REPORT

issued by an Accredited Testing Laboratory

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Date	Reference	Page
2020-10-27	2P06689-NR	1 (162)

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Radio measurements on Radio 4480 44B2/B25 44B66A C equipment with FCC ID TA8AKRC161844 and IC 287AB-AS161844

Product name: Radio 4480 44B2/B25 44B66A C
Product number: KRC 161 844/1 and KRC 161 844/3

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Vehicles and Automation – EMC-IKT

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SWEDAC ACKREDITERING
Accred. No. 1002
Testing
ISO/IEC 17025

Summary

Standard Listed part of		Compliant
FCC CFR 47 part 24 and part 27/ RSS-133, RSS-139, RSS-Gen		
2.1046/ 6.4/ 6.5	RF power output	Yes
2.1049/ 4.6.1 Gen	Occupied bandwidth	Yes
2.1051/ 6.5/ 6.6	Band edge	Yes
2.1051/ 6.5/ 6.6	Spurious emission at antenna terminals	Yes
2.1053/ 6.5/ 6.6	Field strength of spurious radiation	Yes
2.1055/ 6.3/ 6.4	Frequency stability	Yes

Description of the test object

Equipment:	Radio 4480 44B2/B25 44B66A C Product number KRC 161 844/1 and KRC 161 844/3* FCC ID: TA8AKRC161844 IC: 287AB-AS161844 *KRC 161 844/3 is the NEBS version of the same product
HVIN:	AS161844
FVIN:	CXP 901 3268/15, rev. R81JH09
Hardware revision state:	R1A
Radio Access Technology, RAT and Frequency range:	Band 2 (B2): Single RAT: W, L, NB IoT SA, NR Multi RAT: G+W+NB IoT SA, G+L+NB IoT SA, W+L+NB IoT SA, NR+L+NB IoT SA, G+L+NR, W+L+NR TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz Band 25 (B25): Single RAT: W, L, NB IoT SA, NR Multi RAT: W+L+NB IoT SA, NR+L+NB IoT SA, W+L+NR TX: 1930 – 1995 MHz RX: 1850 – 1915 MHz Band 66 (B66): Single RAT: W, L, NB IoT SA, NR Multi RAT: W+L+NB IoT SA, NR+L+NB IoT SA, W+L+NR TX: 2110 – 2180 MHz RX: 1710 – 1780 MHz For WCDMA in B66 the frequencies are as follows: TX: 2110 – 2155 MHz RX: 1710 – 1755 MHz
IBW:	B2: 60 MHz B25: 65 MHz B66: 70 MHz
Output power:	Maximum output power per carrier: NR: 5 MHz: 40 W 10, 15, 20 MHz: 60 W LTE: 1.4 and 3 MHz: 20 W (1.4 MHz and 3 MHz carriers are not supported in B66) 5 MHz: 40 W

10, 15, 20 MHz: 60 W

WCDMA: 40 W

GSM: 20 W (only available in B2)

NB IoT SA: 20 W

Maximum total output power/port: 80 W without optional fan
Maximum total output power/port: 100 W with optional fan
Maximum total output power/band and port: 60 W

Antenna ports B2/B25:	A-D: 4 TX / 4 RX ports
Antenna ports B66:	A-D: 4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing.
RF configuration:	Single and multi-carrier, 1-12 carriers per port for both bands(6 in each band), Non-Contiguous Spectrum (NCS), Contiguous Spectrum (CS). NR: Max 6 carriers per Band and port, TX Diversity, 2x2 MIMO, 4x4 MIMO, Carrier Aggregation (CA) intra-band and inter-band supported. LTE: Max 6 carriers per Band and port, TX Diversity, 2x2 MIMO, 4x4 MIMO, Carrier Aggregation (CA) intra-band and inter-band supported. WCDMA: Max 6 carriers per band and port, 2x2 MIMO, 4x4 MIMO. GSM: Max 4 carriers per port, Single antenna, dual TX and Quad RX. NB IoT SA: Max 2 carriers per band and port. NB IoT Guard Band (GB): Max 1 Anchor PRB + 1 Non-Anchor PRB (For 10 MHz LTE carriers and wider). NB IoT Inband (IB): Max 1 Anchor PRB + 1 Non-Anchor PRB (For 3 MHz LTE carriers and wider).
Channel bandwidths:	NR: 5 MHz, 10 MHz 15 MHz and 20 MHz LTE: 1.4 MHz, 3MHz, 5 MHz, 10 MHz 15 MHz and 20 MHz WCDMA: 5 MHz GSM: 200 kHz NB IoT: 200 kHz

Sub-carrier spacing:	LTE and NR: 15 kHz	
Modulations:	NR: QPSK, 16QAM, 64QAM and 256QAM	
	LTE: QPSK, 16QAM, 64QAM and 256QAM	
	WCDMA: QPSK, 16QAM and 64QAM	
	GSM: GMSK, AQPSK and 8-PSK	
	NB IoT SA/ GB/ IB: QPSK, BPSK (BPSK is for up link only)	
Emission designators:	NR:	5 MHz: 4M50W7D 10 MHz: 9M29W7D 15 MHz: 14M2W7D 20 MHz: 18M9W7D 35 MHz: 33M9W7D (15+20 MHz, Carrier aggregation, only B66)
	LTE with and without NB IoT IB:	1.4 MHz BW:1M10W7D 3 MHz BW:2M69W7D 5 MHz BW: 4M48W7D 10 MHz BW: 8M97W7D 15 MHz BW: 13M5W7D 20 MHz BW: 17M9W7D 40 MHz BW: 37M8W7D (2x20 MHz, Carrier Aggregation)
	WCDMA:	4M20F9W
	GSM:	GMSK: 245KGXW AQPSK: 241KGXW 8PSK: 245KG7W
	NB IoT SA:	200KW7D
	LTE with NB IoT GB:	10 MHz BW: 9M39W7D 15 MHz BW: 14M0W7D 20 MHz BW: 18M4W7D
RF power Tolerance:	+0.6/ -2.5 dB	
CPRI Speed	Up to 10.1 Gbit/s	
Nominal supply voltage:	-48VDC	

The information above is supplied by the manufacturer.

