Test date | March 30, 2021 |
| Test engineer | Andrey Adelberg |

### 8.1.3 Observations, settings and special notes

- PSD was measured using method described in paragraph 5.2.4.4.

**Based on the RF margins noted in this report, considerations pertaining to the maximum allowed EIRP and antenna type should be considered for each installation. The minimum margin found was 17.23 dB.**

- Channel output power was measured using spectrum analyzer with channel power measurement mode.

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 |

### 8.1.1 Test data

***Table 8.1-2:*** *Output power density measurement results of a single-carrier operation for CDMA*

| Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|
| 1931.25 | 42.56 | 42.11 | 45.35 | 41.88 | 41.19 | 44.56 | 62.15 | 17.59 |
| 1960.00 | 42.64 | 42.23 | 45.45 | 42.18 | 41.62 | 44.92 | 62.15 | **17.23** |
| 1988.75 | 42.50 | 42.23 | 45.38 | 41.88 | 41.81 | 44.86 | 62.15 | 17.29 |

***Table 8.1-3:*** *Output power density measurement results of a two-carrier operation of CDMA and LTE 5 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1934.375 | 48.44 | 47.96 | 51.22 | 41.60 | 41.32 | 44.47 | 62.15 | 17.68 |
| 1957.500 | 1960.625 | 48.49 | 48.13 | 51.32 | 41.90 | 41.46 | 44.70 | 62.15 | 17.45 |
| 1988.750 | 1985.625 | 48.31 | 48.12 | 51.23 | 41.69 | 41.42 | 44.57 | 62.15 | 17.58 |

***Table 8.1-4:*** *Output power density measurement results of a two-carrier operation of CDMA and LTE 10 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1936.875 | 48.27 | 47.81 | 51.06 | 41.25 | 40.75 | 44.02 | 62.15 | 18.13 |
| 1955.000 | 1960.625 | 48.40 | 48.00 | 51.21 | 41.39 | 41.00 | 44.21 | 62.15 | 17.94 |
| 1988.750 | 1983.125 | 48.23 | 47.96 | 51.11 | 41.43 | 41.11 | 44.28 | 62.15 | 17.87 |

***Table 8.1-5:*** *Output power density measurement results of a two-carrier operation of CDMA and LTE 15 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1939.375 | 48.83 | 48.32 | 51.59 | 41.65 | 41.04 | 44.37 | 62.15 | 17.78 |
| 1952.500 | 1960.625 | 48.92 | 48.48 | 51.72 | 41.66 | 41.55 | 44.62 | 62.15 | 17.53 |
| 1988.750 | 1980.625 | 48.70 | 48.35 | 51.54 | 41.69 | 41.19 | 44.46 | 62.15 | 17.69 |

Test data, continued

***Table 8.1-6:*** *Output power density measurement results of a two-carrier operation of CDMA and LTE 20 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1941.875 | 48.74 | 48.32 | 51.55 | 41.53 | 40.95 | 44.26 | 62.15 | 17.89 |
| 1950.000 | 1960.625 | 48.84 | 48.47 | 51.67 | 41.45 | 41.51 | 44.49 | 62.15 | 17.66 |
| 1988.750 | 1978.125 | 48.72 | 48.41 | 51.58 | 41.56 | 41.33 | 44.46 | 62.15 | 17.69 |

***Table 8.1-7:*** *Output power density measurement results of a two-carrier operation of CDMA and NR 5 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1934.375 | 48.33 | 47.80 | 51.08 | 41.65 | 41.13 | 44.41 | 62.15 | 17.74 |
| 1957.500 | 1960.625 | 48.57 | 48.13 | 51.37 | 41.98 | 41.63 | 44.82 | 62.15 | 17.33 |
| 1988.750 | 1985.625 | 48.32 | 47.91 | 51.13 | 41.87 | 41.52 | 44.71 | 62.15 | 17.44 |

***Table 8.1-8:*** *Output power density measurement results of a two-carrier operation of CDMA and NR 10 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1936.875 | 48.17 | 47.67 | 50.94 | 41.23 | 40.88 | 44.07 | 62.15 | 18.08 |
| 1955.000 | 1960.630 | 48.28 | 47.83 | 51.07 | 41.63 | 41.23 | 44.44 | 62.15 | 17.71 |
| 1988.750 | 1983.125 | 48.10 | 47.78 | 50.95 | 41.31 | 40.77 | 44.06 | 62.15 | 18.09 |

***Table 8.1-9:*** *Output power density measurement results of a two-carrier operation of CDMA and NR 15 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1939.375 | 48.69 | 48.17 | 51.45 | 41.69 | 41.27 | 44.50 | 62.15 | 17.65 |
| 1952.500 | 1960.625 | 48.81 | 48.34 | 51.59 | 41.88 | 41.47 | 44.69 | 62.15 | 17.46 |
| 1988.750 | 1980.625 | 48.60 | 48.30 | 51.46 | 41.81 | 41.46 | 44.65 | 62.15 | 17.50 |

***Table 8.1-10:*** *Output power density measurement results of a two-carrier operation of CDMA and NR 20 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1941.875 | 48.73 | 48.23 | 51.50 | 41.46 | 41.16 | 44.32 | 62.15 | 17.83 |
| 1950.000 | 1960.625 | 48.83 | 48.40 | 51.63 | 42.00 | 41.44 | 44.74 | 62.15 | 17.41 |
| 1988.750 | 1978.125 | 48.70 | 48.39 | 51.56 | 41.22 | 41.60 | 44.42 | 62.15 | 17.73 |

***Table 8.1-11:*** *Output power density measurement results of a three-carrier operation of CDMA, LTE 5 MHz and NR 5 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | NR Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1934.375 | 1939.375 | 47.81 | 47.30 | 50.57 | 40.82 | 40.54 | 43.69 | 62.15 | 18.46 |
| 1955.000 | 1958.125 | 1963.125 | 47.93 | 47.46 | 50.71 | 41.01 | 40.66 | 43.85 | 62.15 | 18.30 |
| 1988.750 | 1985.625 | 1980.625 | 47.73 | 47.40 | 50.58 | 41.10 | 40.56 | 43.85 | 62.15 | 18.30 |

***Table 8.1-12:*** *Output power density measurement results of a three-carrier operation of CDMA, LTE 10 MHz and NR 10 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | NR Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1936.875 | 1946.875 | 48.07 | 47.58 | 50.84 | 40.74 | 40.68 | 43.72 | 62.15 | 18.43 |
| 1950.000 | 1955.625 | 1965.625 | 48.15 | 47.76 | 50.97 | 41.11 | 40.86 | 44.00 | 62.15 | 18.15 |
| 1988.750 | 1983.125 | 1973.125 | 47.99 | 47.67 | 50.84 | 41.10 | 40.70 | 43.91 | 62.15 | 18.24 |

***Table 8.1-13:*** *Output power density measurement results of a three-carrier operation of CDMA, LTE 15 MHz and NR 15 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | NR Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1939.375 | 1954.375 | 48.76 | 48.24 | 51.52 | 41.47 | 40.82 | 44.17 | 62.15 | 17.98 |
| 1945.000 | 1953.125 | 1968.125 | 48.99 | 48.41 | 51.72 | 41.82 | 41.17 | 44.52 | 62.15 | 17.63 |
| 1988.750 | 1980.625 | 1965.625 | 48.85 | 48.27 | 51.58 | 41.65 | 41.00 | 44.35 | 62.15 | 17.80 |

***Table 8.1-14:*** *Output power density measurement results of a three-carrier operation of CDMA, LTE 20 MHz and NR 20 MHz channel*

| CDMA Frequency, MHz | LTE Frequency, MHz | NR Frequency, MHz | Port A power, dBm | Port B power, dBm | Combined total power, dBm | RF power density A, dBm/MHz | RF power density B, dBm/MHz | Total RF power density, dBm/MHz | EIRP limit, dBm/MHz | Margin, dB |
|---|---|---|---|---|---|---|---|---|---|---|
| 1931.250 | 1941.875 | 1961.875 | 48.87 | 48.23 | 51.57 | 41.70 | 40.99 | 44.37 | 62.15 | 17.78 |
| 1940.000 | 1950.625 | 1970.625 | 48.87 | 48.30 | 51.60 | 41.63 | 41.38 | 44.52 | 62.15 | 17.63 |
| 1988.750 | 1978.125 | 1958.125 | 48.75 | 48.37 | 51.57 | 41.65 | 41.15 | 44.42 | 62.15 | 17.73 |

