

Contact person RISE

Björn Skönvall  
Safety and Transport  
+46 10 516 51 23  
Bjorn.skonvall@ri.se

Date

2024-09-20  
RevDate  
2024-09-30

Reference

P122228-F2-2 Rev1

Page

1 (35)

Ericsson AB  
Lennart Blixt  
Torshamnsgatan 21  
164 80 Stockholm**Radio measurements on Radio 4494 44B14 20B29 M01  
with FCC ID TA8AKRC1610023 and IC 287AB-  
AS1610023**

Rev1: TYPO errors in Diagram titles corrected

Product name: Radio 4494 44B14 20B29 M01  
Product number: KRC 161 0023/3**RISE Research Institutes of Sweden AB  
Vehicles and Automation – EMC-IKT**

Performed by



Björn Skönvall

Examined by



Daniel Lundgren

**RISE Research Institutes of Sweden AB**

Postal address

Box 857  
SE-501 15 BORÅS  
SWEDEN

Office location

Brinellgatan 4  
SE-504 62 Borås  
SWEDEN

Phone / Fax / E-mail

+46 10 516 50 00  
+46 33 13 55 02  
info@ri.seThis report may not be reproduced other than in full, except  
with the prior written approval of the issuing laboratory.Accred. No. 1002  
Testing  
ISO/IEC 17025

Summary ..... 3

Description of the test object ..... 4

Purpose of test ..... 7

Operation modes during measurements ..... 7

Conducted measurements ..... 8

Measurement equipment ..... 8

Uncertainties ..... 8

Reservation ..... 9

Delivery of test object ..... 9

Manufacturer’s representative ..... 9

Test engineers ..... 9

Test participant(-s) ..... 9

Test frequencies used for conducted measurements ..... 10

Test setup: conducted measurements ..... 11

RF power output measurements according to §90.542/RSS-140 4.3, conducted ..... 12

    Test set-up and procedure ..... 12

    Results NR with NB IoT IB B14 ..... 13

    Limits ..... 15

    Remark ..... 16

Occupied bandwidth measurements according to CFR47 §2.1049/ RSS-Gen 6.7 ..... 17

    Test set-up and procedure ..... 17

    Results NR with NB IoT IB B14 ..... 17

Band edge measurements according to CFR 47 §90.543/RSS-140 4.4 ..... 19

    Test set-up and procedure ..... 19

    Results NR with NB IoT IB B14 ..... 19

    Limits ..... 20

Conducted spurious emission measurements according to CFR 47 §90.543/RSS-140 4.4 .... 25

    Test set-up and procedure ..... 25

    Results NR with NB IoT IB B14 ..... 26

    Remark ..... 26

    Limits ..... 26

Photos of test object ..... 34

**Summary**

<b>Standard Listed part of</b>	<b>Compliant</b>
<b>FCC CFR 47 Part 2 and Part 90 Subpart R ISED RSS-140 and RSS-Gen</b>	
2.1046/ RSS-140 4.3 RF power output	Yes
2.1049/ RSS-Gen 6.7 Occupied bandwidth	Yes
2.1051/ RSS-140 4.4 Band edge	Yes
2.1051/ RSS-140 4.4 Spurious emission at antenna terminals	Yes

## Description of the test object

Equipment:	Radio 4494 44B14 20B29 M01 Product number KRC 161 0023/3 and variant KRC 161 0023/31 FCC ID: TA8AKRC1610023 IC: 287AB-AS1610023 Note*, The hardware and software (except for the security software) are identical for both types of Radios KRC 161 0023/3 (Security unlocked) and KRC 161 0023/31 (Security locked). The tests were performed on KRC 161 0023/3, Radio 4494 44B14 20B29 M01 with security unlocked software for testing purpose
HVIN:	AS1610023
FVIN:	-
Hardware revision state:	R1C
Radio Access Technology, RAT and Frequency range:	<b>Band 14:</b> Single RAT: LTE, NR, NB IoT SA, LTE+NB IoT(IB, GB), NR+NB-IoT IB. Multi RAT: NR, LTE, ESS, NB IoT  TX: 758 – 768 MHz RX: 788 – 798 MHz  <b>Band 29</b> Single RAT: LTE, NR Multi RAT: LTE, NR  TX: 717 – 728 MHz RX: No RX in this Band
IBW:	B14: 10 MHz B29: 11 MHz
Output power:	Maximum nominal output power per band, carrier and port B14 LTE: 5, 10 MHz: 40 W (With and without NB IoT) B14 NB IoT SA 20 W B14 NR: 5, 10 MHz: 40 W (With and without NB IoT) B14 ESS 10 MHz: 40 W  B29 LTE: 5, 10 MHz: 40 W B29 LTE: 3 MHz: 20 W B29 NR: 5, 10 MHz: 40 W  Maximum total output power per port(both bands): 80 W on RF port A, B (Band 14/n14+29/n29). 40 W on RF port C, D (Only Band 14/n14) Maximum total output power per Radio Unit(Multi Band): 240W

Antenna ports B14:	A-D: 4 TX / 4 RX ports
Antenna ports B29:	A-B: 2 TX / 0 RX ports
Antenna:	50 Ohm Impedance, No dedicated antenna, handled during licensing.
RF configuration B14:	Single and multi-carrier, maximum 2 carriers per port, Non-Contiguous Spectrum (NCS), Contiguous Spectrum (CS) TX Diversity, 2x2 MIMO, 4x4 MIMO, Carrier Aggregation (CA) intra-band and inter-band supported.  LTE with NB IoT IB/GB: 1 PRB, Boosted up to 6 dB NR with NB IoT IB: 1 PRB, Boosted up to 6 dB
RF configuration B29:	Single and multi-carrier, maximum 3 carriers per port, Non-Contiguous Spectrum (NCS), Contiguous Spectrum (CS) TX Diversity, 2x2 MIMO, 2x2 MIMO, Carrier Aggregation (CA) intra-band and inter-band supported.
Channel bandwidths:	Band 14 LTE: 5 MHz and 10 MHz NB IoT SA: 200 kHz NR: 5 MHz, 10 MHz  Band 29 LTE: 3 MHz, 5 MHz and 10 MHz NR: 5 MHz and 10 MHz
Sub-carrier spacing:	LTE: 15 kHz NR: 15 kHz and 30 kHz (30 kHz only for 10 MHz BW B14)
Modulations:	LTE: QPSK, 16QAM, 64QAM and 256QAM NR: QPSK, 16QAM, 64QAM and 256QAM  NB IoT: QPSK
RF power Tolerance:	+0.6/ -2.5 dB
CPRI Speed	Up to 25.8 Gbps
Nominal supply voltage:	-48VDC

The information above is supplied by the manufacturer.

Emission designators:

B14:

NB IoT SA: 189KW7D

LTE with and without NB IoT IB

5 MHz, BW: 4M49W7D

10 MHz, BW: 8M95W7D

10 MHz, BW: 9M42W7D (5+5 MHz, Carrier aggregation)

LTE with NB IoT GB:

10 MHz, BW: 9M32W7D

NR SCS 15kHz :

5 MHz, BW: 4M48W7D

5 MHz, BW: 4M50W7D (NR+NB IoT IB)

10 MHz, BW: 9M26W7D

10 MHz, BW: 9M33W7D (NR+NB IoT IB)

10 MHz, BW: 9M40W7D (5+5 MHz, Carrier aggregation)

NR SCS 30kHz :

10 MHz, BW: 8M64W7D

B29:

LTE

3 MHz, BW: 2M70W7D

5 MHz, BW: 4M48W7D

10 MHz, BW: 8M95W7D

10 MHz, BW: 9M41W7D (5+5 MHz, Carrier aggregation)

NR: SCS 15kHz :

5 MHz, BW: 4M48W7D

10 MHz, BW: 9M26W7D

10 MHz, BW: 9M41W7D (5+5 MHz, Carrier aggregation)

## Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 Part 2, 90, RSS-140 and RSS-Gen. With the test object configured for NR+NB IoT IB operation in Band 14.

No modifications of the test object was made during the testing.

## Operation modes during measurements

LTE measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM, test model E-TM3.1 to represent 64QAM modulation and E-TM3.1A to represent 256QAM modulation. Test model E-TM1.1 was used for all measurements representing worst case if not otherwise stated.

NR measurements were performed with the test object transmitting test models as defined in 3GPP TS 38.141-1. Test model NR: FR1-TM1.1 is used to represent QPSK, test model NR: FR1-TM3.2 to represent 16QAM, test model NR: FR1-TM3.1 to represent 64QAM modulation and test model NR: FR1-TM3.1a to represent 256QAM modulation. Test model NR: FR1-TM1.1 was used for all measurements representing worst case.

NB IoT GB/ IB and SA measurements were performed with the test object transmitting test model N-TM representing QPSK as defined in 3GPP TS 36.141.