Tested configurations in this report:	Single RAT: NR Multi RAT: NR+LTE+GSM, NR+LTE+ NB IoT SA, NR+LTE +WCDMA

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 24 and Part 27, ISED RSS-133, RSS-139 and RSS-Gen.

Origin of test data

The test data in this report if from measurements performed on a similar version of this radio. Justification of the test data reuse is addressed in the operational description document included in the filing.

Operation modes during measurements

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.

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.

WCDMA measurements were performed with the test object transmitting the Test model 1 which are defined in 3GPP TS 25.141. Test model 1 (TM1) represent QPSK modulation. Test model 5 (TM5) includes the 16QAM modulation and Test model 6 (TM6) includes the 64QAM modulation. Test model TM1 was used for all measurements representing worst case.

GSM measurements were performed with the test object transmitting GMSK modulation representing worst case.

NB IoT SA (Stand Alone)
NB IoT SA measurements were performed with the test object transmitting test model N-TM representing QPSK as defined in 3GPP TS 36.141.

B2 and B25 overlap each other. They both have the same lower edge but the upper edge for B25 is 5 MHz higher. For measurements on middle configuration, the middle frequency for B25 was deemed representative for both bands. For band edge measurements on the top frequency configuration the measurements were repeated for the upper edge of both B2 and B25.

For all measurements the radio was configured with the total output power of 80 watts per port. For measurements noted with B25 max power configuration the Carrier(s) were configured with the maximum possible output power for the Carrier(s) in that band. The carrier in B66 was a 10 MHz NR carrier on 2145 MHz configured with the necessary output power to reach the maximum total power per port of 80 watts.

For measurements noted with B66 max power configuration, the Carrier(s) were configured with the maximum possible output power for the Carrier(s) in that band. The carrier in B2/25 was a 10 MHz NR carrier on 1962.5 MHz configured with the necessary output power to reach the maximum total power per port of 80 watts.

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.

Radiated measurements

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

EUT Emission= SA reading + (CableLosses – Antenna gain(dBi) + TheoreticalPathloss + FilterLoss – LNAgain)

The correction factors are stored in R&S EMC 32 software as separate files and activated as applicable in the Hardware setup, for each measurement configuration. Emissions close or above the limit is verified with the substitution method where the EUT is replaced by a signal generator and an Antenna with known gain.

Test facility

The used semi-anechoic chamber is compliant with ANSI C63.4. RISE is an ISO 17025 accredited test facility for Electromagnetic Compatibility (EMC) and Radio testing. RISE is a Recognized Lab under FCC and ISED (registration No. 3482A) rules for the scope of standards used in this test report.

References

Measurements were done according to relevant parts of the following standards:
ANSI C63.4-2014+ C63.4a-2017
ANSI C63.5-2017
ANSI C63.26-2015
CFR 47 part 2, March 2020
CFR 47 part 24, March 2020
CFR 47 part 27, March 2020
KDB 484596 D01 Referencing Test Data v01
KDB 971168 D03 IM Emission Repeater Amp v01
3GPP TS 25.141, version 15.3.0
3GPP TS 36.141, version 15.3.0
3GPP TS 38.141-1, version 15.4.0
RSS-Gen Issue 5 Amendment 1
RSS-133 Issue 6 Amendment 1
RSS-139 Issue 3

Measurement equipment

	Calibration Due	RISE number
Test site Tesla	2022-12	503 881
Test site Marconi	-	15:121
R&S ESU 40	2021-07	901 385
R&S FSQ 40	2021-07	504 143
R&S FSW 43	2021-07	902 073
Control computer with R&S software EMC32 version 10.20.01	-	BX62351
Directional coupler	2021-02	901 496
RF attenuator	2021-02	902 282
High pass filter 3-27 GHz	2021-02	901 502
High pass filter 3-27 GHz	2021-02	BX40074
Coaxial cable Megaphase	2021-02	BX50191
Coaxial cable Sucoflex 102EA	2021-02	BX50236
Coaxial cable Sucoflex 102EA	2021-02	BX50237
Coaxial cable, Tesla emission	2021-06	BX91490
Coaxial cable	2021-09	503 508
Coaxial cable	2021-09	503 509
Teseq BiConiLog Antenna CBL6143A	2022-09	BX92331
EMCO Horn Antenna 3115	2021-07	502 175
Flann Standard Gain Horn 20240-20	-	BX92412
Miteq, Low Noise Amplifier 18-40 GHz	2021-01	503 278
Coaxial cable	2021-02	503 697
EMCO Horn Antenna 3116	2021-07	503 279
µComp Nordic, Low Noise Amplifier	2021-01	901 545
Temperature and humidity meter, Testo 635	2021-06	504 203
Temperature and humidity meter, Testo 625	2021-06	504 188

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).
Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

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

Delivery of test object

The test object was delivered: 2020-02-10.

Manufacturer’s representative

Mikael Jansson, Ericsson AB.

Test engineers

Tomas Isbring and Andreas Björnqvist for radiated tests, RISE
Tomas Lennhager and Karl Flysjö for conducted tests, RISE.

Test participant(-s)

None.