Test data, continued

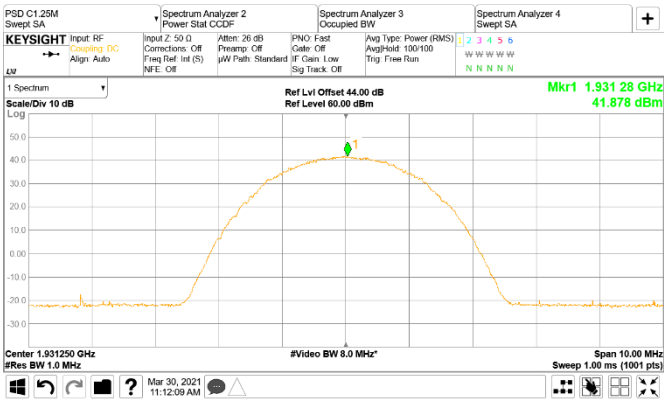



***Figure 8.1-1:*** *PSD of CDMA, single carrier operation, sample plot*

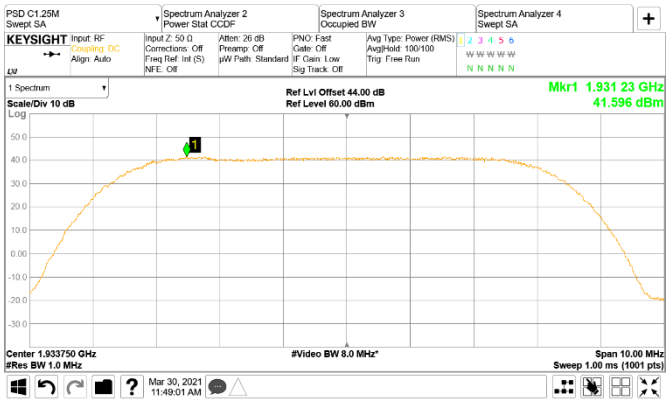



***Figure 8.1-2:*** *PSD of CDMA and LTE 5 MHz, two-carrier operation, sample plot*

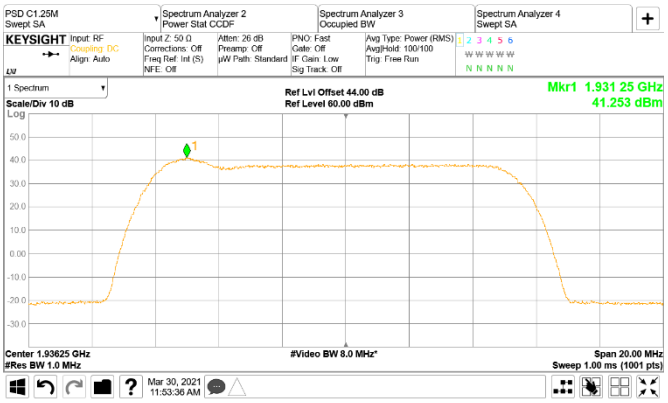



***Figure 8.1-3:*** *PSD of CDMA and LTE 10 MHz, two-carrier operation, sample plot*

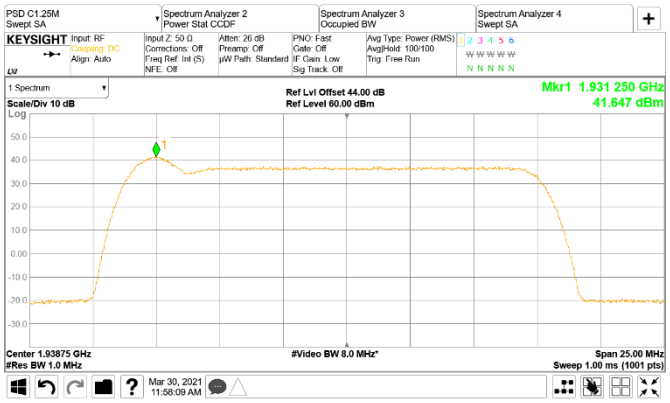



***Figure 8.1-4:*** *PSD of CDMA and LTE 15 MHz, two-carrier operation, sample plot*

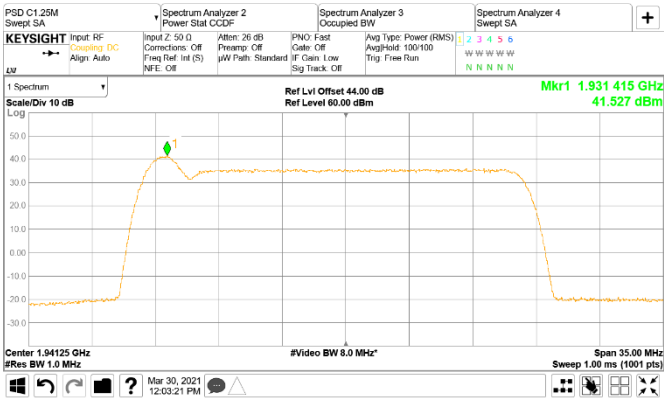



***Figure 8.1-5:*** *PSD of CDMA and LTE 20 MHz, two-carrier operation, sample plot*

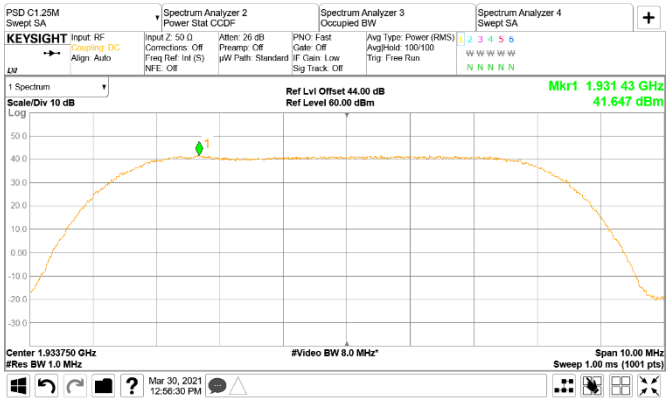



***Figure 8.1-6:*** *PSD of CDMA and NR 5 MHz, two-carrier operation, sample plot*

Test data, continued

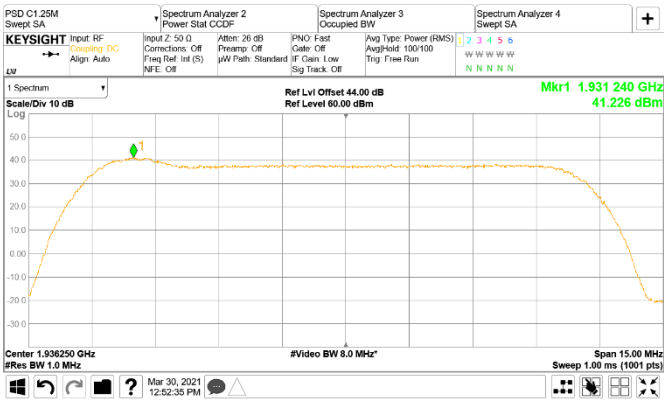



***Figure 8.1-7:*** *PSD of CDMA and NR 10 MHz, two-carrier operation, sample plot*

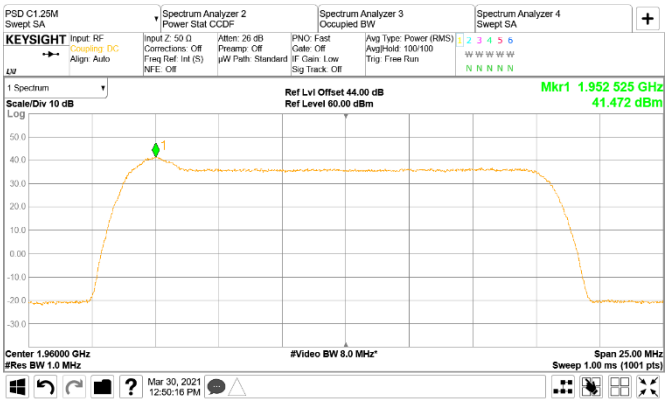



***Figure 8.1-8:*** *PSD of CDMA and NR 15 MHz, two-carrier operation, sample plot*

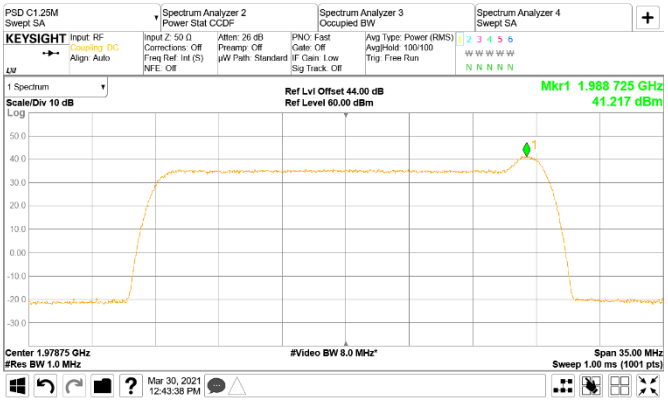



***Figure 8.1-9:*** *PSD of CDMA and NR 20 MHz, two-carrier operation, sample plot*

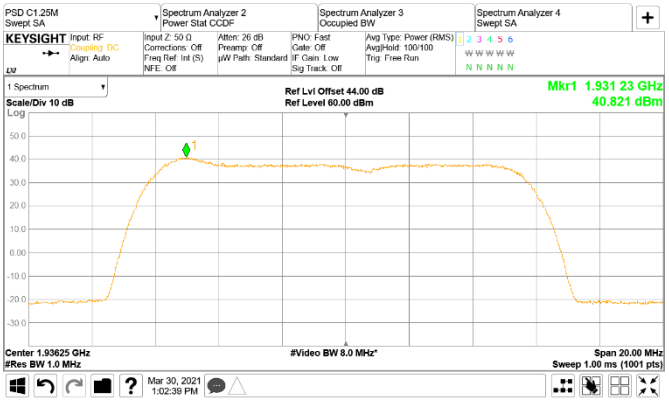



***Figure 8.1-10:*** *PSD of CDMA, LTE 5 MHz and NR 5 MHz, three-carrier operation, sample plot*

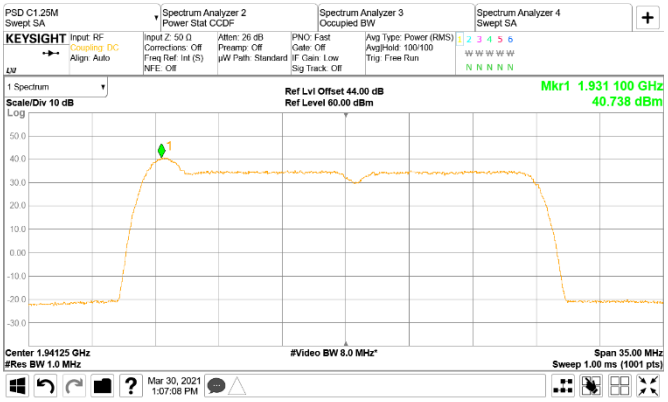



***Figure 8.1-11:*** *PSD of CDMA, LTE 10 MHz and NR 10 MHz, three-carrier operation, sample plot*

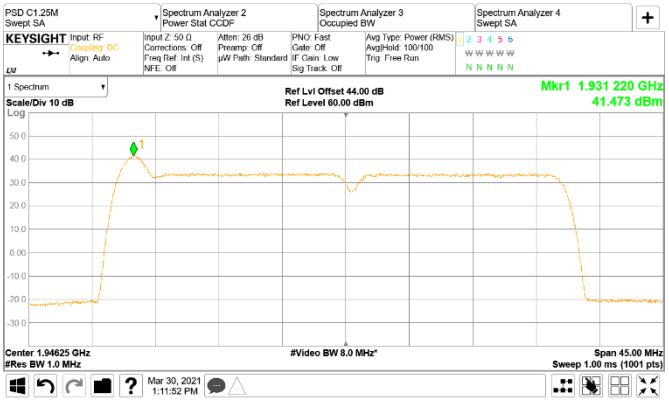



***Figure 8.1-12:*** *PSD of CDMA, LTE 15 MHz and NR 15 MHz, three-carrier operation, sample plot*

Test data, continued

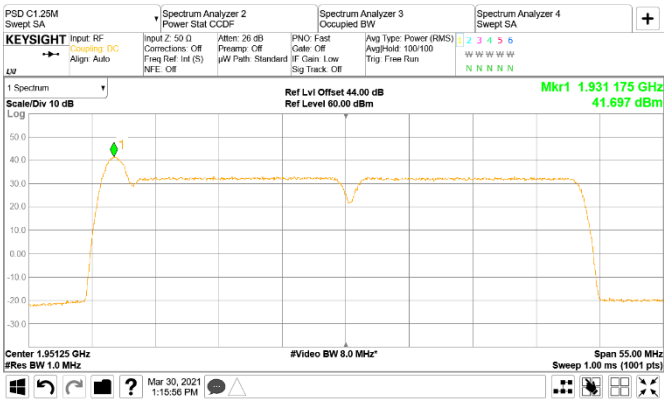



***Figure 8.1-13:*** *PSD of CDMA, LTE 20 MHz and NR 20 MHz, three-carrier operation, sample plot*

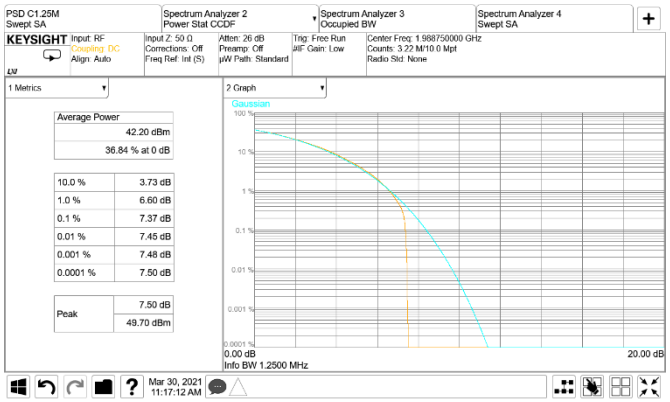



***Figure 8.1-14:*** *CCDF sample plot for CDMA*

***Table 8.1-15:*** *Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for CDMA*

| Frequency, MHz | 0.1% CCDF port A, dB | 0.1% CCDF port B, dB | PAPR reduction limit, dB | Margin*, dB |
|---|---|---|---|---|
| 1931.25 | 7.36 | 7.35 | 13.00 | 5.64 |
| 1960.00 | 7.34 | 7.34 | 13.00 | 5.66 |
| 1988.75 | 7.36 | 7.37 | 13.00 | 5.63 |

Note: *Margin was calculated as follows: Limit – max (CCDF measured at antenna port A and B)

## 8.2 Radiated spurious emissions

### 8.2.1 Definitions and limits

**FCC §24.238(a):**
Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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-133, Section 6.5.1:**
i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.
ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

### 8.2.2 Test summary

| | |
|---|---|
| Test date | February 8, 2021 |
| Test engineer | Andrey Adelberg |