The test object was simultaneously transmitting in both bands at maximum output power settings during all measurements.

## Conducted measurements

The test object was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings for conducted measurements.

The signal path of the measurement chain was calibrated with a network analyzer and the correction stored as a transducer factor in the measurement equipment.

## Measurement equipment

Item	Name	Inv.no	Cal. due date
Spectrum analyzer	R&S FSQ 40	504143	2025-07-23
RF attenuator	Weinschel 30dB	900229	2025-09-01
HP filter	Wainwright WHKY1.0/15G-12SS	504199	2025-06-04
RF Cable	Sucoflex 102EA	BX50236	2025-09-01
RF Cable	Sucoflex 102EA	BX50237	2025-09-01
Filter Tunable	Notch Filter, Lorch Microwave	502 679	2025-06-15
Thermohygrometer	Testo 635	504203	2025-08-14

## Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "RISE – 3936". The uncertainties are calculated with a coverage factor  $k=2$  (95% level of confidence).



## Reservation

The test results in this report apply only to the particular test objects as declared in the report.

## Delivery of test object

The test object was delivered: 2024-05-30.

## Manufacturer's representative

Patrik Hellström, Ericsson AB.

## Test engineers

Björn Skönvall, RISE.

## Test participant(-s)

None.

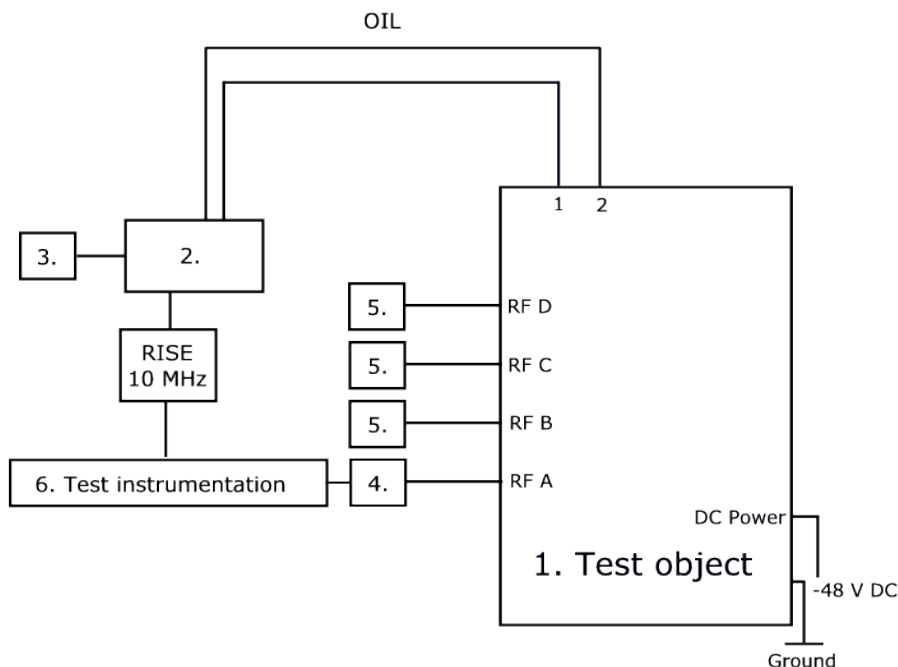
## Test frequencies used for conducted measurements

### B14 NR:NR+NB IoT IB

Frequency [MHz]	Symbolic name	Comment
760.5	B <sub>5NR</sub>	TX bottom frequency in 5 MHz BW configuration NB IoT IB, PRB 0
763.0	M <sub>10NR(-1)</sub>	TX mid frequency in 10 MHz BW configuration NB IoT IB, PRB -1
763.0	M <sub>10NR(50)</sub>	TX mid frequency in 10 MHz BW configuration NB IoT IB, PRB 50
765.5	T <sub>5NR</sub>	TX top frequency in 5 MHz BW configuration NB IoT IB, PRB 24

The RX frequency in Band 14/n14 was configured 30 MHz above the corresponding TX frequency according to the applicable duplex offset for the operating band.

**Test setup: conducted measurements**



**Test object:**

1.	Radio 4494 44B14 20B29 M01, KRC 161 0023/3, rev. R1C, s/n: E23F393227 With Radio Software: CXP 202 1113/1, rev. R21A08.  FCC ID: TA8AKRC1610023, IC: 287AB-AS1610023
----	---

**Associated equipment:**

2.	Testing Equipment: CT-DU25, LPC 102 500/1, rev. R3F, s/n: ET5K000193 with software Ruma R50B02
----	--

**Functional test equipment:**

3.	Computer, Mac book pro, BAMS – 1056772758
4.	RF Attenuator: RISE number: 900 229
5.	Terminator, 50 ohm
6.	RISE Test Instrumentation according to measurement equipment list for each test. The signal analyzer was connected to the RISE 10 MHz reference standard during all measurements.

## RF power output measurements according to §90.542/RSS-140 4.3, conducted

Date 2024-09-11	Temperature 23 °C ± 3 °C	Humidity 33 % ± 5 %
--------------------	-----------------------------	------------------------

### Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.2.3.4. The test object was connected to a signal analyser measuring peak and RMS output power in CCDF mode. A resolution bandwidth of 50 MHz was used if not otherwise specified.

Measurement equipment	RISE number
R&S FSQ 40	504 143
RF attenuator	900 229
Coaxial cable Sucoflex 102EA	BX50236
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

### Results NR with NB IoT IB B14

Single carrier: NR: TM1.1, NB IoT: N-TM

Rated output power level at each RF port 1x 46 dBm/ port.

Symbolic name	Output power CCDF [RMS dBm/ PAR dB]				
	Port RF A	Port RF B	Port RF C	Port RF D	Total power <sup>1)</sup>
B <sub>5NR</sub>	46.10/7.44	46.00/7.37	46.12/7.44	46.06/7.37	52.12
T <sub>5NR</sub>	45.95/7.47	46.10/7.47	46.08/7.47	46.08/7.50	52.10
M <sub>10NR(-1)</sub>	45.78/7.63	45.83/7.66	45.89/7.66	45.79/7.66	51.89
M <sub>10NR(50)</sub>	45.88/7.60	45.89/7.66	45.92/7.66	45.85/7.66	51.92

<sup>1)</sup>: summed output power according to ANSI C63.26 section 6.4.3.1

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Rated output power level at each RF port 1x 46 dBm/ port.

Symbolic name	Output power per 1 MHz [RMS dBm]					Maximum Antenna gain <sup>3)</sup> [dBd]/ ERP Limit [dBm]
	Port RF A	Port RF B	Port RF C	Port RF D	Total power <sup>2)</sup>	
B <sub>5NR</sub>	40.45	40.64	40.42	40.79	46.79	16.21/ 63.0
T <sub>5NR</sub>	39.96	40.10	39.51	40.19	46.19	16.81/ 63.0
M <sub>10NR(-1)</sub>	37.21	37.67	37.34	37.50	43.67	19.33/ 63.0
M <sub>10NR(50)</sub>	37.12	37.07	37.15	37.11	43.15	19.85/ 63.0

<sup>2)</sup>: 6 dB ( $10 \log_{10}(N_{out})$ ) was added to the highest measured power among the measured ports, according to the procedure described in ANSI C63.26 section 6.4.3.2.4.

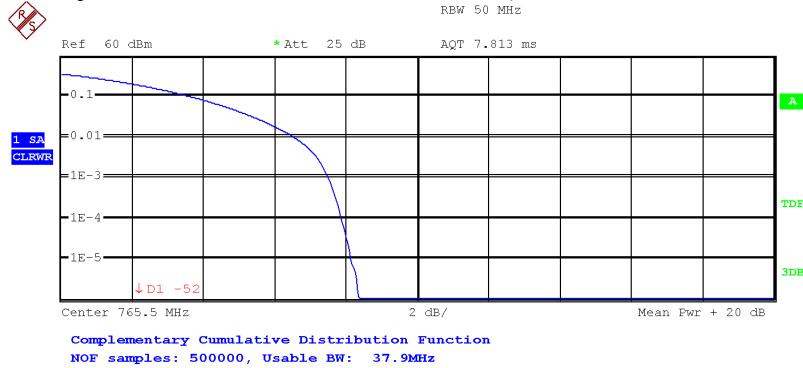
<sup>3)</sup>: The gain value is the maximum antenna gain that can be used with the tested device for the configuration tested with maximum power setting, and still comply with the maximum ERP limit as defined in §90.542(a) and SRSP-540 section 5.1.1

The used formula is: Maximum antenna gain (dBd) = ERP limit (dBm) - Measured Total power<sup>2)</sup>/ 1 MHz (dBm) + feeder loss (dB).