Test frequencies used for conducted measurements

B25 NR:

Frequency [MHz]	Symbolic name	Comment
1932.5	B_{5NR}	TX bottom frequency, 46 dBm output power
1935.0	B_{10NR}	TX bottom frequency, 47.8 dBm output power
1937.5	B_{15NR}	TX bottom frequency, 47.8 dBm output power
1940.0	B_{20NR}	TX bottom frequency, 47.8 dBm output power
1962.5	M_{5NR}	TX middle frequency, 46 dBm output power
1962.5	M_{10NR}	TX middle frequency, 47.8 dBm output power
1962.5	M_{15NR}	TX middle frequency, 47.8 dBm output power
1962.5	M_{20NR}	TX middle frequency, 47.8 dBm output power
1992.5	T_{5NR}	TX top frequency, 46 dBm output power
1990.0	T_{10NR}	TX top frequency, 47.8 dBm output power
1987.5	T_{15NR}	TX top frequency, 47.8 dBm output power
1985.0	T_{20NR}	TX top frequency, 47.8 dBm output power
1932.5 1937.5 1992.5	Bim_{5NR}	TX constellation for Bim, 43 dBm output power per carrier (47.8 dBm total output power).
1932.5 1987.5 1992.5	Tim_{5NR}	TX constellation for Tim, 43 dBm output power per carrier (47.8 dBm total output power).
1950.0 1955.0 1960.0 1965.0 1970.0 1975.0	$M6_{5NR}$	TX max carriers constellation, 40 dBm output power per carrier (47.8 dBm total output power).

B2 NR:

Frequency [MHz]	Symbolic name	Comment
1987.5	T_{5NR}	TX top frequency, 46 dBm output power
1985.0	T_{10NR}	TX top frequency, 47.8 dBm output power
1982.5	T_{15NR}	TX top frequency, 47.8 dBm output power
1980.0	T_{20NR}	TX top frequency, 47.8 dBm output power

The RX frequency was configured 80 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

B66 NR:

Frequency [MHz]	Symbolic name	Comment
2112.5	B_{5NR}	TX bottom frequency, 46 dBm output power
2115.0	B_{10NR}	TX bottom frequency, 47.8 dBm output power
2117.5	B_{15NR}	TX bottom frequency, 47.8 dBm output power
2120.0	B_{20NR}	TX bottom frequency, 47.8 dBm output power
2145.0	M_{5NR}	TX middle frequency, 46 dBm output power
2145.0	M_{10NR}	TX middle frequency, 47.8 dBm output power
2145.0	M_{15NR}	TX middle frequency, 47.8 dBm output power
2145.0	M_{20NR}	TX middle frequency, 47.8 dBm output power
2177.5	T_{5NR}	TX top frequency, 46 dBm output power
2175.0	T_{10NR}	TX top frequency, 47.8 dBm output power
2172.5	T_{15NR}	TX top frequency, 47.8 dBm output power
2170.0	T_{20NR}	TX top frequency, 47.8 dBm output power

2112.5 2117.5 2177.5	Bim_{5NR}	TX constellation for Bim, 43 dBm output power per carrier (47.8 dBm total output power).
2112.5 2172.5 2177.5	Tim_{5NR}	TX constellation for Tim, 43 dBm output power per carrier (47.8 dBm total output power).
2132.5 2137.5 2142.5 2147.5 2152.5 2157.5	$M6_{5NR}$	TX max carriers constellation, 40 dBm output power per carrier (47.8 dBm total output power).
2135.0 2152.5	$CA_{M15-20NR}$	Carrier Aggregation TX middle 15 MHz + 20 MHz configuration, 44.8 dBm output power per carrier (47.8 dBm total output power).

The RX frequency was configured 400 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

B2 NR+LTE+GSM:

Frequency [MHz]	Symbolic name	Comment
G=1930.4 L=1949.3 NR=1987.5	Bim_{NR+L+G}	TX constellation for Bim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR=1932.5 L=1970.7 G=1989.6	Tim_{NR+L+G}	TX constellation for Tim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR_1=1932.5 L_1=1950.7 G_1=1955.0 L_2=1965.0 G_2=1969.8 NR_2=1987.5	Max_{NR+L+G}	TX max carriers constellation, NR carriers with 5 MHz BW, LTE carriers with 1.4 MHz BW, 40 dBm output power per carrier (47.8 dBm total output power).

B25 NR+LTE+NB IoT SA:

Frequency [MHz]	Symbolic name	Comment
IoT=1930.2 L=1949.3 NR=1992.5	$Bim_{NR+L+IoT}$	TX constellation for Bim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR=1932.5 L=1975.7 IoT=1994.8	$Tim_{NR+L+IoT}$	TX constellation for Tim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR_1=1932.5 L_1=1953.2 IoT_1=1960.0 L_2=1965.0 IoT_2=1971.8 NR_2=1992.5	$Max_{NR+L+IoT}$	TX max carriers constellation, NR carrier with 5 MHz BW, LTE carriers with 1.4 MHz BW, 40 dBm output power per carrier (47.8 dBm total output power).

B66 NR+LTE+NB IoT SA:

Frequency [MHz]	Symbolic name	Comment
IoT=2110.2 L=2127.5 NR=2177.5	$Bim_{NR+L+IoT}$	TX constellation for Bim, NR carrier with 5 MHz BW, LTE carrier with 5 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR=2112.5 L=2162.5 IoT=2179.8	$Tim_{NR+L+IoT}$	TX constellation for Tim, NR carrier with 5 MHz BW, LTE carrier with 5 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR_1=2112.5 L_1=2133.2 IoT_1=2140.0 L_2=2145.0 IoT_2=2151.8 NR_2=2177.5	$Max_{NR+L+IoT}$	TX max carriers constellation, NR carriers with 5 MHz BW, LTE carriers with 5 MHz BW, 40 dBm output power per carrier (47.8 dBm total output power).