### 8.2.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10$^{th}$ harmonic per ANSI C63.26 Paragraph 5.5.3.2 method.
- RBW within 30–1000 MHz was 100 kHz and 1 MHz above 1 GHz. VBW was wider than RBW.
- Testing was performed with RF ports terminated with 50 Ohm load.
- **Testing was performed with CDMA, LTE and NR simultaneous transmission.**

## 8.2.4 Test data

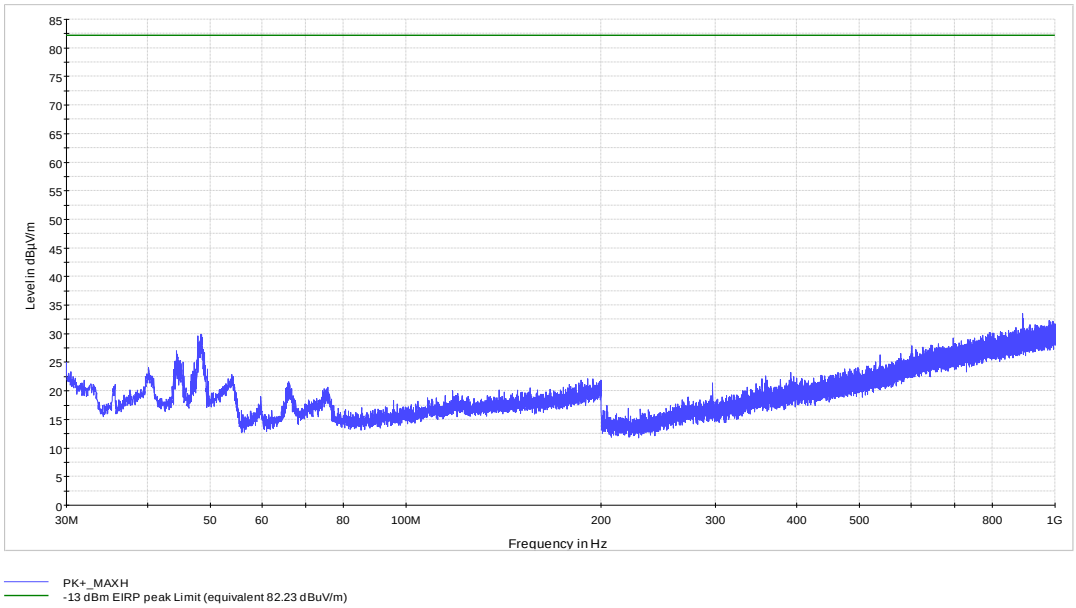



***Figure 8.2-1:*** *Radiated spurious emissions within 30–1000 MHz*

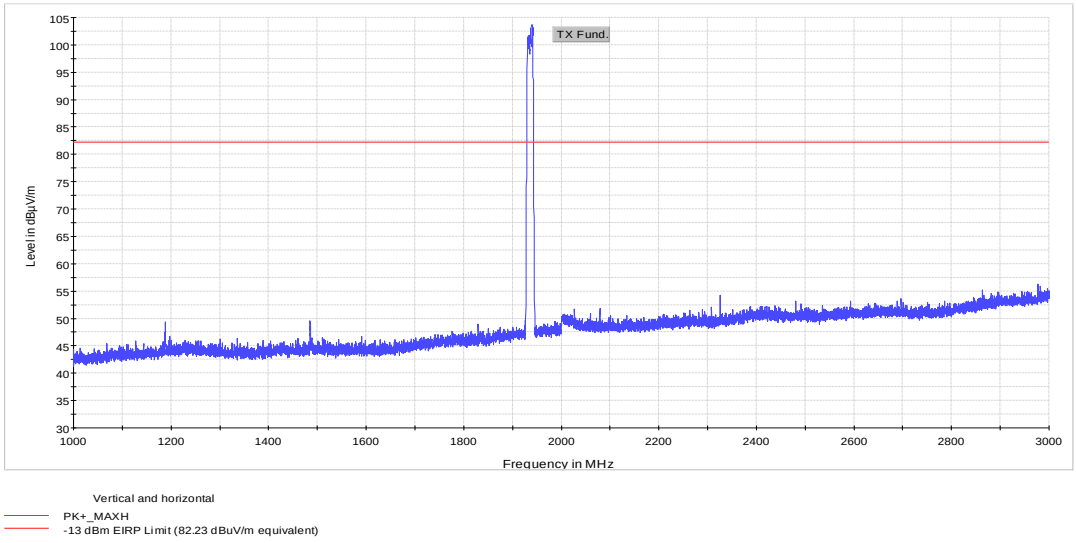



***Figure 8.2-2:*** *Radiated spurious emissions within 1–3 GHz*

Test data, continued

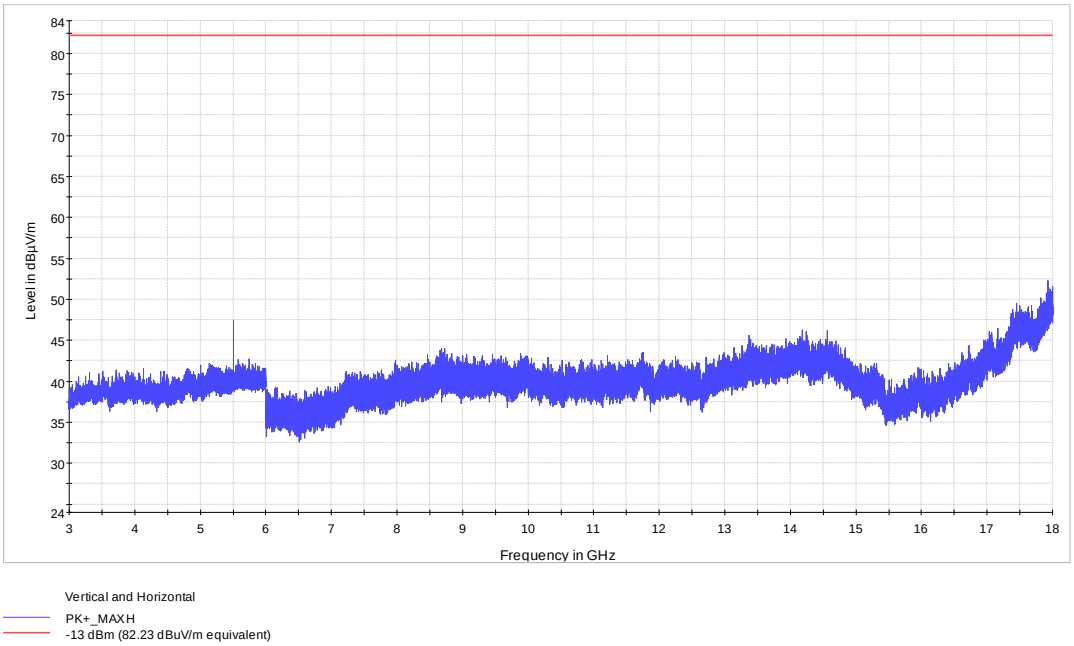



***Figure 8.2-3:*** *Radiated spurious emissions within 3–18 GHz*

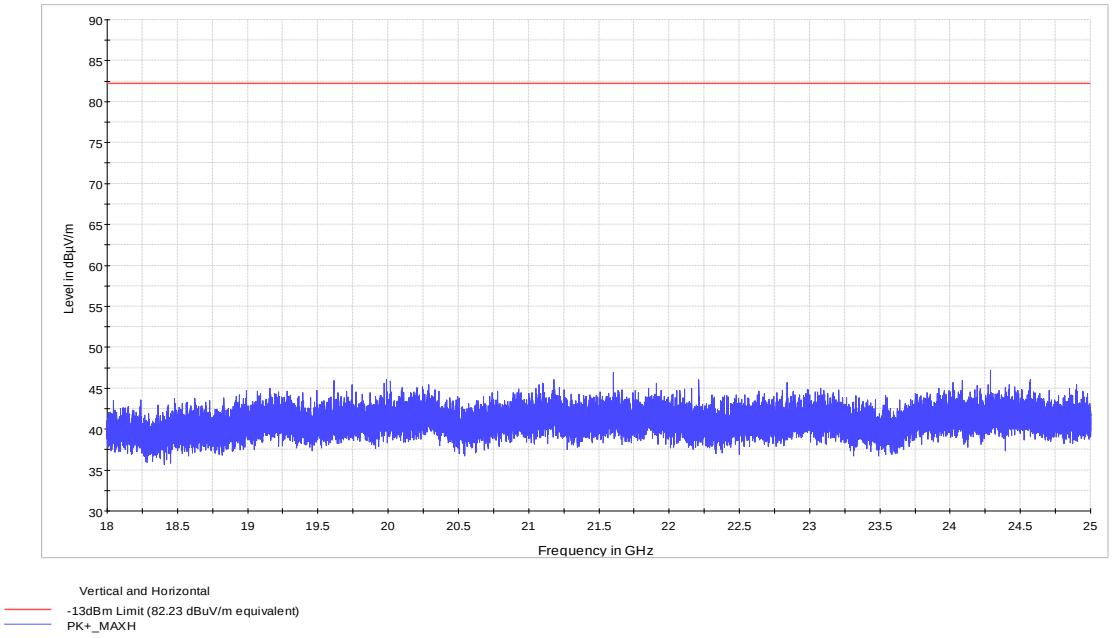



***Figure 8.2-4:*** *Radiated spurious emissions within 18–25 GHz*

## 8.3 Spurious out-of-band emissions

### 8.3.1 Definitions and limits

**FCC §24.238(a):**
Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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-133, Section 6.5.1:**
i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB.
ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10}$ p (watts) dB. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

### 8.3.2 Test summary

| | |
|---|---|
| Test date | March 31, 2021 |
| Test engineer | Andrey Adelberg |

### 8.3.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10$^{th}$ 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 3 dB*: −13 dBm – 3 dB = −16 dBm
  *MIMO correction factor for 2 antenna ports: 10 × $\text{Log}_{10}$(2) = 3 dB
- RBW 1 MHz, VBW was wider than RBW.