Feeder loss is assumed to be 0 dB in the antenna gain calculation.

Please note that the maximum ERP limit for a specific site may be lower due to various site conditions.

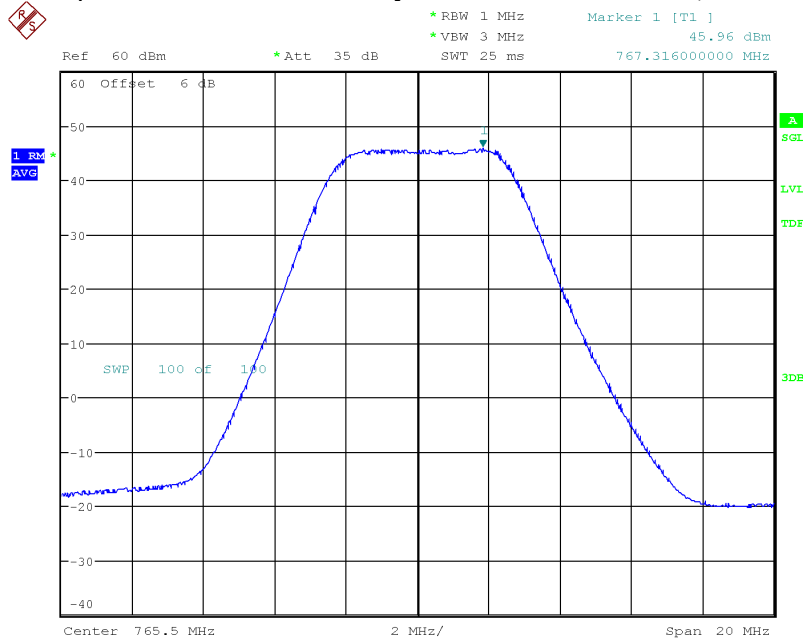
### Example of CCDF measurement: B14 T<sub>5NR</sub>, Port A



Trace 1	
Mean	45.93 dBm
Peak	54.28 dBm
Crest	8.35 dB
10 %	3.69 dB
1 %	6.54 dB
.1 %	7.50 dB
.01 %	7.85 dB

Date: 9.SEP.2024 14:34:54

### Example of 1 MHz Power density measurement: B14 T<sub>5NR</sub>, Port A



Date: 10.SEP.2024 08:49:32

Note: Incorrect reference level offset(6dB) should be subtracted from result.

## Limits

### § 90.542 Broadband transmitting power limits:

- (a) The following power limits apply to the 758-768/788-798 MHz band:
- 1) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.
  - 2) Fixed and base stations located in a 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, and transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.
  - 3) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.
  - 4) Fixed and base stations located in a 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, and transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.
  - 5) Licensees of fixed or base stations transmitting a signal in the 758-768 MHz band at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b) of this section.
- (b) For base and fixed stations operating in the 758-768 MHz band in accordance with the provisions of paragraph (a)(5) of this section, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

**RSS-140**

4.3 Transmitter output power

Fixed and base station equipment shall comply with the e.r.p. limits in SRSP-540.

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-540**

5.1 Radiated power and antenna height limits

5.1.1 Fixed and base stations

For fixed and base stations transmitting in accordance with section 4 within the frequency range 758-768 MHz with a channel bandwidth equal to or less than 1 MHz, the maximum permissible equivalent radiated power (e.r.p.) is 1000 W with an antenna height above average terrain (HAAT) of up to 305 m.

For fixed and base stations transmitting in accordance with section 4 within the frequency range 758-768 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.r.p. is 1000 W/MHz (i.e. no more than 1000 W e.r.p. in any 1 MHz band segment) with an antenna HAAT of up to 305 m.

Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres and transmitting in accordance with section 4 within the frequency range 758-768 MHz may increase their e.r.p. up to a maximum of 2000 W/MHz (i.e. no more than 2000 W e.r.p. in any 1 MHz band segment), with an antenna HAAT of up to 305 m.

This provision also applies to fixed and base stations with a channel bandwidth equal to or less than 1 MHz (i.e. e.r.p. may be increased up to a maximum of 2000 W).

**Remark**

ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/ISED Bureau(s). Licensee's are required to take into account maximum antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

Complies?	Yes
-----------	-----



## Occupied bandwidth measurements according to CFR47 §2.1049/ RSS-Gen 6.7

Date 2024-09-11	Temperature 23 °C ± 3 °C	Humidity 32 % ± 5 %
--------------------	-----------------------------	------------------------

### Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.4.4. The output was connected to a signal analyzer using the built in OBW function with the Peak detector activated in max hold.

Measurement equipment	RISE number
R&S FSQ 40	504 143
RF attenuator	900 229
Coaxial cable Sucoflex 102EA	BX50236
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

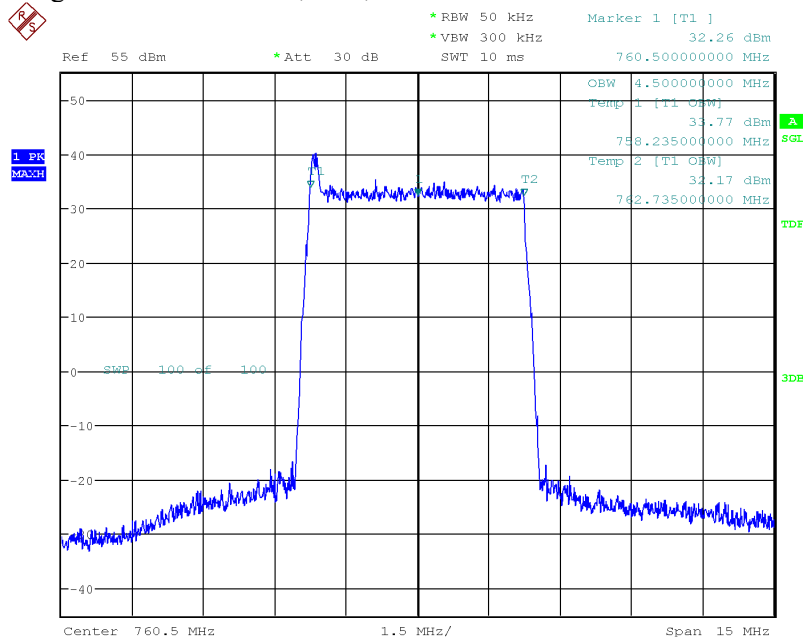
Measurement uncertainty: 2.6%

### Results NR with NB IoT IB B14

Single carrier: NR: TM1.1, NB IoT: N-TM,

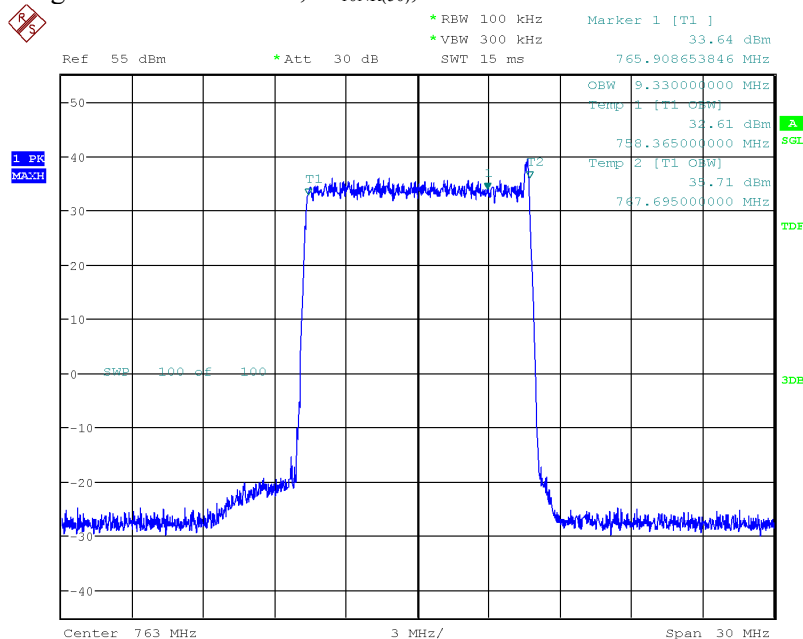
Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1.1	B <sub>5NR</sub>	RF A	4500
1.2	M <sub>10NR(50)</sub>	RF A	9330

Diagram 1.1 NR: TM1.1, B<sub>5NR</sub>, Port A:



Date: 11.SEP.2024 12:12:36

Diagram 1.2 NR: TM1.1, M<sub>10NR(50)</sub>, Port A:



Date: 10.SEP.2024 09:20:49

## Band edge measurements according to CFR 47 §90.543/RSS-140 4.4

Date	Temperature	Humidity
2024-09-10	23 °C ± 3 °C	46 % ± 5 %
2024-09-11	23 °C ± 3 °C	32 % ± 5 %

### Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.7.2 and 5.7.3. The test object was connected to a spectrum analyzer with the RMS detector activated.