B25 NR+LTE+WCDMA

Frequency [MHz]	Symbolic name	Comment
NR=1932.5 L=1947.3 W=1992.6	Bim_{NR+L+W}	TX constellation for Bim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
W=1932.4 L=1975.7 NR=1992.5	Tim_{NR+L+W}	TX constellation for Tim, NR carrier with 5 MHz BW, LTE carrier with 1.4 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR_1=1932.5 W_1=1940.0 L_1=1953.2 L_2=1971.8 W_2=1985.0 NR_2=1992.5	Max_{NR+L+W}	TX max carrier constellation, NR carriers with 5 MHz BW, LTE carriers with 1.4 MHz BW, 40 dBm output power per carrier (47.8 dBm total output power).

The RX frequency was configured 80 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

B66 NR+LTE+WCDMA

Frequency [MHz]	Symbolic name	Comment
NR=2112.5 W=2127.6 L=2177.5	Bim_{NR+L+W}	TX constellation for Bim, NR carrier with 5 MHz BW, LTE carrier with 5 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
W=2112.4 L=2162.5 NR=2177.5	Tim_{NR+L+W}	TX constellation for Tim, NR carrier with 5 MHz BW, LTE carrier with 5 MHz BW, 43 dBm output power per carrier (47.8 dBm total output power).
NR_1=2112.5 W_1=2120.0 L_1=2132.5 W_2=2150.0 L_2=2165.0 NR_2=2177.5	Max_{NR+L+W}	TX max carriers constellation, NR carriers with 5 MHz BW, LTE carriers with 1.4 MHz BW, 40 dBm output power per carrier (47.8 dBm total output power).

Test frequencies used for radiated measurements

B2/25 and B66

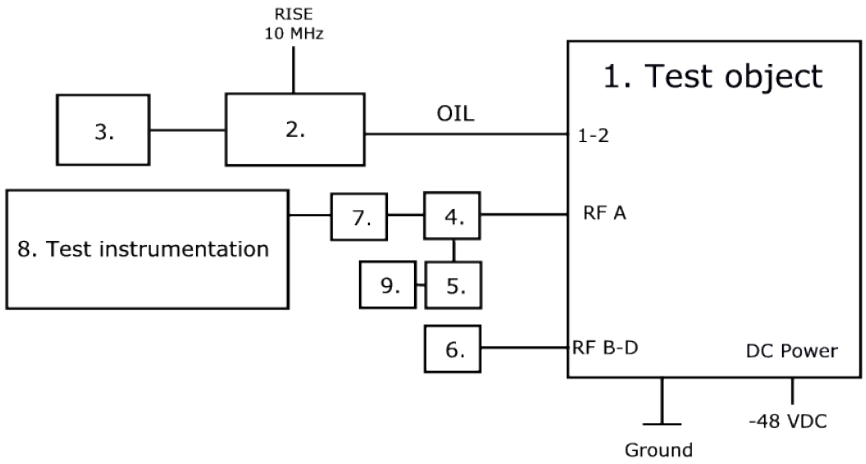
Frequency [MHz]	Symbolic name	Comment
1992.5 2177.5	T_{5NR}	TX top frequency in 5 MHz BW configuration in B25 and B66
1992.5 2177.5	$T_{5NR+5LTE}$	TX top frequency in 5 MHz BW configuration, NR carrier in B25 and LTE carrier in B66
1990.0 2177.5	$T_{10NR+5LTE}$	TX top frequency in 10 MHz BW configuration for NR in B25 and in 5 MHz BW configuration for LTE in B66

For B2/25 the RX frequency was configured 80 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

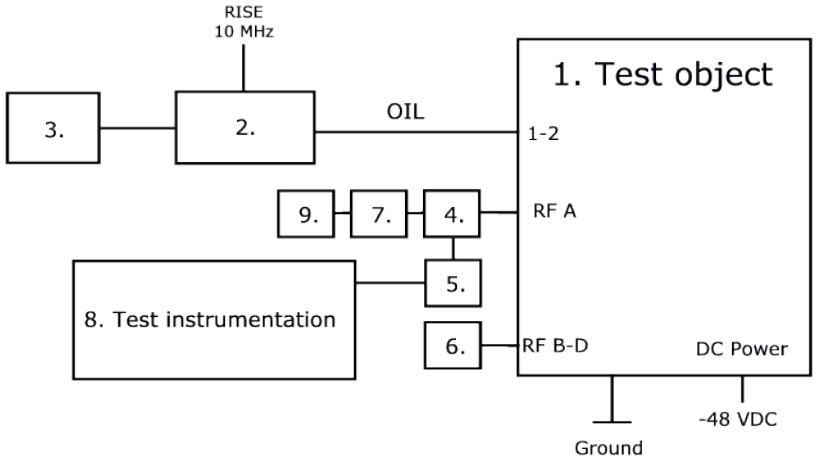
For B66 the RX frequencies were configured 400 MHz below the corresponding TX frequency according to the applicable duplex offset for the operating band.

Test setup: conducted measurements

Setup for measurements from 9 kHz to 3 GHz.



Setup for measurements from 3 GHz to 22GHz.