## 8.3.4 Test data

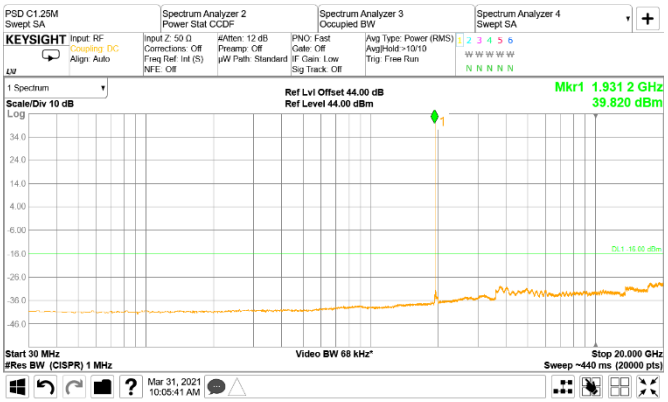



***Figure 8.3-1:*** *Conducted spurious emissions of CDMA on low channel, single carrier operation, antenna port A*

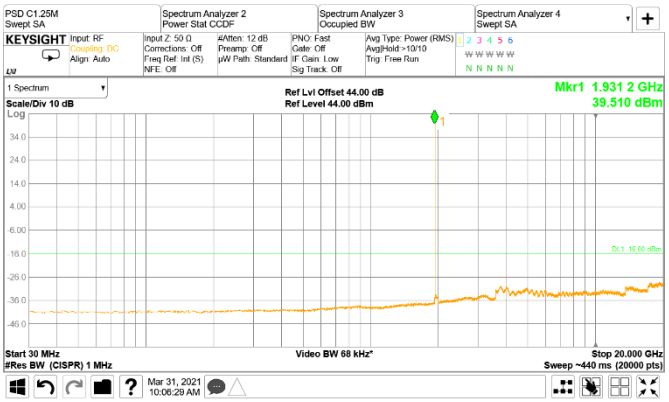



***Figure 8.3-2:*** *Conducted spurious emissions of CDMA on low channel, single carrier operation, antenna port B*

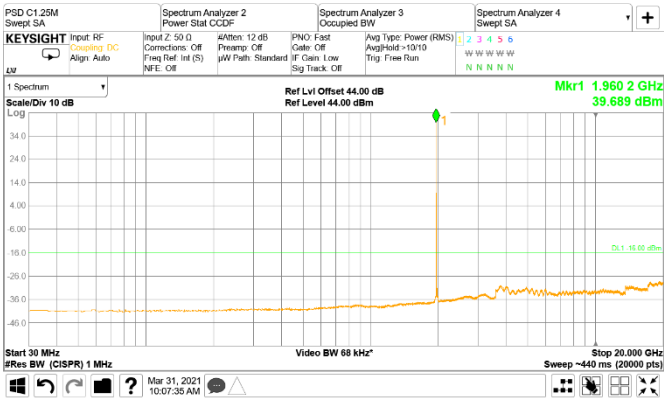



***Figure 8.3-3:*** *Conducted spurious emissions of CDMA on mid channel, single carrier operation, antenna port A*

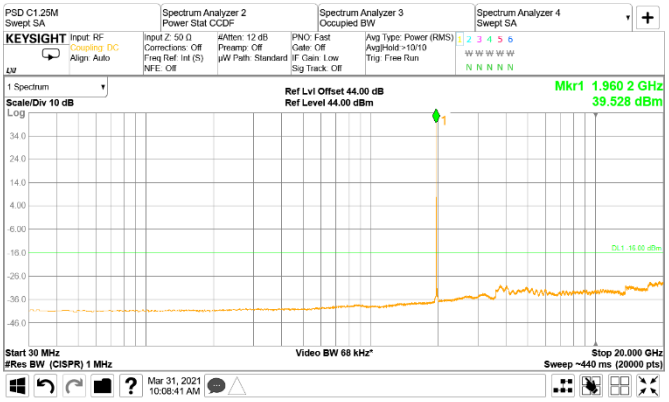



***Figure 8.3-4:*** *Conducted spurious emissions of CDMA on mid channel, single carrier operation, antenna port B*

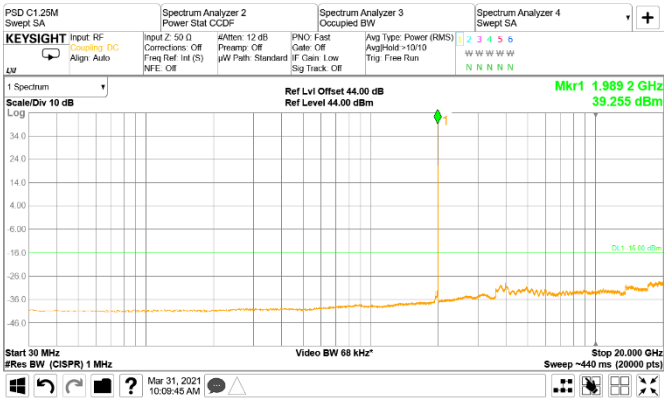



***Figure 8.3-5:*** *Conducted spurious emissions of CDMA on top channel, single carrier operation, antenna port A*

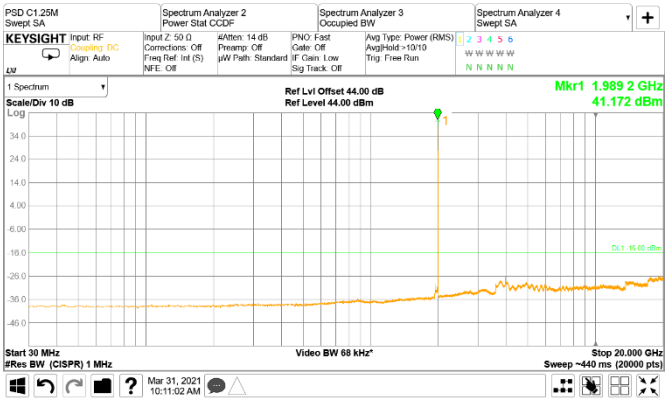



***Figure 8.3-6:*** *Conducted spurious emissions of CDMA on top channel, single carrier operation, antenna port B*

Test data, continued

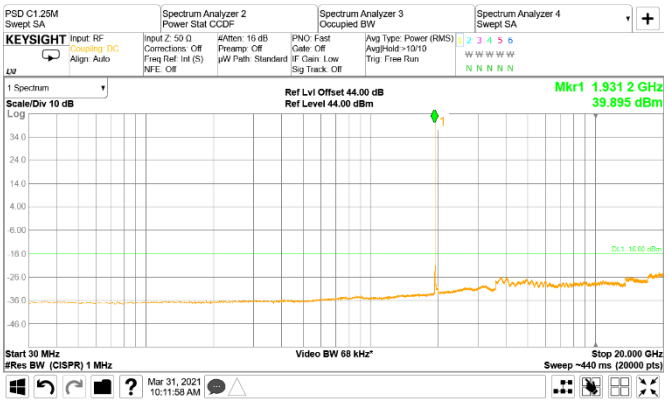



***Figure 8.3-7:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on low channel, two-carrier operation, antenna port A*

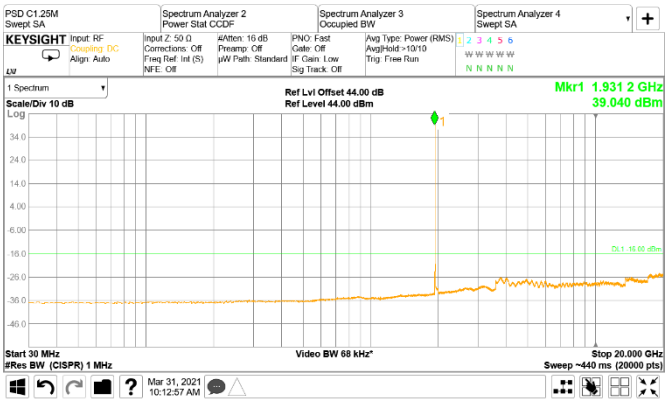



***Figure 8.3-8:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on low channel, two-carrier operation, antenna port B*

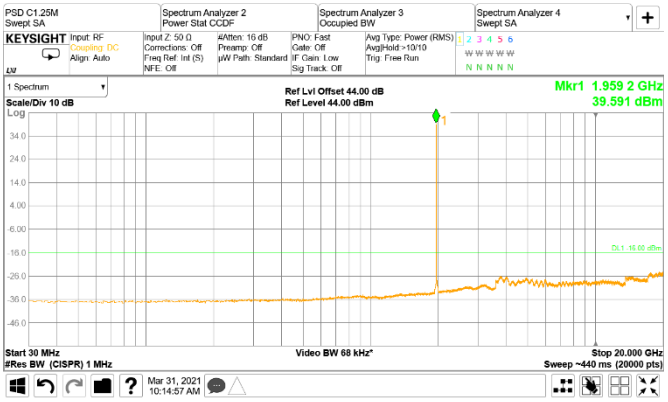



***Figure 8.3-9:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on mid channel, two-carrier operation, antenna port A*

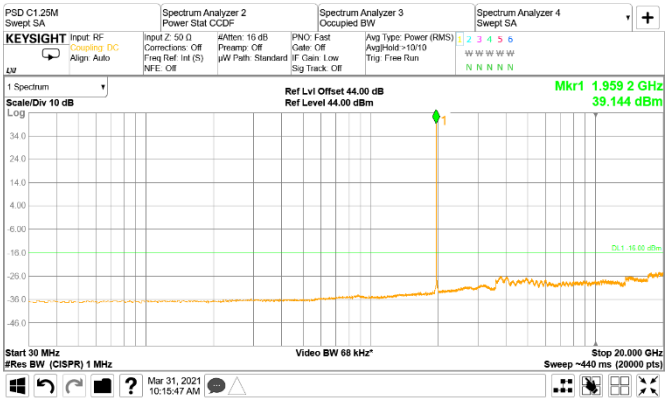



***Figure 8.3-10:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on mid channel, two-carrier operation, antenna port B*

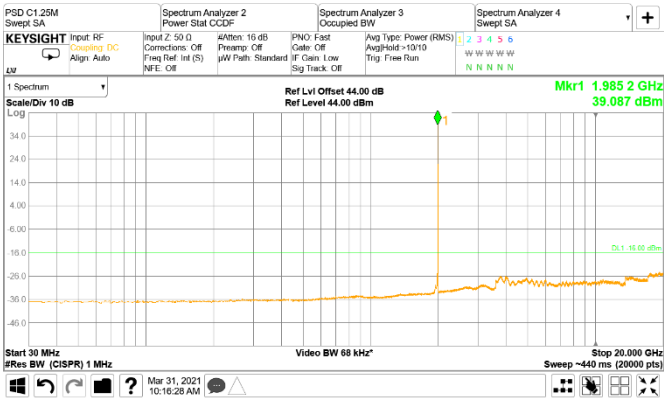



***Figure 8.3-11:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on top channel, two-carrier operation, antenna port A*

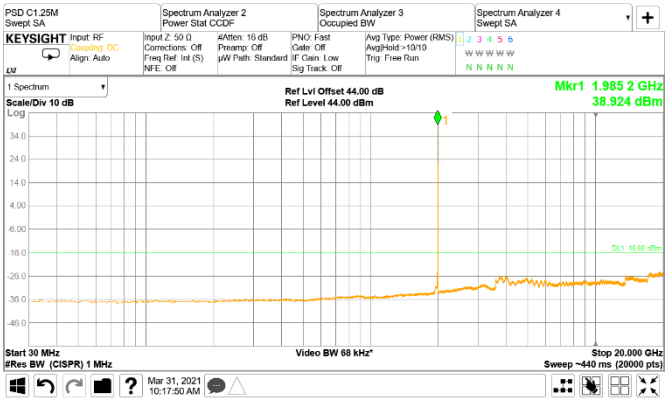



***Figure 8.3-12:*** *Conducted spurious emissions of CDMA and LTE 5 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

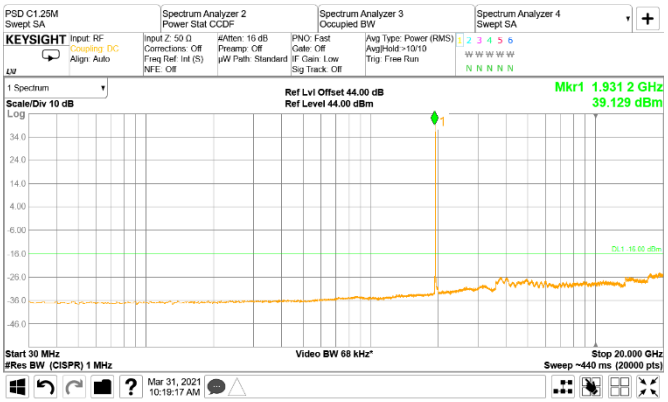



***Figure 8.3-13:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on low channel, two-carrier operation, antenna port A*