The transmitter unwanted emissions shall be measured with a resolution bandwidth of at least 100 kHz. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

An offset of 6 dB has been used for Band 14 to cover 4x4 MIMO according to ANSI C63.26 6.4.4.1 c “measure and add  $10 \log_{10} (N_{ANT})$ ”.

Measurement equipment	RISE number
R&S FSQ 40	504 143
RF attenuator	900 292
Coaxial cable Sucoflex 102EA	BX50236
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 2.6 dB

### Results NR with NB IoT IB B14

Single carrier NR: TM1.1, NB IoT: N-TM

Diagram	Symbolic name	Tested Port
2.1 a-b	$B_{5NR}$	RF A
2.2 a-b	$T_{5NR}$	RF A
2.3 a-b	$M_{10NR(-1)}$	RF A
2.4 a-b	$M_{10NR(50)}$	RF A

**Limits**

**eCFR 47 §90.543 Emission limitations.**

- e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
  - 1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB (-46 dBm) in a 6.25 kHz band segment, for base and fixed stations.
  - 3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB (-13 dBm)
  - 4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
  - 5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.
- f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to  $-70$  dBW/MHz (-40 dBm) equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

**RSS-140**

**4.4 Transmitter unwanted emission limits**

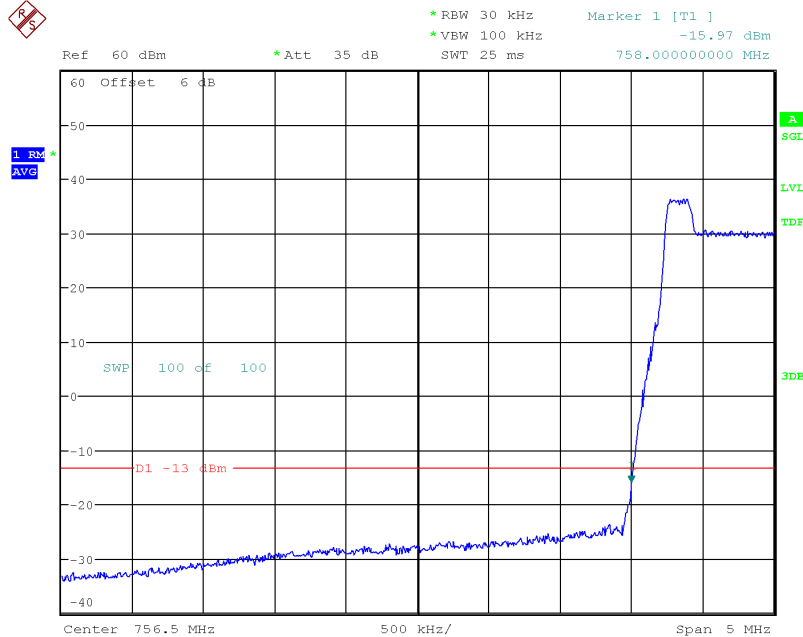
The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power p in dBW as follows, where p is the transmitter output power in watts:

- a. For any frequency between 769-775 MHz and 799-806 MHz:
  - i.  $76 + 10 \log (p)$ , dB (-46 dBm) in a 6.25 kHz band for fixed and base station equipment
- b. For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz:  $43 + 10 \log (p)$ , dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed  $-70$  dBW/MHz (-40 dBm) for wideband emissions, and  $-80$  dBW/kHz (-50 dBm) for discrete emissions of less than 700 Hz bandwidth.

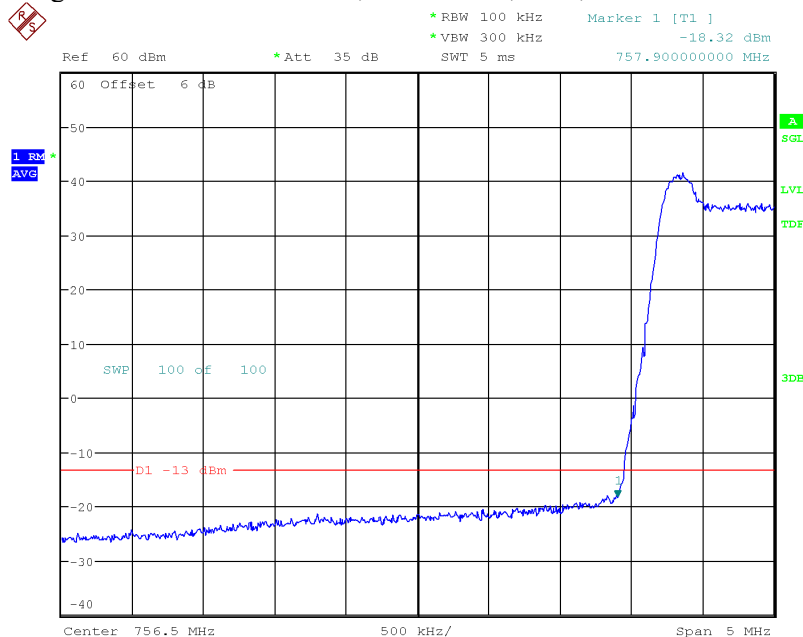
Complies?	Yes
-----------	-----

Diagram 2.1a NB IoT: N-TM, NR: TM1.1, B<sub>5NR</sub>, Port A:



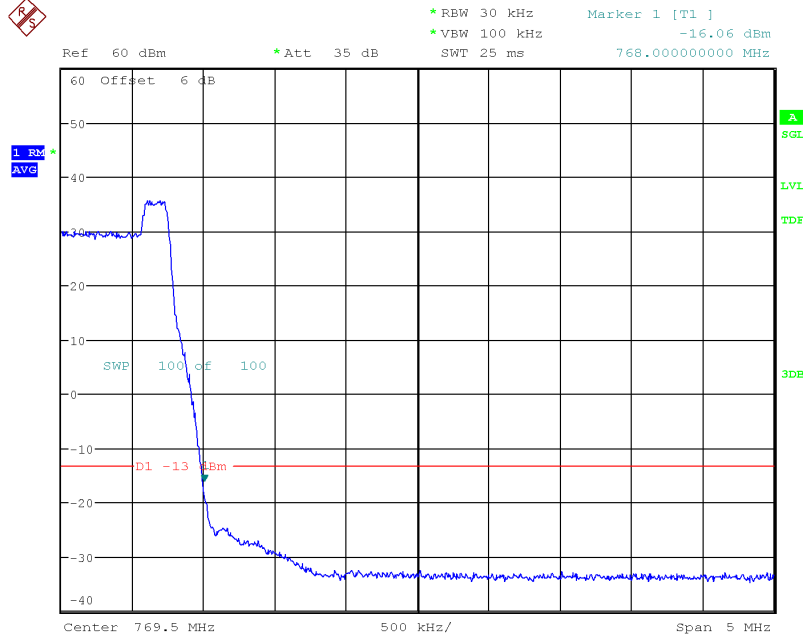
Date: 10.SEP.2024 08:03:39

Diagram 2.1b NB IoT: N-TM, NR: TM1.1, B<sub>5NR</sub>, Port A:



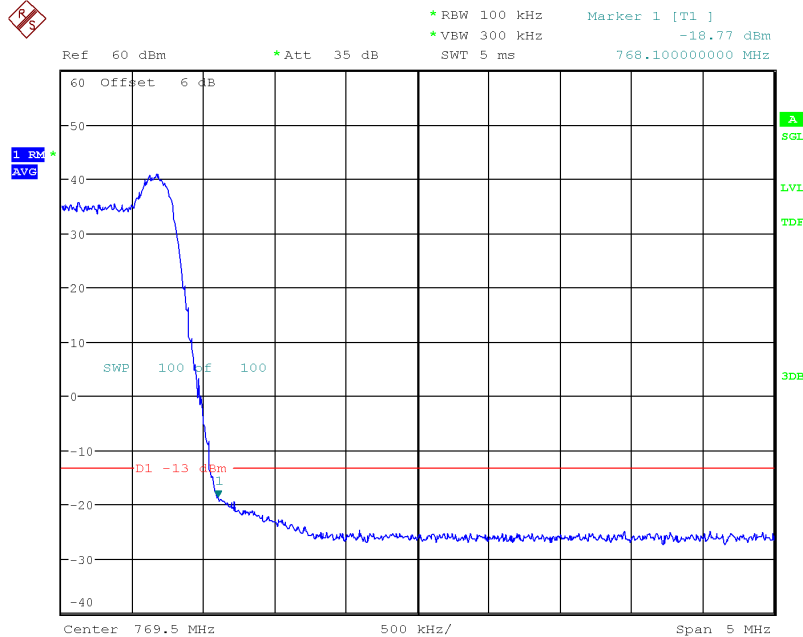
Date: 10.SEP.2024 08:02:03

Diagram 2.2a NB IoT: N-TM, NR: TM1.1, T<sub>5NR</sub>, Port A:



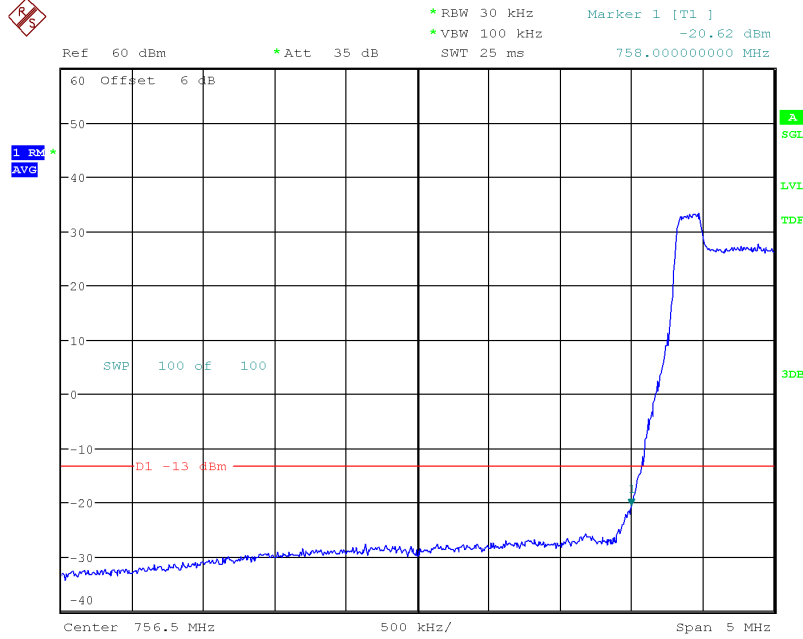
Date: 10.SEP.2024 07:58:05

Diagram 2.2b NB IoT: N-TM, NR: TM1.1, T<sub>5NR</sub>, Port A:



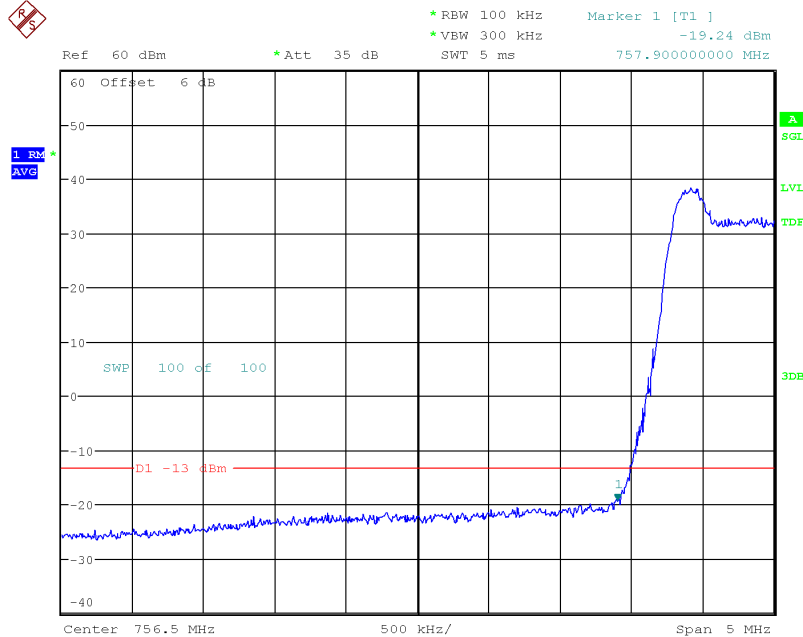
Date: 10.SEP.2024 07:59:15

Diagram 2.3a NB IoT: N-TM, NR: TM1.1, M<sub>10NR(-1)</sub>, Port A



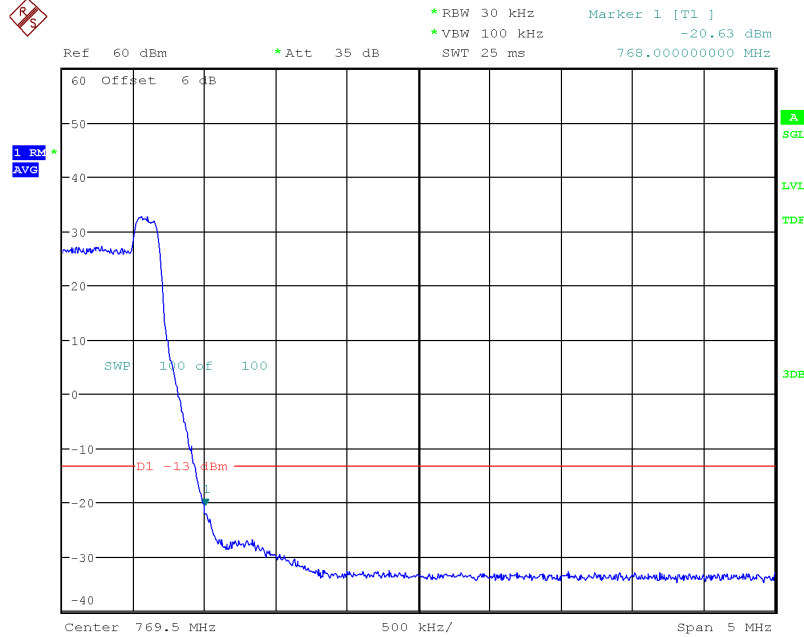
Date: 10.SEP.2024 09:41:03

Diagram 2.3b NB IoT: N-TM, NR: TM1.1, M<sub>10NR(-1)</sub>, Port A



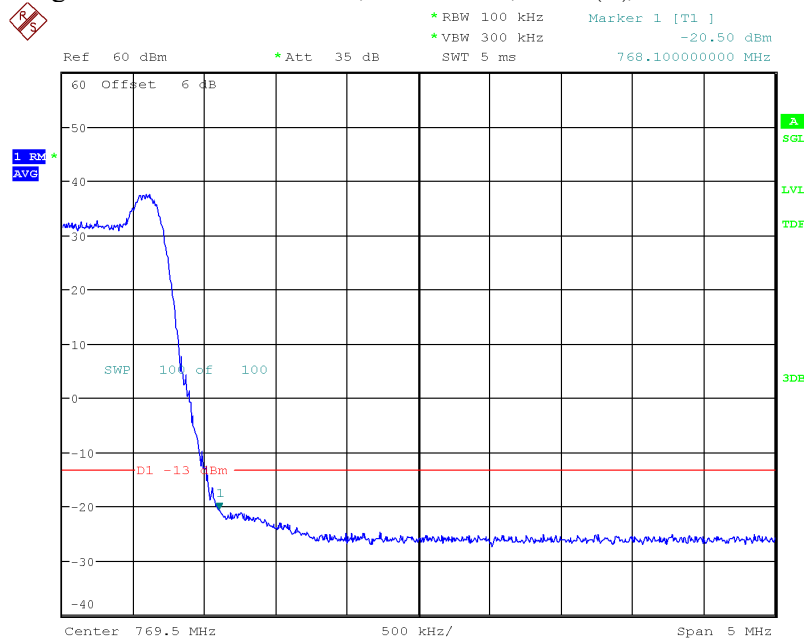
Date: 10.SEP.2024 09:40:19

Diagram 2.4a NB IoT: N-TM, NR: TM1.1, M<sub>10NR(50)</sub>, Port A



Date: 10.SEP.2024 09:37:07

Diagram 2.4b NB IoT: N-TM, NR: TM1.1, M<sub>10NR(50)</sub>, Port A



Date: 10.SEP.2024 09:38:07



## Conducted spurious emission measurements according to CFR 47 §90.543/RSS-140 4.4

Date	Temperature	Humidity
2024-09-10	23 °C ± 3 °C	46 % ± 5 %
2024-09-11	23 °C ± 3 °C	32 % ± 5 %

### Test set-up and procedure

The measurements were made per definition in ANSI C63.26, 5.7.4. The output was connected to a spectrum analyzer with the RMS detector activated.

An offset of 6 dB has been used to cover 4x4 MIMO according to ANSI C63.26 6.4.4.1 c “measure and add  $10 \log_{10}(N_{ANT})$ ” in the frequency range 9k – 1GHz, for 1–8 GHz an offset of 6.62 was used to compensate for the high pass filter

Measurement equipment	RISE number
R&S FSQ 40	504 143
RF attenuator	900 229
High pass filter 1-20 GHz	504 199
Coaxial cable Sucoflex 102EA	BX50236
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203
Notch Filter, Lorch Microwave	502 679

Measurement uncertainty: 2.6 dB

## Results NR with NB IoT IB B14

Single carrier: NR: TM1.1,NB IoT : N-TM

Diagram	Symbolic name B14	Tested Port
3.1 a-d	B <sub>5NR</sub>	RF A
3.2 a-d	T <sub>5NR</sub>	RF A
3.3 a-d	M <sub>10NR(50)</sub>	RF A

## Remark

The emission at 9 kHz on the plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through.