Test object:

1.	Radio 4499 44B2/B25 44B66A C, KRC 161 847/1, rev. R1A, s/n: E23B067325 With Radio Software: CXP 901 3268/15, rev. R81JH09 FCC ID: TA8AKRC161847, IC: 287AB-AS161847

Associated equipment:

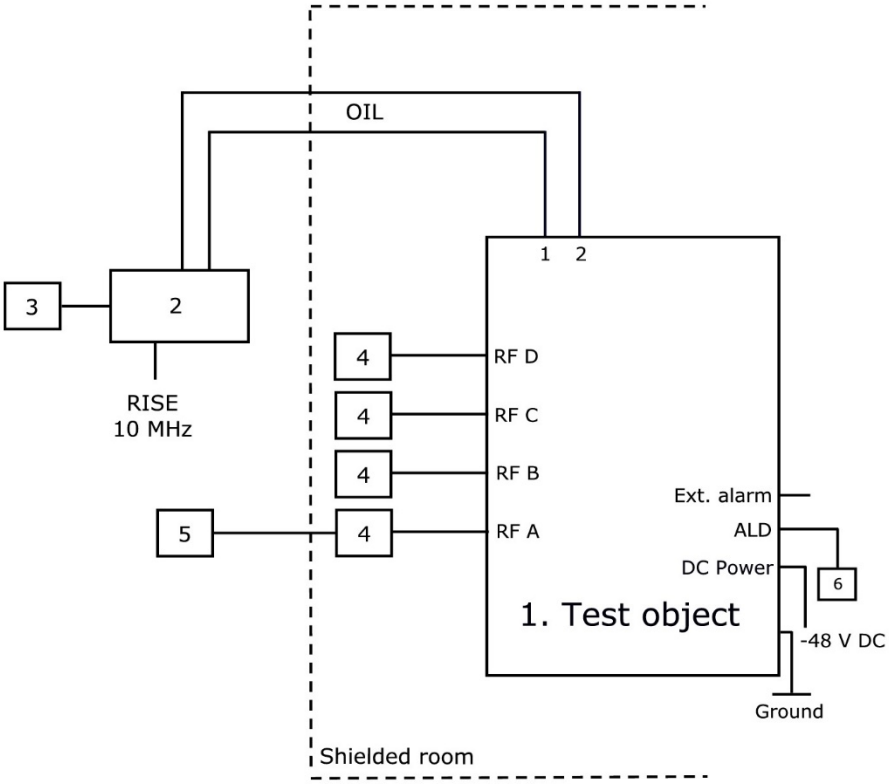
2.	Testing Equipment: CT10, LPC 102 487/1, rev. R1C, s/n: T01F265039, BAMS – 1001908401 with software CXC 173 5312/29, rev. R1A02

Functional test equipment:

3.	Computer, HP ZBook 15u G3, BAMS - 1001835579
4.	Directional Coupler: RISE-number: 901 496
5.	High pass filter 3-27 GHz: RISE-Number: 901 502
6.	50 ohm terminator on each port

7.	RF Attenuator: RISE number: 902 282
8.	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.
9.	50 ohm SMA terminator.

Test setup: radiated measurements



1.	Radio 4499 44B2/B25 B66A C, KRC 161 847/1, rev. R1A, s/n: E23B067329 With Radio Software: CXP 901 3268/15, rev. R81JH09. FCC ID: TA8AKRC161847, IC: 287AB-AS161847

Associated equipment:

2.	Testing Equipment: CT10, LPC 102 487/1, rev. R1C, s/n: T01F265031, BAMS – 1000797753 with software CXC 173 5312/25, rev. R1A07

Functional test equipment:

3.	HP EliteBook 8560w, BAMS – 1001236854
4.	Attenuator/ Terminator
5.	R&S ESIB 26, SP no: 503 292 for supervision purpose only
6.	Remote Control Unit, ANDREW Model: ATM200-A20, Serial: CN10151085133

Interfaces:

Power input configuration DC: -48 VDC	Power
RF A-D, 4.3-10 connector, combined TX/RX	Antenna
1, Optical Interface Link, single mode opto fibre	Signal
2, Optical Interface Link, single mode opto fibre	Signal
ALD Control, shielded multi-wire	Signal
EXT Alarm, shielded multi-wire	Signal
Ground wire	Ground

RF power output measurements according to CFR 47 §24.232 and §27.50/ RSS-133 6.4, RSS-139 5.5 conducted

Date	Temperature	Humidity
2020-06-17	22 °C ± 3 °C	52 % ± 5 %
2020-06-18	22 °C ± 3 °C	56 % ± 5 %
2020-06-23	22 °C ± 3 °C	52 % ± 5 %
2020-06-25	23 °C ± 3 °C	49 % ± 5 %
2020-07-01	23 °C ± 3 °C	51 % ± 5 %
2020-08-12	23 °C ± 3 °C	50 % ± 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 CDF mode. A resolution bandwidth of 80 MHz was used if not otherwise specified.

Measurement equipment	RISE number
R&S FSW 43	902 073
R&S FSQ 40	504 143
Directional coupler	901 496
RF attenuator	902 282
Coaxial cable Megaphase	BX50191
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results NR

B25 max power configuration:

Single carrier NR-FR1-TM1.1

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

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
B_{5NR}	45.37/8.90	45.03/8.90	44.95/8.90	45.00/8.90	51.11
M_{5NR}	45.47/8.86	45.33/8.86	45.23/8.88	45.30/8.86	51.35
T_{5NR}	45.30/8.88	45.03/8.88	44.97/8.88	44.98/8.90	51.09

[1)]: 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.

	Output power per 1 MHz [RMS dBm]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[2)]
M_{5NR}	39.58	39.61	39.45	39.58	45.61

[2)]: 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.

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
B_{20NR}	46.90/7.72	47.02/7.72	47.04/7.68	47.28/7.72	53.08
M_{10NR}	47.03/7.42	47.19/7.42	47.09/7.42	47.16/7.42	53.14
M_{15NR}	47.00/7.48	47.16/7.48	47.07/7.48	47.14/7.48	53.11
M_{20NR}	47.01/7.46	47.15/7.46	47.09/7.46	47.19/7.46	53.13
T_{20NR}	47.06/7.56	47.17/7.56	47.08/7.56	47.13/7.56	53.13

[1)]: 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 47.8 dBm/ port.