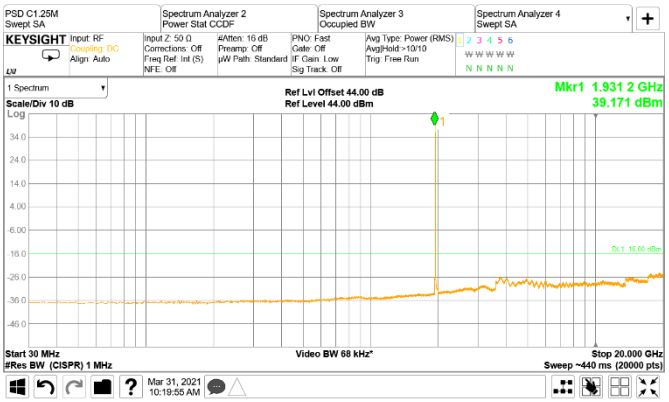



***Figure 8.3-14:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on low channel, two-carrier operation, antenna port B*

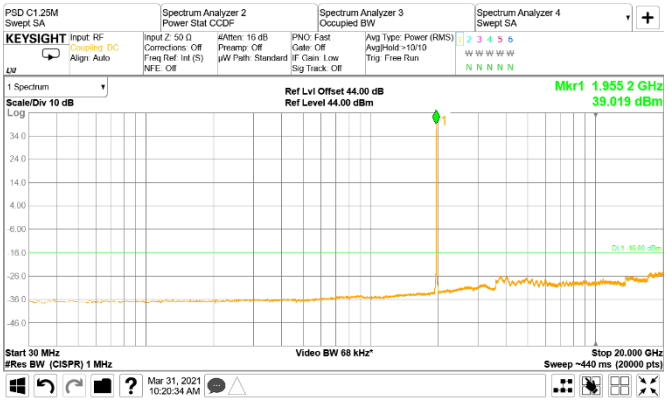



***Figure 8.3-15:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on mid channel, two-carrier operation, antenna port A*

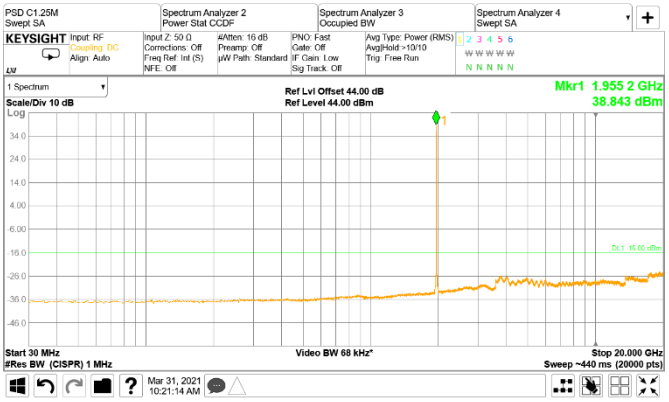



***Figure 8.3-16:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on mid channel, two-carrier operation, antenna port B*

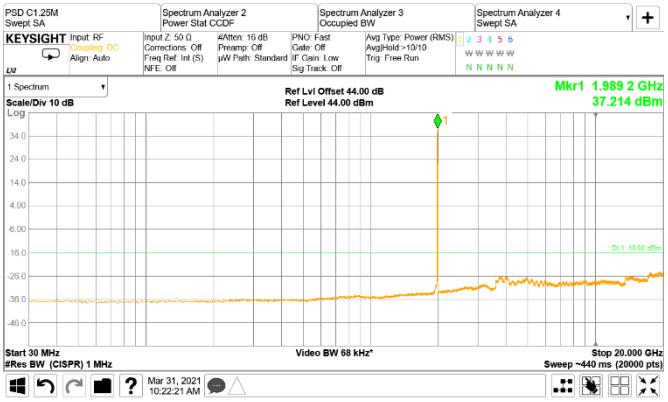



***Figure 8.3-17:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on top channel, two-carrier operation, antenna port A*

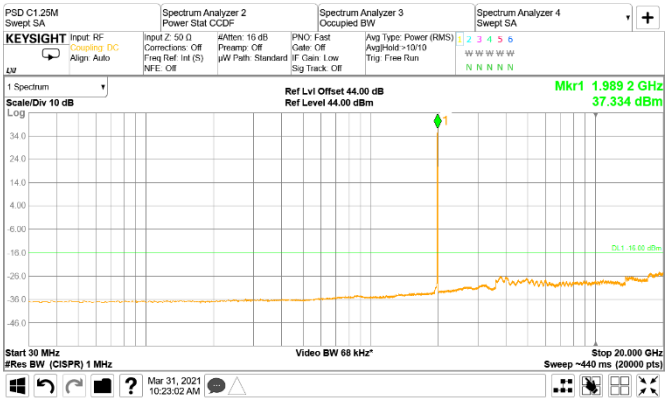



***Figure 8.3-18:*** *Conducted spurious emissions of CDMA and LTE 10 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

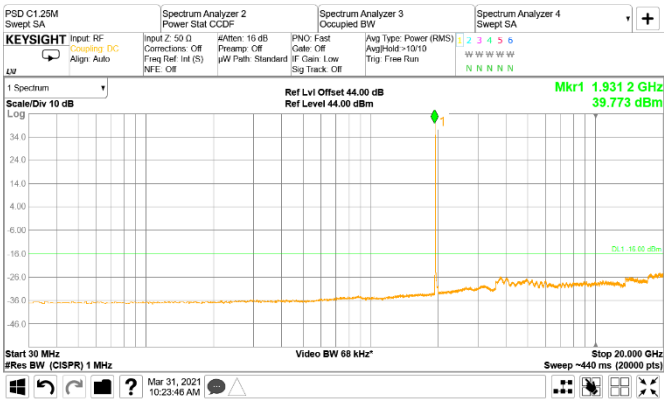



***Figure 8.3-19:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on low channel, two-carrier operation, antenna port A*

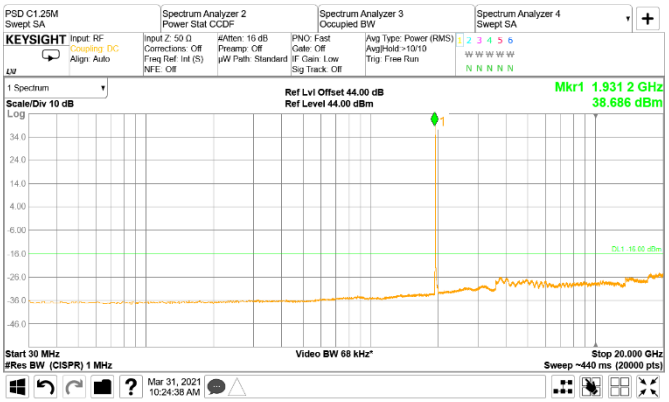



***Figure 8.3-20:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on low channel, two-carrier operation, antenna port B*

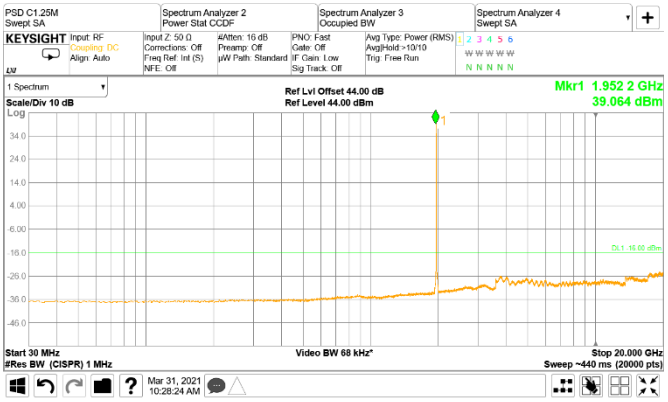



***Figure 8.3-21:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on mid channel, two-carrier operation, antenna port A*

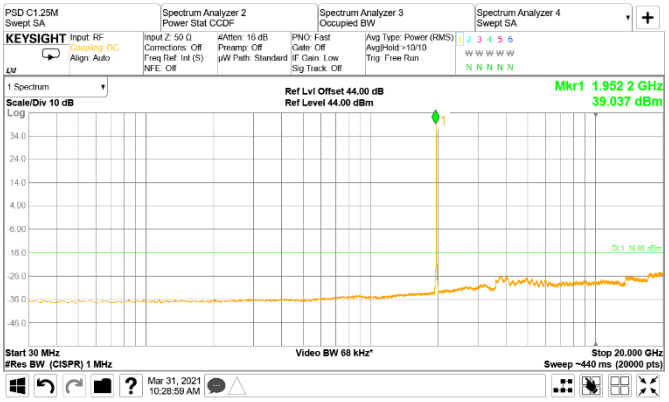



***Figure 8.3-22:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on mid channel, two-carrier operation, antenna port B*

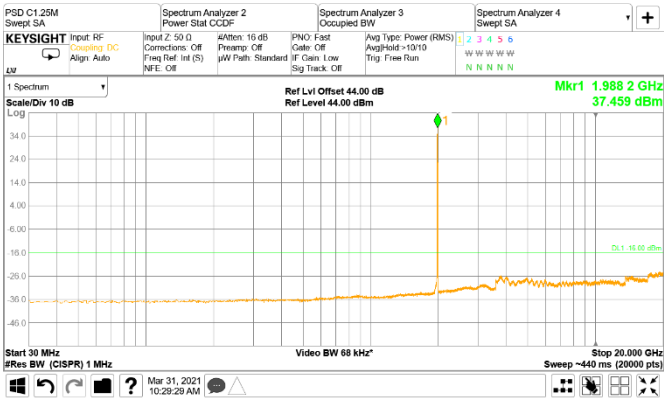



***Figure 8.3-23:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on top channel, two-carrier operation, antenna port A*

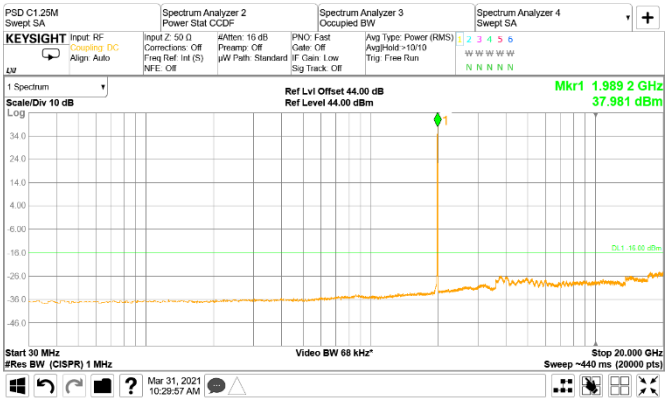



***Figure 8.3-24:*** *Conducted spurious emissions of CDMA and LTE 15 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

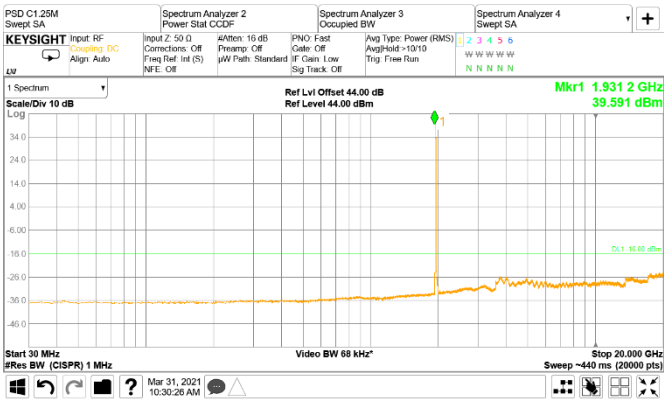



***Figure 8.3-25:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on low channel, two-carrier operation, antenna port A*