The highest fundamental frequency is 768 MHz. The measurements were made up to 8 GHz (10x768 MHz = 7.68 GHz).

## Limits

### eCFR 47 §90.543 Emission limitations.

- e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
  - 1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $76 + 10 \log(P)$  dB (-46 dBm) in a 6.25 kHz band segment, for base and fixed stations.
  - 3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log(P)$  dB (-13 dBm)
  - 4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
  - 5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.
- f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz (-40 dBm) equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

**RSS-140****4.4 Transmitter unwanted emission limits**

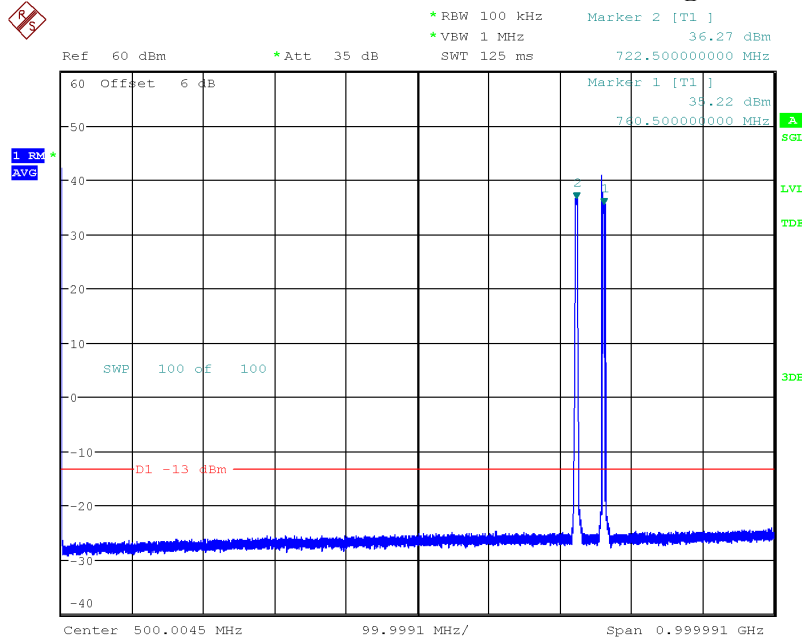
The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power  $P$  in dBW as follows, where  $P$  is the transmitter output power in watts:

- a. For any frequency between 769-775 MHz and 799-806 MHz:
  - i.  $76 + 10 \log(p)$ , dB (-46 dBm) in a 6.25 kHz band for fixed and base station equipment
- b. For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz:  
 $43 + 10 \log(p)$ , dB (-13 dBm) in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed  $-70$  dBW/MHz (-40 dBm) for wideband emissions, and  $-80$  dBW/kHz (-50 dBm) for discrete emissions of less than 700 Hz bandwidth.

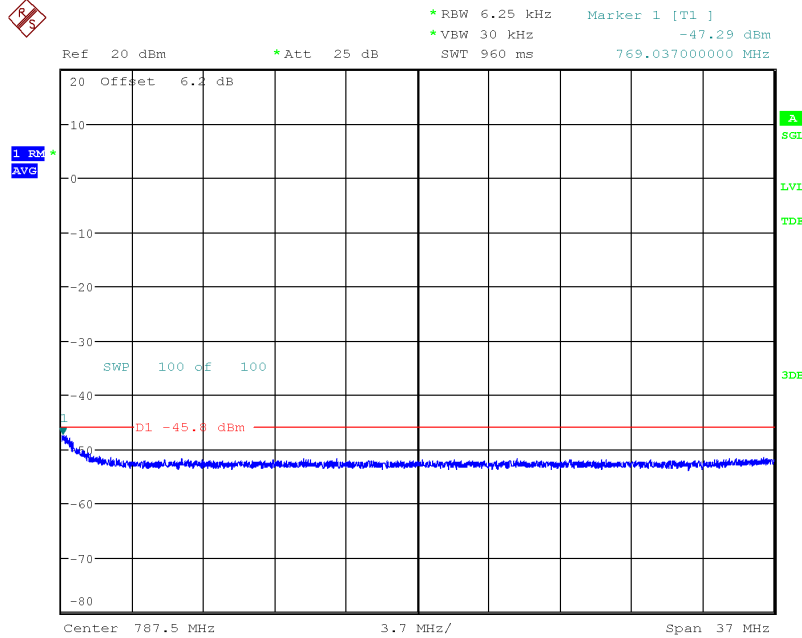
Complies?	Yes
-----------	-----

Diagram 3.1a NR: TM1.1,NB IoT : N-TM, B<sub>5NR</sub>, 9 kHz – 1 GHz, Port A.  
Note: marker 1&2 are the carriers of band14 & 29, level @ 1GHz=-27dBm.



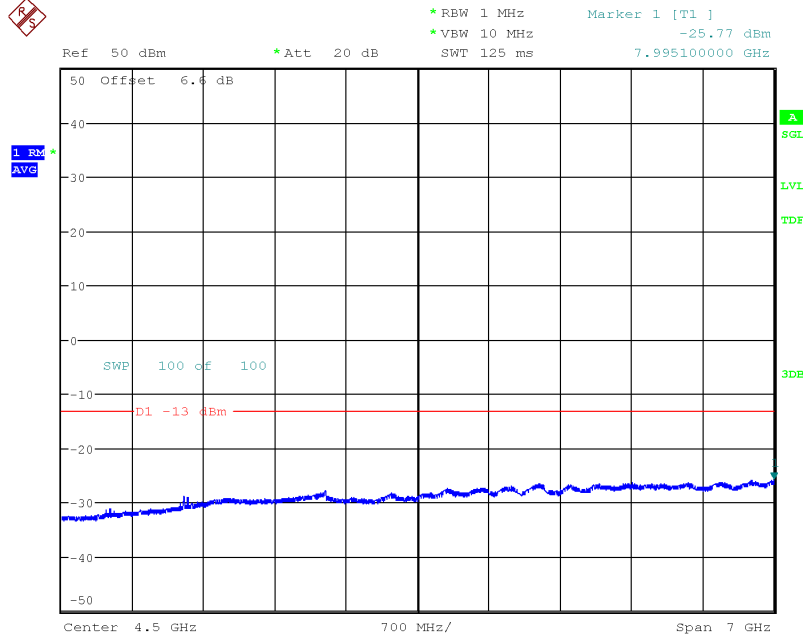
Date: 10.SEP.2024 08:26:36

Diagram 3.1b NR: TM1.1,NB IoT : N-TM, B<sub>5NR</sub>, 769 – 806 MHz, Port A:



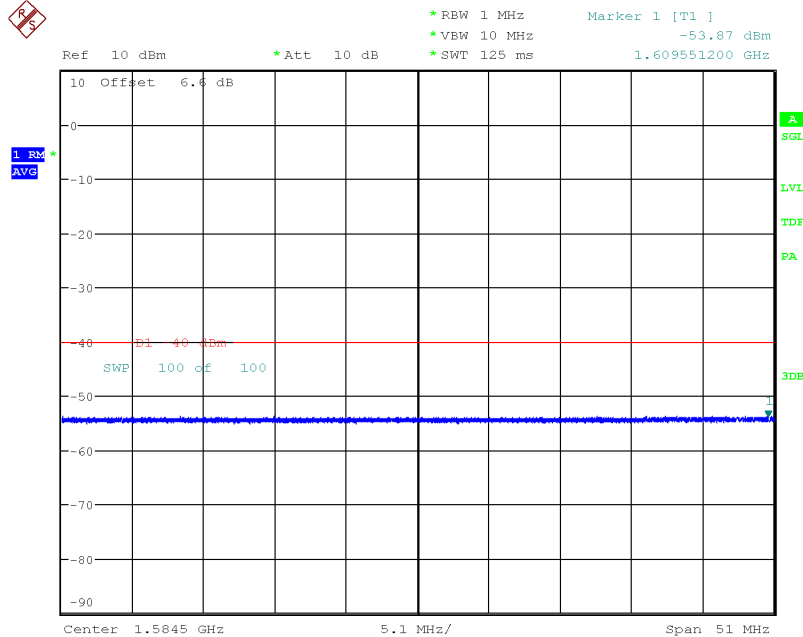
Date: 11.SEP.2024 12:27:55

Diagram 3.1c NR: TM1.1,NB IoT : N-TM, B<sub>5NR</sub>, 1 – 8 GHz, Port A:



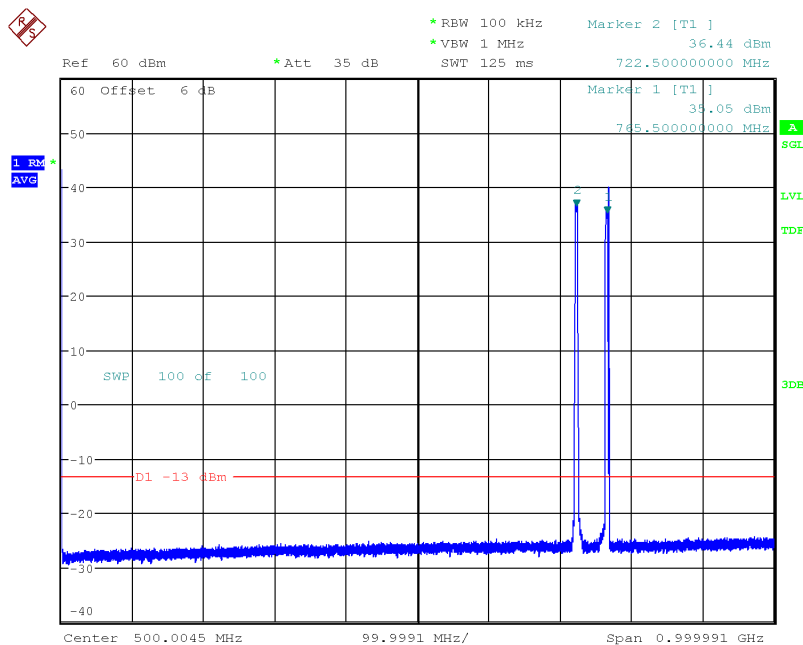
Date: 11.SEP.2024 12:40:42

Diagram 3.1d NR: TM1.1,NB IoT : N-TM, B<sub>5NR</sub>, 1559 – 1610 MHz, Port A:



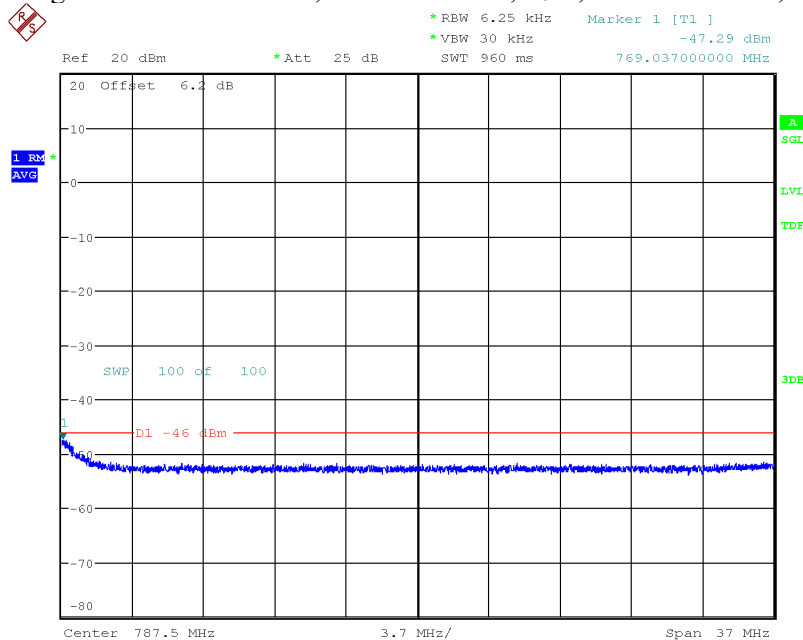
Date: 10.SEP.2024 08:43:04

Diagram 3.2a NR: TM1.1,NB IoT : N-TM, T<sub>5NR</sub>, 9 kHz – 1 GHz, Port A:  
Note: marker 1&2 are the carriers of band14 & 29, level @ 1GHz=-27dBm.



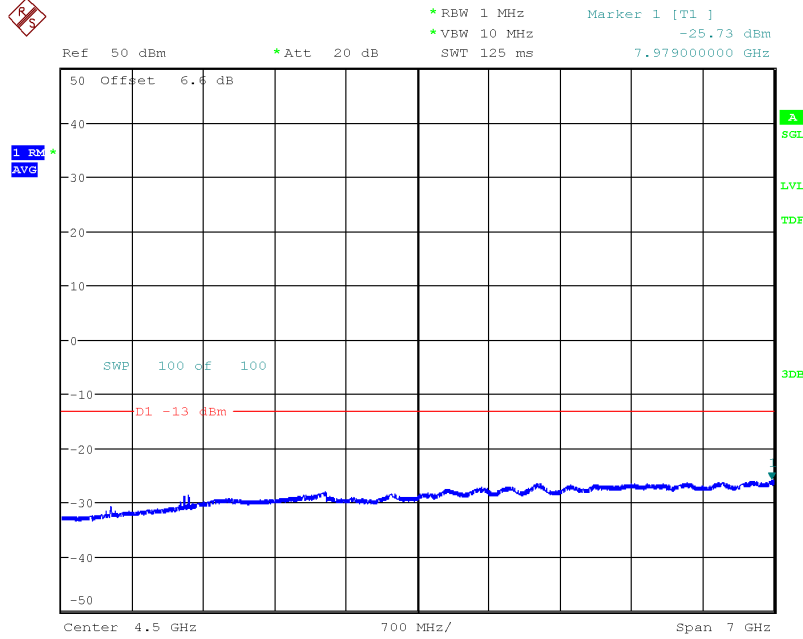
Date: 9.SEP.2024 14:49:46

Diagram 3.2b NR: TM1.1,NB IoT : N-TM, T<sub>5NR</sub>, 769 – 806 MHz, Port A:



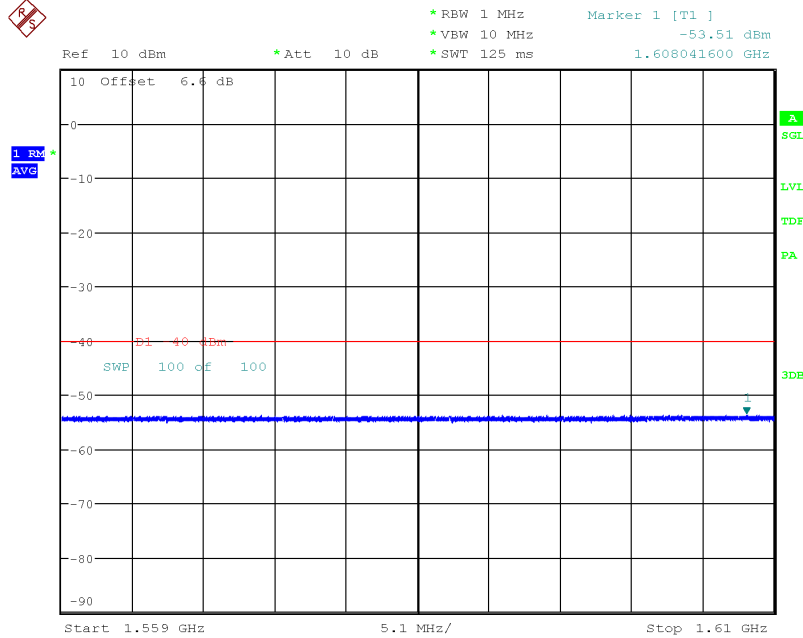
Date: 11.SEP.2024 12:29:23

Diagram 3.2c NR: TM1.1,NB IoT : N-TM, T<sub>5NR</sub>, 1 – 8 GHz, Port A:



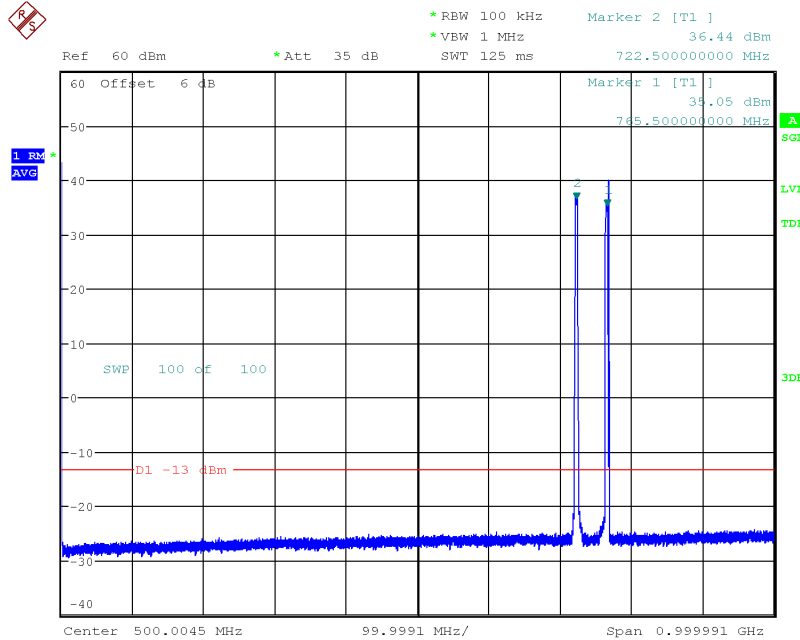
Date: 11.SEP.2024 12:43:22

Diagram 3.2d NR: TM1.1,NB IoT : N-TM, T<sub>5NR</sub>, 1559 – 1610 MHz, Port A:



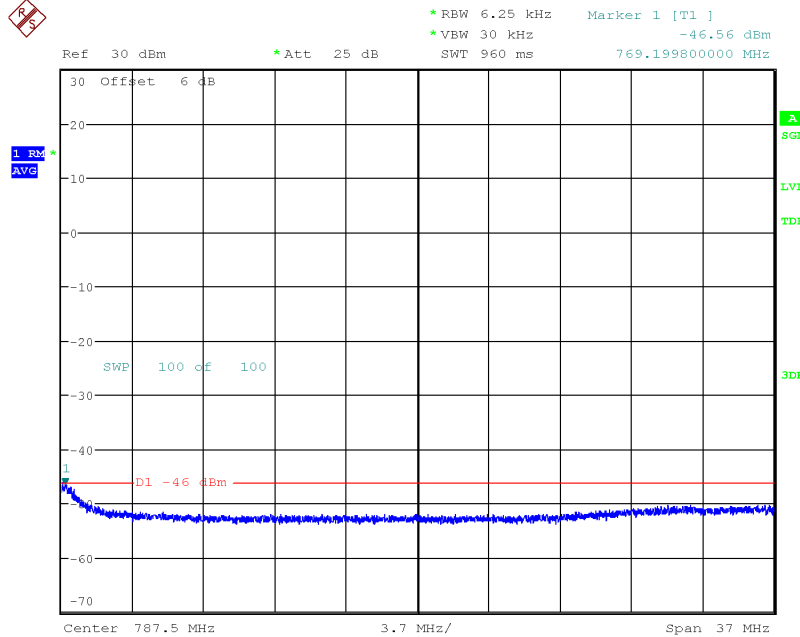
Date: 10.SEP.2024 07:51:03

Diagram 3.3a NR: TM1.1,NB IoT : N-TM, M<sub>10NR(50)</sub>, 9 kHz – 1 GHz, Port A.  
Note: marker 1&2 are the carriers of band14 & 29, level @ 1GHz=-27dBm



Date: 9.SEP.2024 14:49:46

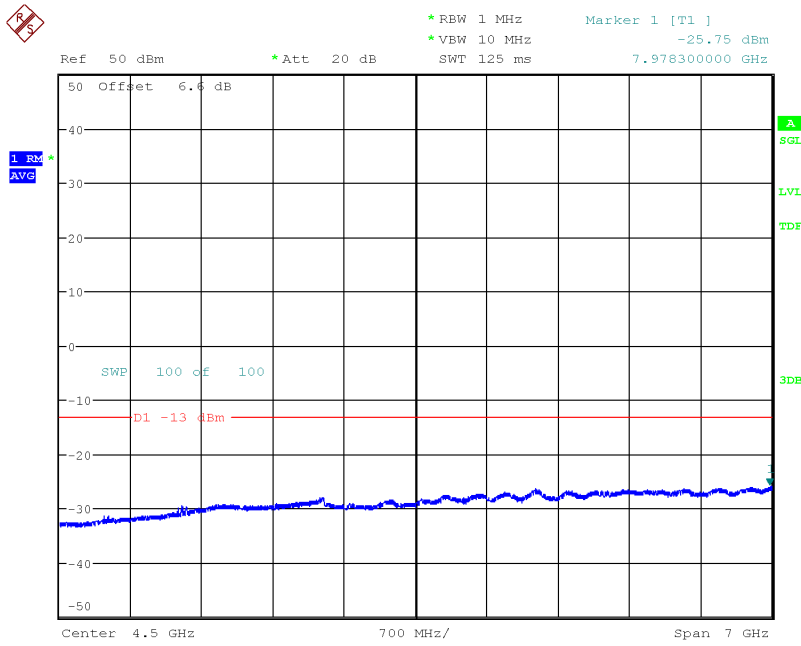
Diagram 3.3b NR: TM1.1,NB IoT : N-TM, M<sub>10NR(50)</sub>, 769 – 806 MHz, Port A:



Date: 10.SEP.2024 09:30:22

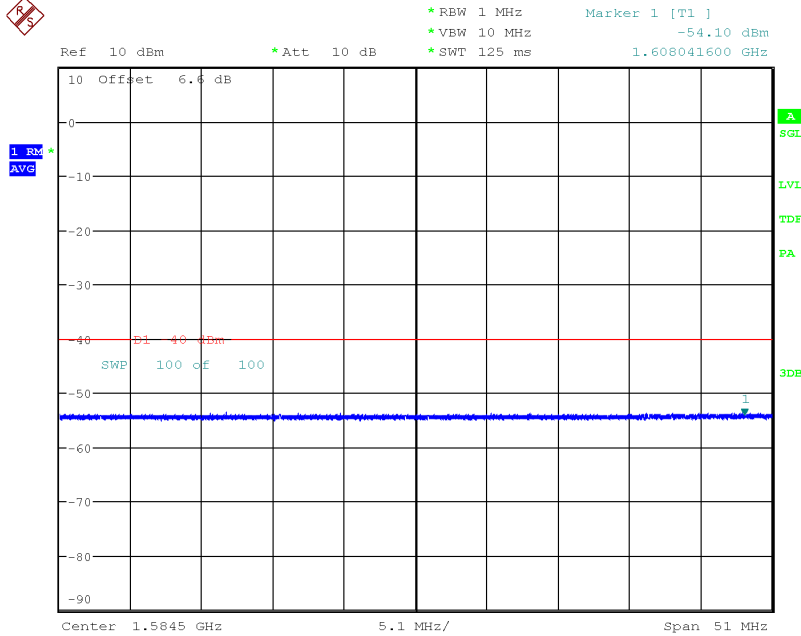
Diagram 3.3c NR: TM1.1,NB IoT : N-TM, M<sub>10NR(50)</sub>, 1 – 8 GHz, Port A:





Date: 11.SEP.2024 12:46:38

Diagram 3.3d NR: TM1.1,NB IoT : N-TM, M<sub>10NR(50)</sub>, 1559 – 1610 MHz, Port A:



Date: 10.SEP.2024 09:34:02

**Photos of test object**

Front side



Rear side



Left side



Right side



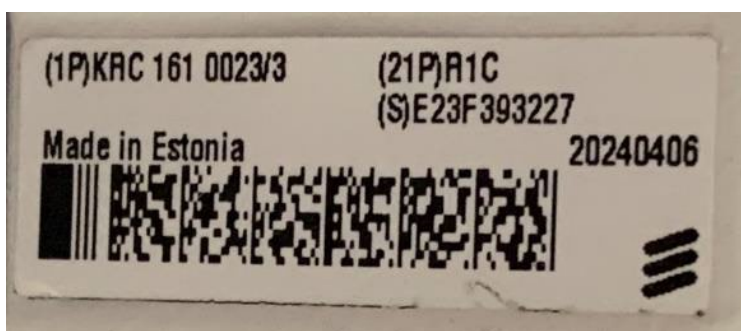
Bottom side



Top side



Test object label:



End of report.

# Verification

Transaction 09222115557528373719

## Document

**P122228-F2-2 Rev1**

Main document

35 pages

*Initiated on 2024-10-01 11:43:58 CEST (+0200) by Björn Skönvall (BS)*

*Finalised on 2024-10-01 13:48:59 CEST (+0200)*

## Signatories

**Björn Skönvall (BS)**

*bjorn.skonvall@ri.se*



*Signed 2024-10-01 11:44:30 CEST (+0200)*

**Daniel Lundgren (DL)**

*Daniel.lundgren@ri.se*



*Signed 2024-10-01 13:48:59 CEST (+0200)*

This verification was issued by Scrive. Information in italics has been safely verified by Scrive. For more information/evidence about this document see the concealed attachments. Use a PDF-reader such as Adobe Reader that can show concealed attachments to view the attachments. Please observe that if the document is printed, the integrity of such printed copy cannot be verified as per the below and that a basic print-out lacks the contents of the concealed attachments. The digital signature (electronic seal) ensures that the integrity of this document, including the concealed attachments, can be proven mathematically and independently of Scrive. For your convenience Scrive also provides a service that enables you to automatically verify the document's integrity at: <https://scrive.com/verify>