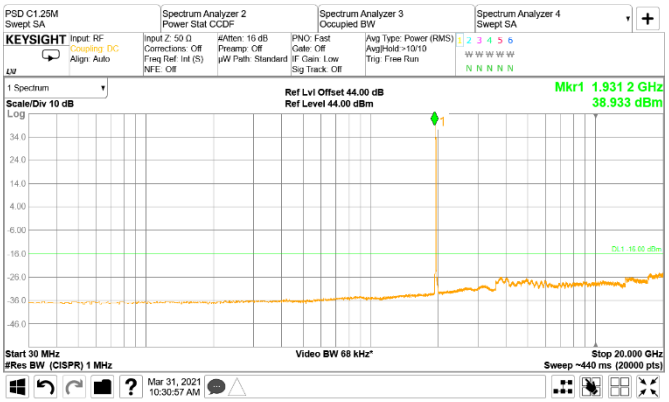



***Figure 8.3-26:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on low channel, two-carrier operation, antenna port B*

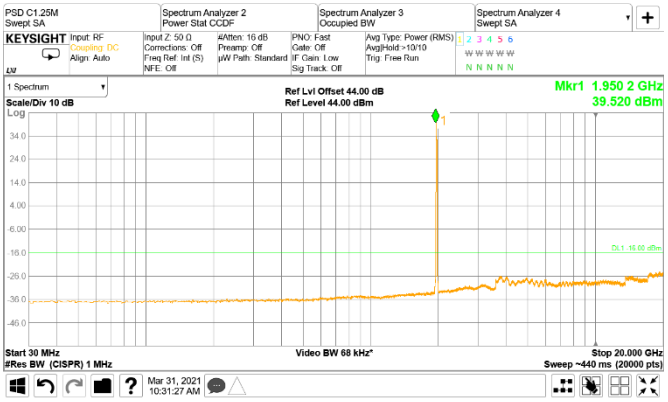



***Figure 8.3-27:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on mid channel, two-carrier operation, antenna port A*

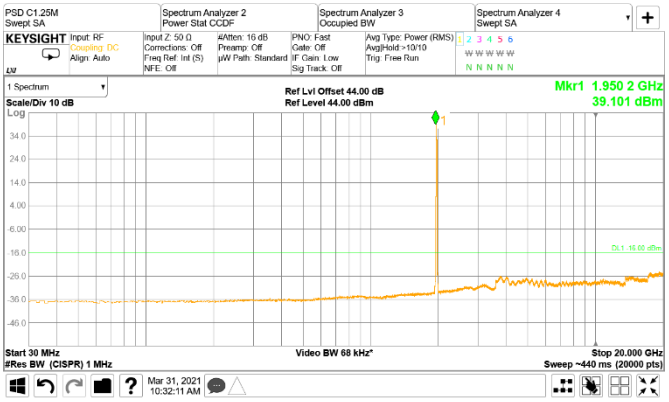



***Figure 8.3-28:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on mid channel, two-carrier operation, antenna port B*

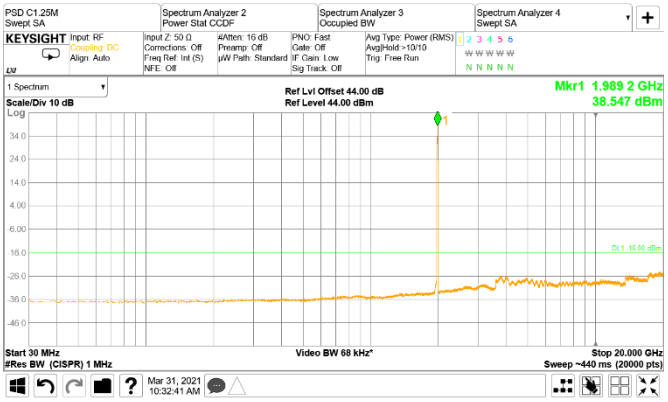



***Figure 8.3-29:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on top channel, two-carrier operation, antenna port A*

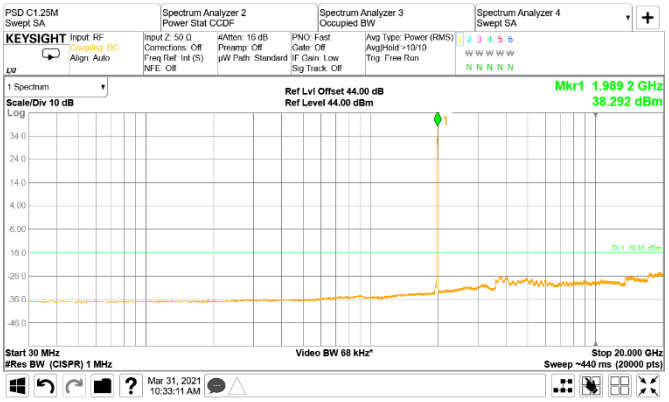



***Figure 8.3-30:*** *Conducted spurious emissions of CDMA and LTE 20 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

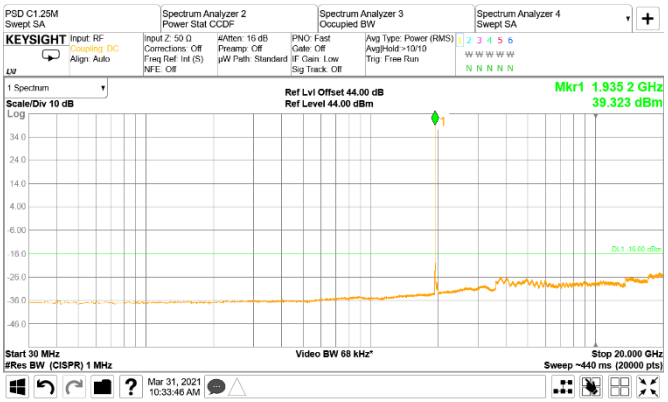



***Figure 8.3-31:*** *Conducted spurious emissions of CDMA and NR 5 MHz on low channel, two-carrier operation, antenna port A*

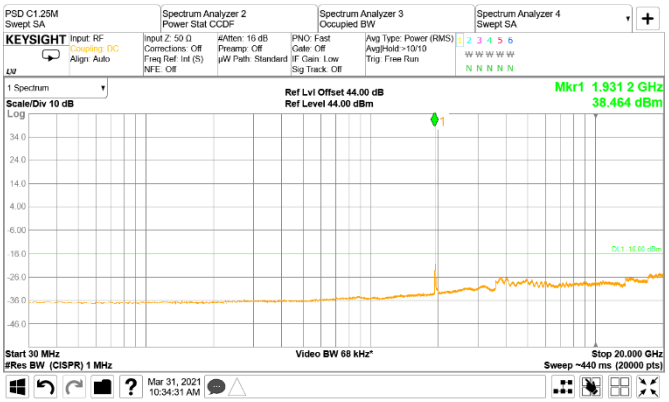



***Figure 8.3-32:*** *Conducted spurious emissions of CDMA and NR 5 MHz on low channel, two-carrier operation, antenna port B*

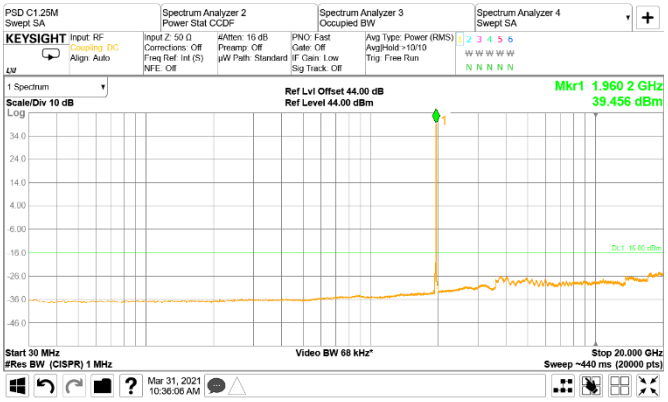



***Figure 8.3-33:*** *Conducted spurious emissions of CDMA and NR 5 MHz on mid channel, two-carrier operation, antenna port A*

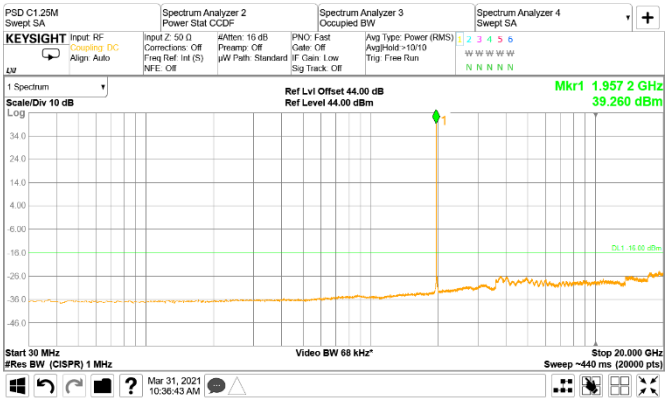



***Figure 8.3-34:*** *Conducted spurious emissions of CDMA and NR 5 MHz on mid channel, two-carrier operation, antenna port B*

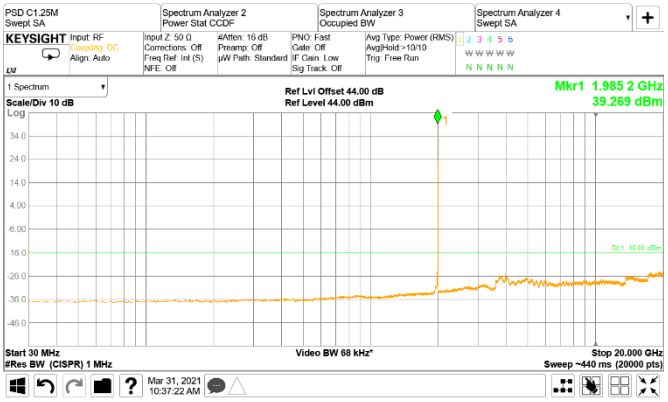



***Figure 8.3-35:*** *Conducted spurious emissions of CDMA and NR 5 MHz on top channel, two-carrier operation, antenna port A*

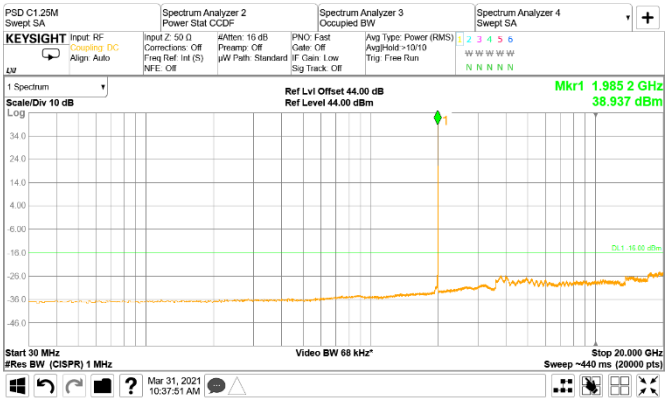



***Figure 8.3-36:*** *Conducted spurious emissions of CDMA and NR 5 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

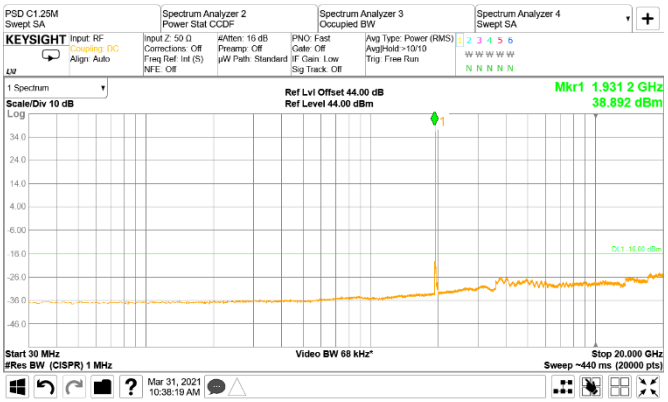



***Figure 8.3-37:*** *Conducted spurious emissions of CDMA and NR 10 MHz on low channel, two-carrier operation, antenna port A*

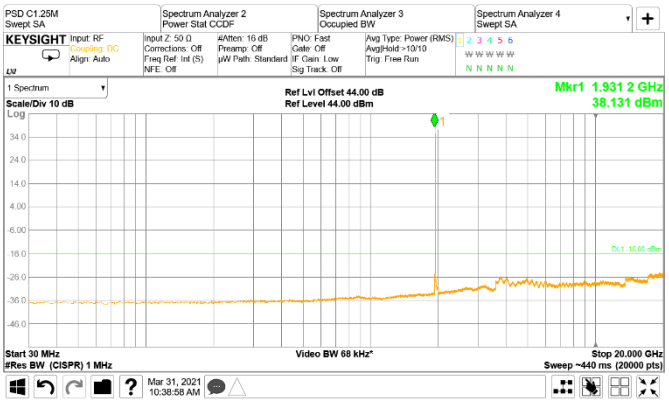



***Figure 8.3-38:*** *Conducted spurious emissions of CDMA and NR 10 MHz on low channel, two-carrier operation, antenna port B*

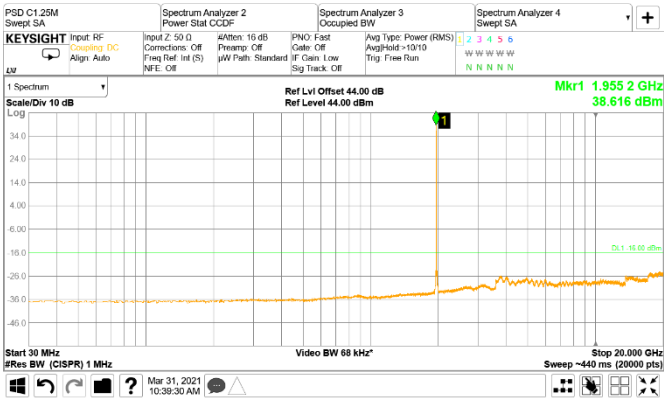



***Figure 8.3-39:*** *Conducted spurious emissions of CDMA and NR 10 MHz on mid channel, two-carrier operation, antenna port A*

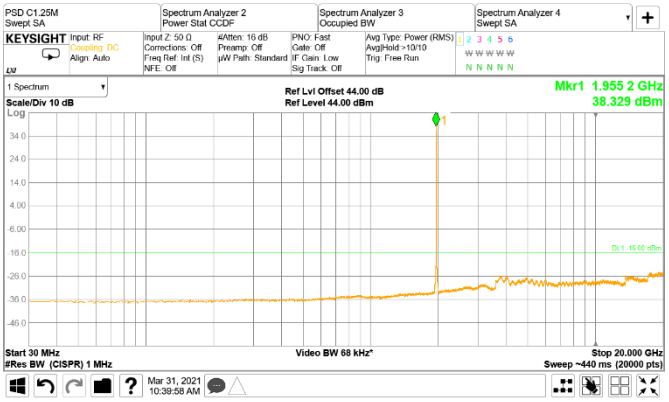



***Figure 8.3-40:*** *Conducted spurious emissions of CDMA and NR 10 MHz on mid channel, two-carrier operation, antenna port B*

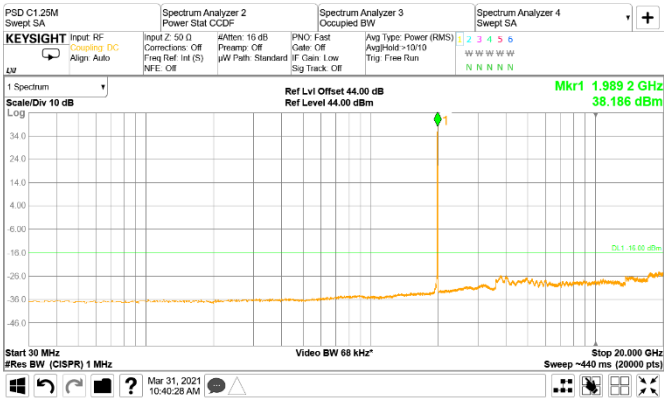



***Figure 8.3-41:*** *Conducted spurious emissions of CDMA and NR 10 MHz on top channel, two-carrier operation, antenna port A*

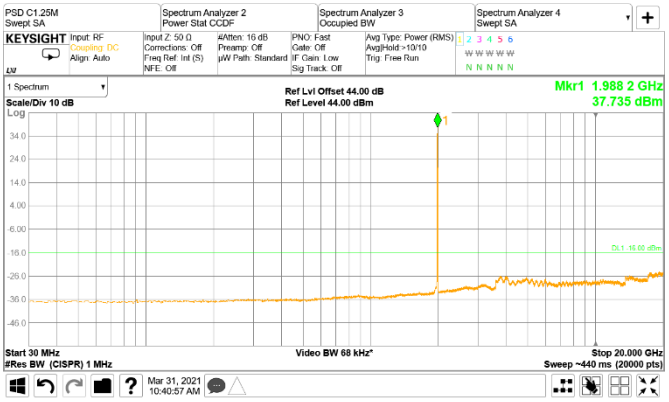



***Figure 8.3-42:*** *Conducted spurious emissions of CDMA and NR 10 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

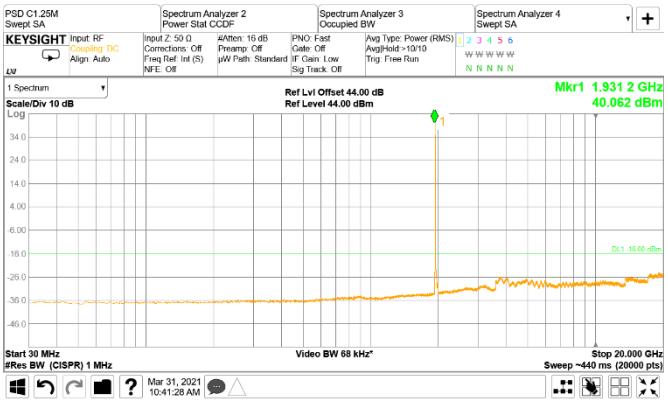



***Figure 8.3-43:*** *Conducted spurious emissions of CDMA and NR 15 MHz on low channel, two-carrier operation, antenna port A*

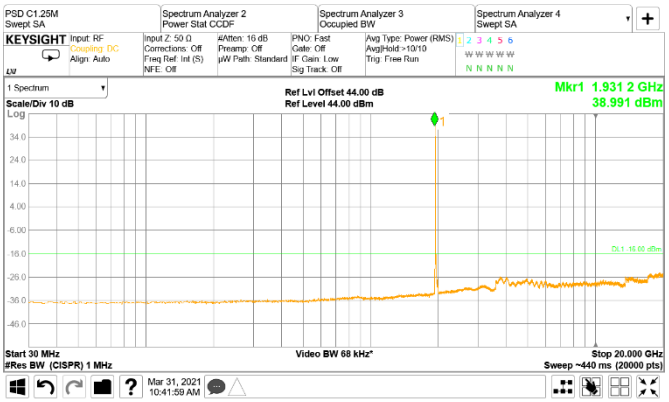



***Figure 8.3-44:*** *Conducted spurious emissions of CDMA and NR 15 MHz on low channel, two-carrier operation, antenna port B*

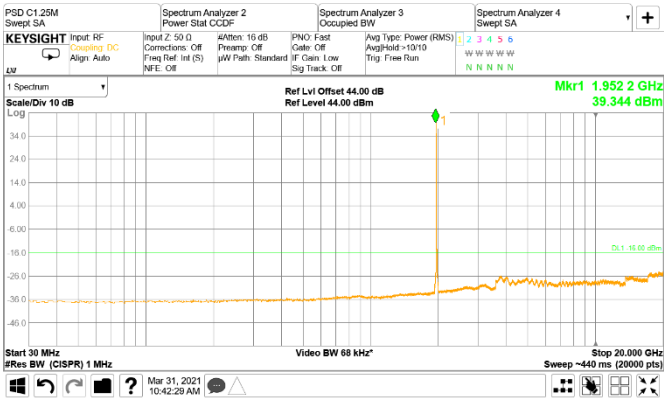



***Figure 8.3-45:*** *Conducted spurious emissions of CDMA and NR 15 MHz on mid channel, two-carrier operation, antenna port A*

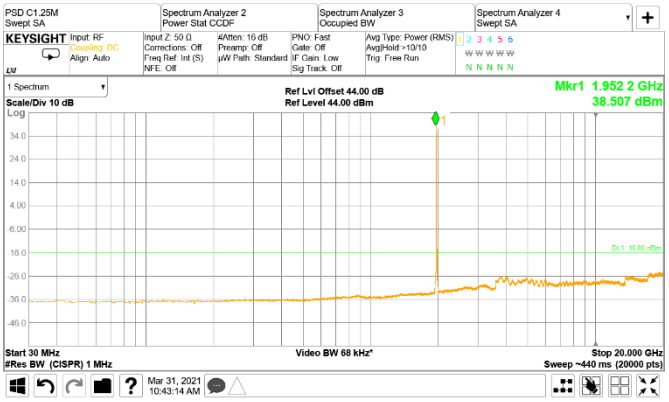



***Figure 8.3-46:*** *Conducted spurious emissions of CDMA and NR 15 MHz on mid channel, two-carrier operation, antenna port B*

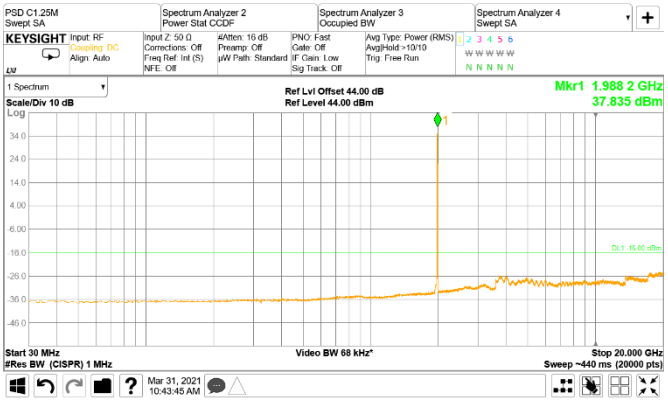



***Figure 8.3-47:*** *Conducted spurious emissions of CDMA and NR 15 MHz on top channel, two-carrier operation, antenna port A*

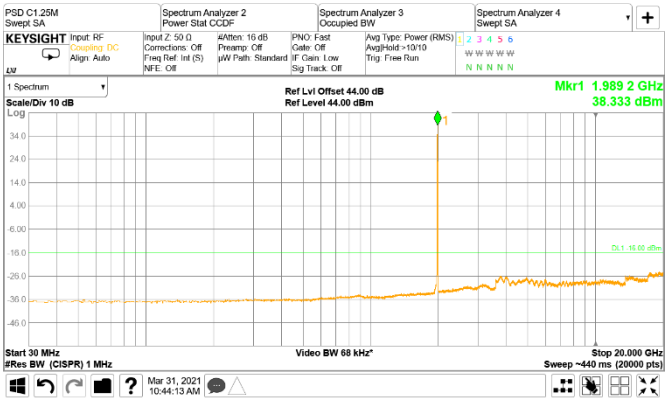



***Figure 8.3-48:*** *Conducted spurious emissions of CDMA and NR 15 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

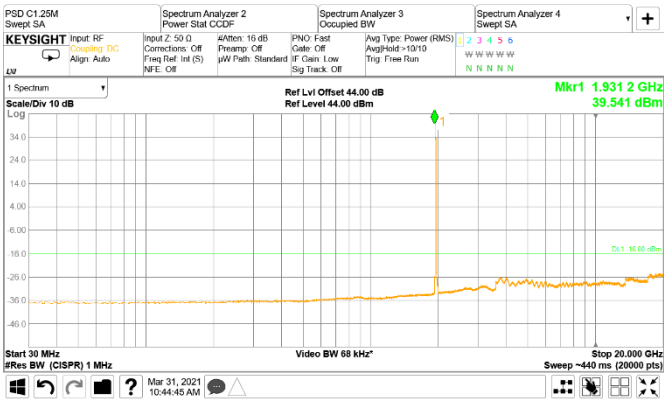



***Figure 8.3-49:*** *Conducted spurious emissions of CDMA and NR 20 MHz on low channel, two-carrier operation, antenna port A*

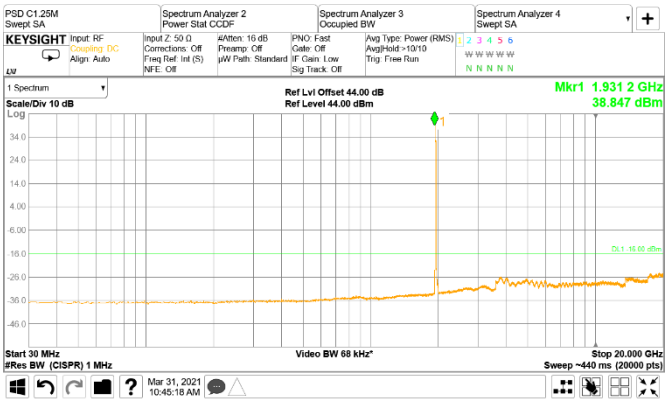



***Figure 8.3-50:*** *Conducted spurious emissions of CDMA and NR 20 MHz on low channel, two-carrier operation, antenna port B*

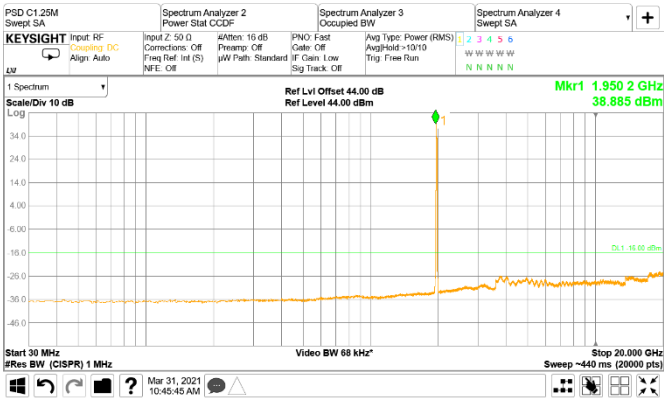



***Figure 8.3-51:*** *Conducted spurious emissions of CDMA and NR 20 MHz on mid channel, two-carrier operation, antenna port A*

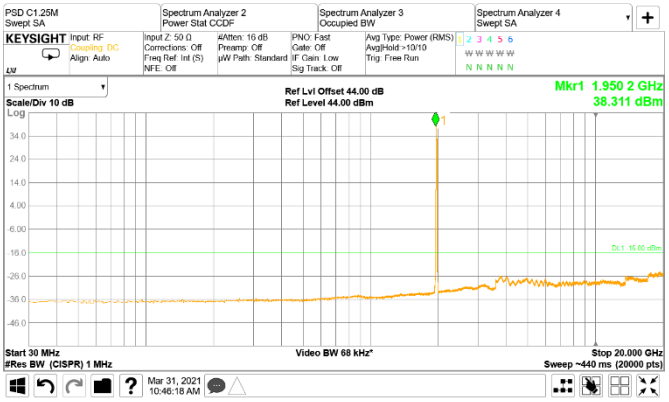



***Figure 8.3-52:*** *Conducted spurious emissions of CDMA and NR 20 MHz on mid channel, two-carrier operation, antenna port B*

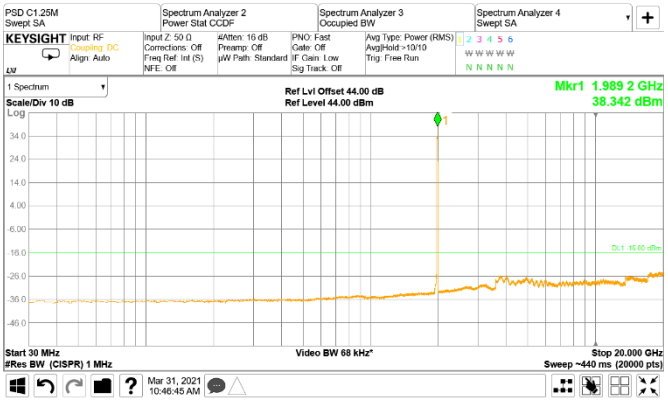



***Figure 8.3-53:*** *Conducted spurious emissions of CDMA and NR 20 MHz on top channel, two-carrier operation, antenna port A*

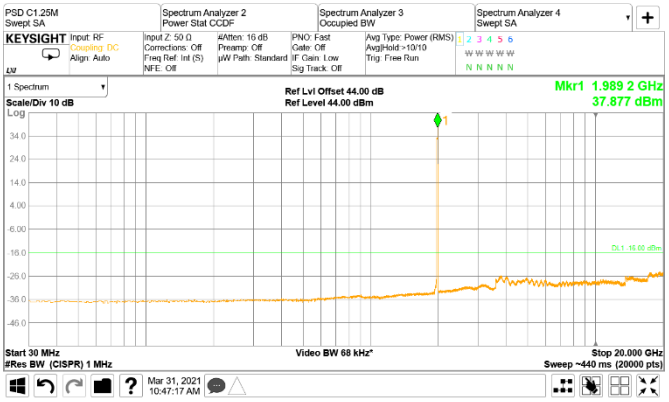



***Figure 8.3-54:*** *Conducted spurious emissions of CDMA and NR 20 MHz on top channel, two-carrier operation, antenna port B*

Test data, continued

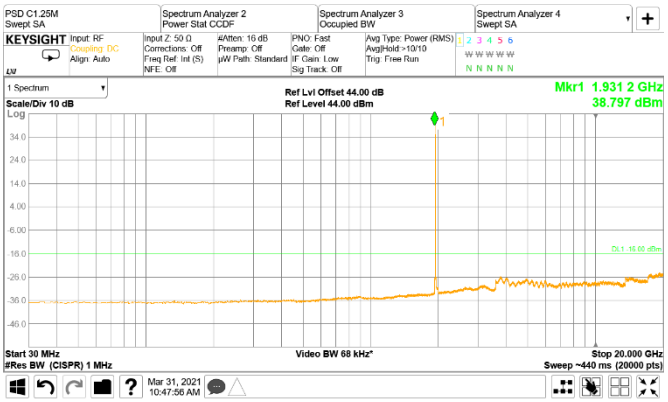



***Figure 8.3-55:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on low channel, three-carrier operation, antenna port A*

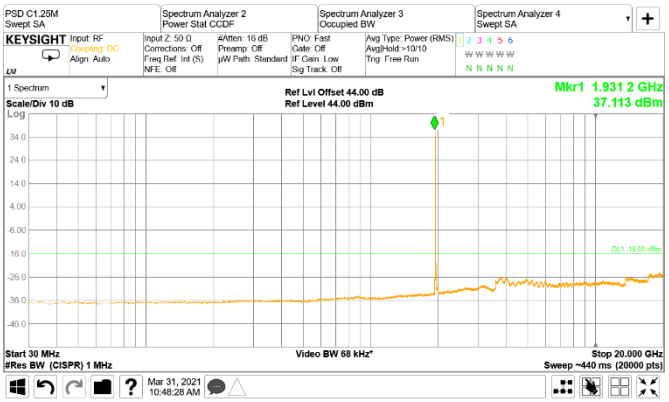



***Figure 8.3-56:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on low channel, three-carrier operation, antenna port B*

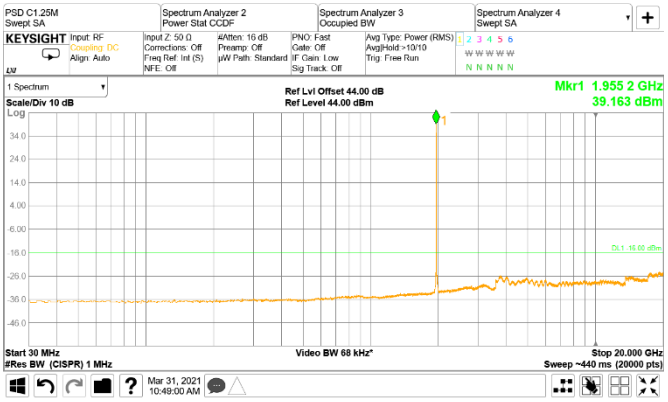



***Figure 8.3-57:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on mid channel, three-carrier operation, antenna port A*

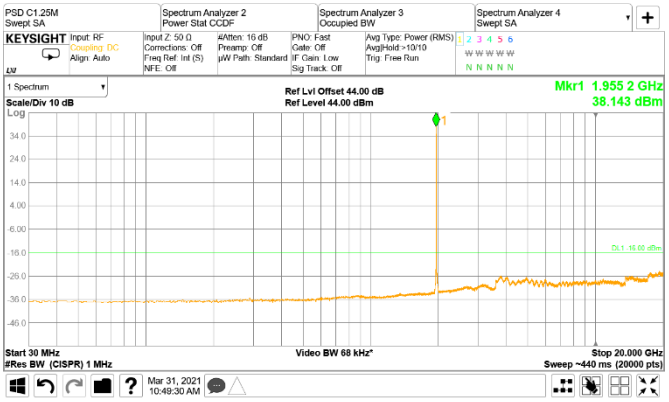



***Figure 8.3-58:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on mid channel, three-carrier operation, antenna port B*

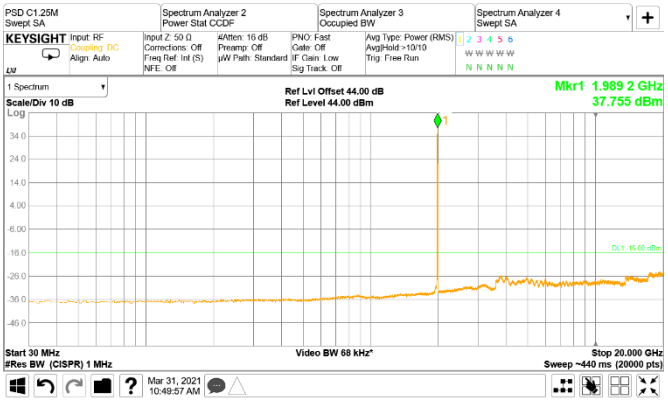



***Figure 8.3-59:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on top channel, three-carrier operation, antenna port A*

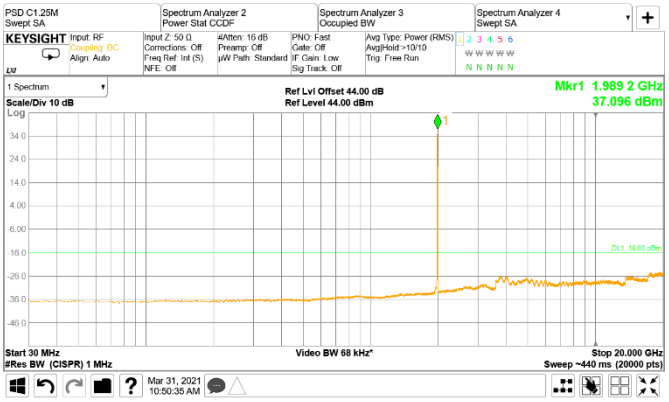



***Figure 8.3-60:*** *Conducted spurious emissions of CDMA, LTE5 MHz and NR 5 MHz on top channel, three-carrier operation, antenna port B*