	Output power per 1 MHz [RMS dBm]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[2)]
M_{10NR}	38.58	38.34	38.26	38.21	44.58
M_{15NR}	36.43	36.55	36.48	36.38	42.55
M_{20NR}	35.26	35.30	35.14	35.25	41.30

[2)]: 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.

Multi carrier NR-FR1-TM1.1

CCDF resolution bandwidth of 50 MHz was used for the measurements in the table below.

Rated output power level at each RF port 6x 40 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
$M6_{5NR}$	47.05/7.33	47.50/7.31	47.53/7.31	47.59/7.31	53.44

[1)]: 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.

B66 max power configuration:

CCDF resolution bandwidth of 50 MHz was used for the entirety of B66.

Single carrier NR-FR1-TM1.1

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

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
B_{5NR}	45.09/8.92	45.13/8.88	45.09/8.88	45.31/8.88	51.18
M_{5NR}	45.30/8.87	45.59/8.85	45.33/8.88	45.31/8.88	51.40
T_{5NR}	45.01/8.89	45.08/8.88	45.02/8.91	44.99/8.91	51.05

[1)]: 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.

	Output power per 1 MHz [RMS dBm]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[2)]
M_{5NR}	39.55	39.63	39.53	39.58	45.63

[2)]: 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.

Rated output power level at each RF port 1x 47.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
B_{20}	47.19/7.50	47.18/7.50	47.14/7.50	47.16/7.50	53.19
M_{10NR}	47.12/7.43	47.16/7.40	47.21/7.40	47.25/7.40	53.21
M_{15NR}	47.08/7.48	47.12/7.47	47.18/7.47	47.21/7.47	53.17
M_{20NR}	47.09/7.48	47.19/7.47	47.18/7.47	47.20/7.47	53.19
T_{20}	47.10/7.57	47.17/7.56	47.15/7.56	47.13/7.60	53.16

[1)]: 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 47.8 dBm/ port.

	Output power per 1 MHz [RMS dBm]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[2)]
M_{10NR}	38.26	38.40	38.33	38.41	44.41
M_{15NR}	36.38	36.56	36.48	36.51	42.56
M_{20NR}	35.18	35.20	35.39	35.18	41.39

[2)]: 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.

Multi carrier NR-FR1-TM1.1

Rated output power level at each RF port 6x 40 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
$M6_{5NR}$	47.05/7.33	47.50/7.31	47.53/7.31	47.59/7.31	53.44

[1)]: 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.

Carrier aggregation NR-FR1-TM1.1

Rated output power level at each RF port 2x 44.8 dBm/ port.

	Output power CCDF [RMS dBm/ PAR dB]				
Symbolic name	Port RF A	Port RF B	Port RF C	Port RF D	Total power[1)]
$CA_{M15\text{-}20NR}$	47.04/7.37	47.19/7.37	47.19/7.37	47.14/7.37	53.16

[1)]: 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.

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.

Limits

§24.232 and RSS-133 6.4/SRSP-510 5.1.1
The maximum output power may not exceed 3280 W/MHz (EIRP).
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.

§27.50 (d) an RSS-139 6.5/SRSP-513 5.1.1
The maximum output power may not exceed 3280 W/MHz (EIRP).
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.

Complies?	Yes

Occupied bandwidth measurements according to CFR47 2.1049/ RSS-Gen 4.6.1

Date	Temperature	Humidity
2020-06-17	22 °C ± 3 °C	52 % ± 5 %
2020-06-18	22 °C ± 3 °C	56 % ± 5 %
2020-06-22	22 °C ± 3 °C	51 % ± 5 %
2020-06-25	23 °C ± 3 °C	49 % ± 5 %
2020-06-26	22 °C ± 3 °C	47 % ± 5 %
2020-08-12	23 °C ± 3 °C	50 % ± 5 %
2020-09-21	22 °C ± 3 °C	43 % ± 5 %
2020-09-22	22 °C ± 3 °C	36 % ± 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 with the Peak detector activated in max hold.

Measurement equipment	RISE number
R&S FSW 43	902 073
R&S FSQ 40	504 143
Directional coupler	901 496
RF attenuator	902 282
Coaxial cable Megaphase	BX50191
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 2.6 %

Results

B25 max power configuration:

Single carrier NR-FR1-TM1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1.1	B_{5NR}	RF D	4.469
1.2	B_{20NR}	RF D	18.898
1.3	M_{5NR}	RF D	4.470
1.4	M_{10NR}	RF D	9.285
1.5	M_{15NR}	RF D	14.155
1.6	M_{20NR}	RF D	18.909
1.7	T_{5NR}	RF D	4.495
1.8	T_{20NR}	RF D	18.902

B66 max power configuration:

Single carrier NR-FR1-TM1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1.9	B_{5NR}	RF A	4.475
1.10	B_{20NR}	RF A	18.902
1.11	M_{5NR}	RF A	4.470
1.12	M_{10NR}	RF A	9.288
1.13	M_{15NR}	RF A	14.149
1.14	M_{20NR}	RF A	18.902
1.15	T_{5NR}	RF A	4.468
1.16	T_{20NR}	RF A	18.896

Carrier aggregation NR-FR1-TM1.1

Diagram	Symbolic name	Tested Port	Occupied BW (99%) [MHz]
1.17	CA_{M15-20}	RF A	33.915

Diagram 1.1, NR-FR1-TM1.1, B_{5NR}, Port D:

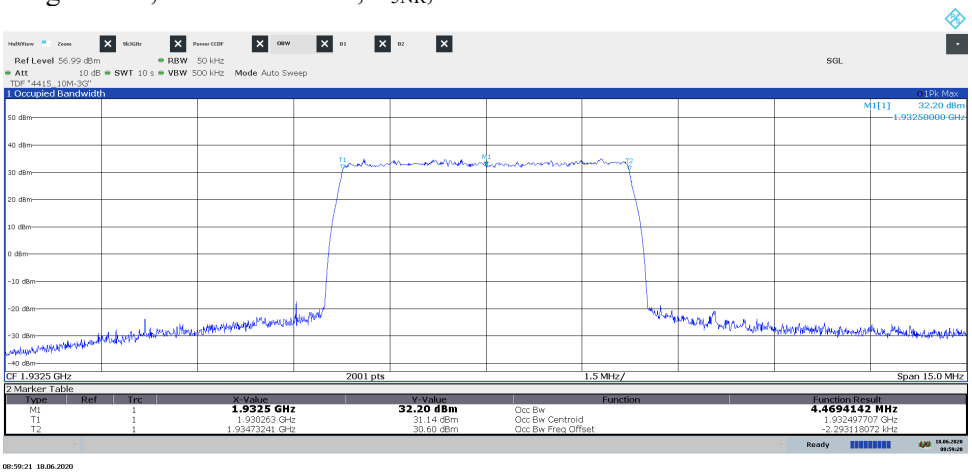


Diagram 1.2, NR-FR1-TM1.1, B_{20NR}, Port D:

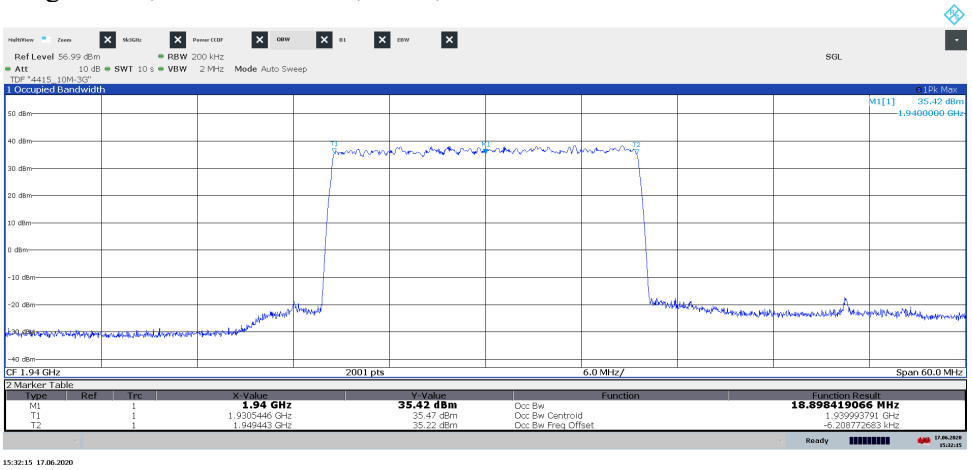


Diagram 1.3, NR-FR1-TM1.1, M_{5NR}, Port D:

Diagram 1.4, NR-FR1-TM1.1, M_{10NR}, Port D:

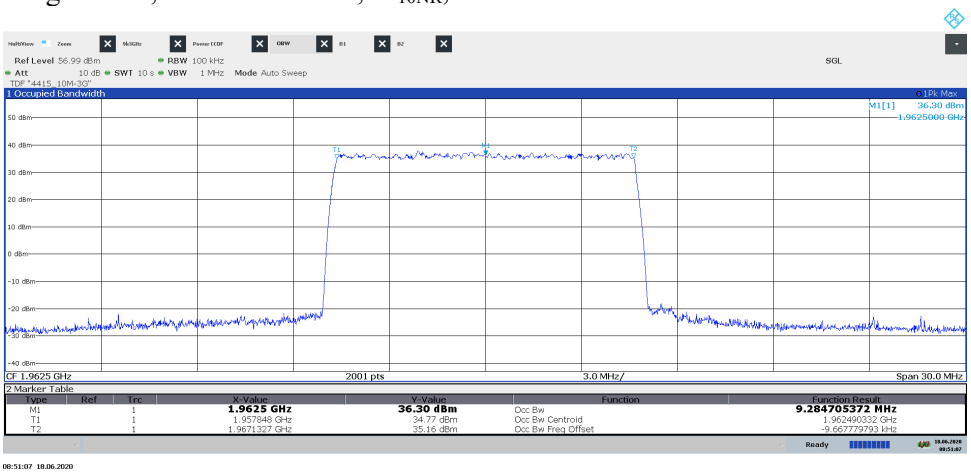


Diagram 1.5, NR-FR1-TM1.1, M_{15NR}, Port D:

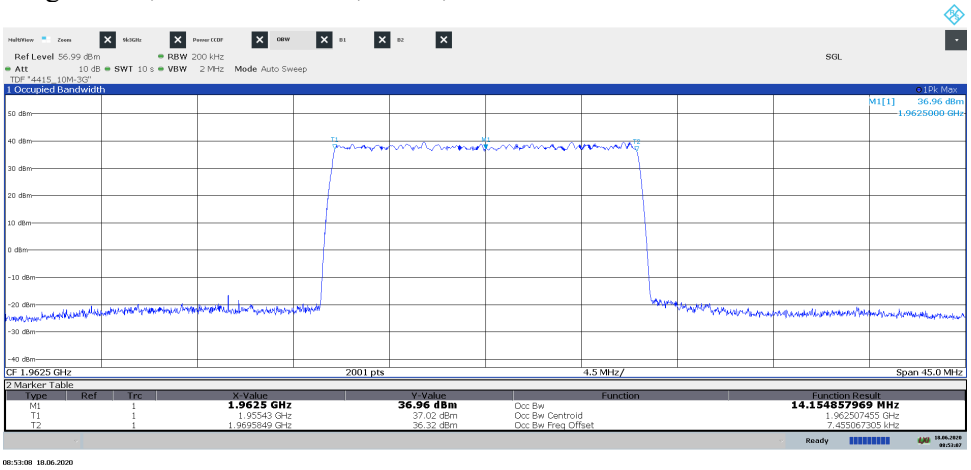


Diagram 1.6, NR-FR1-TM1.1, M_{20NR}, Port D:

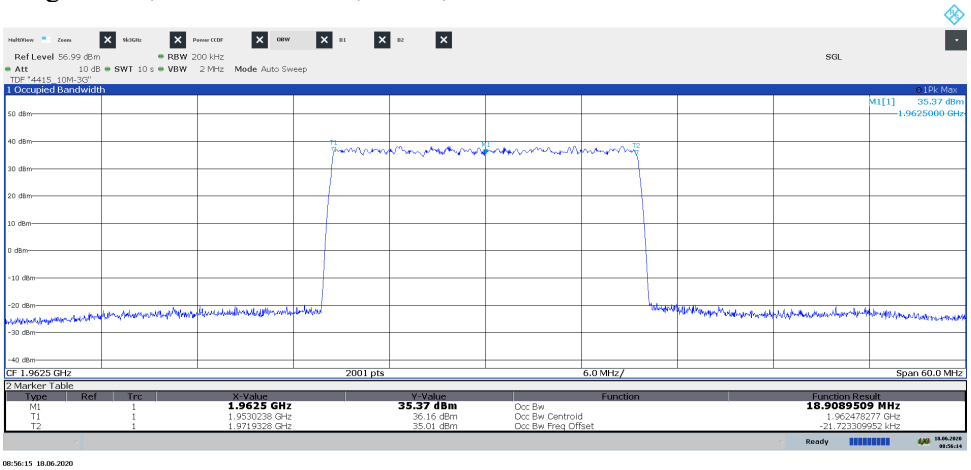


Diagram 1.7, NR-FR1-TM1.1, T_{5NR}, Port D:

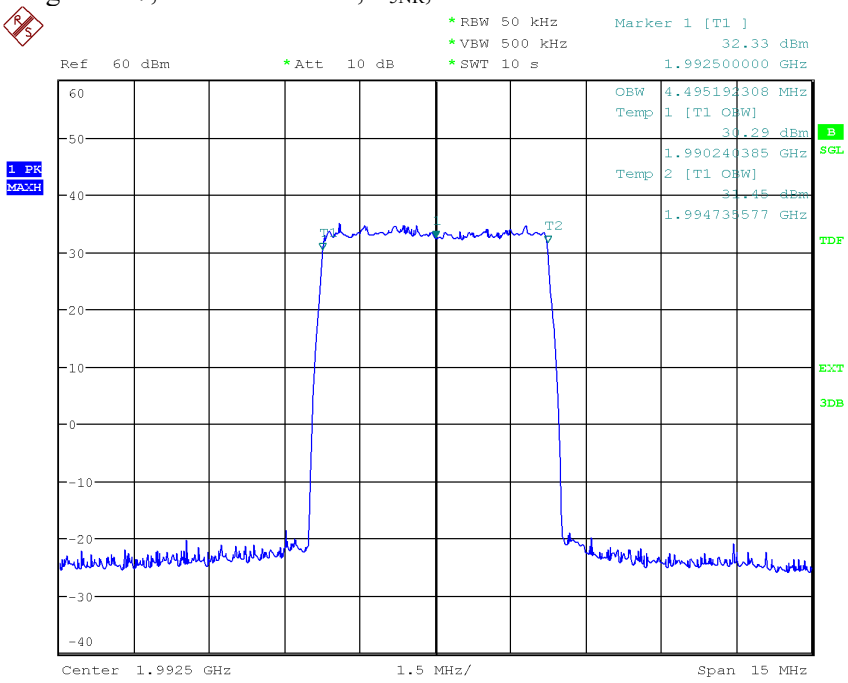


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Diagram 1.8, NR-FR1-TM1.1, T_{20NR}, Port D:

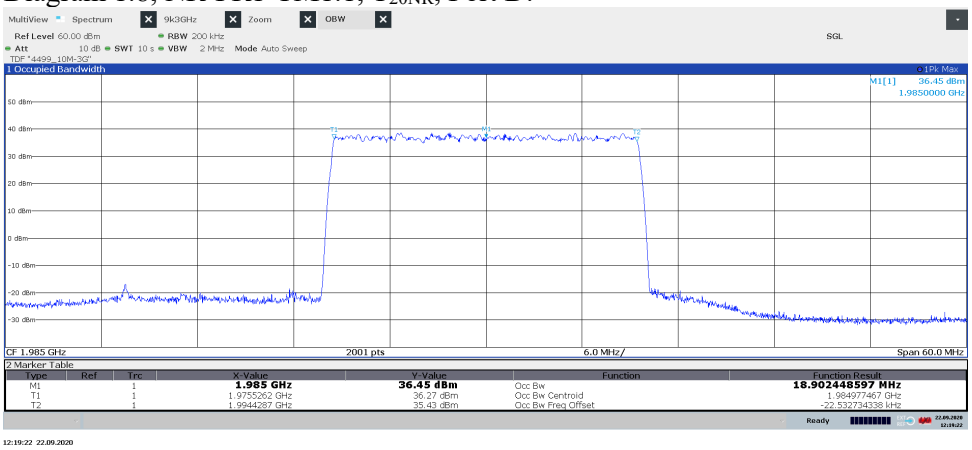


Diagram 1.9, NR-FR1-TM1.1, B_{5NR}, Port A:

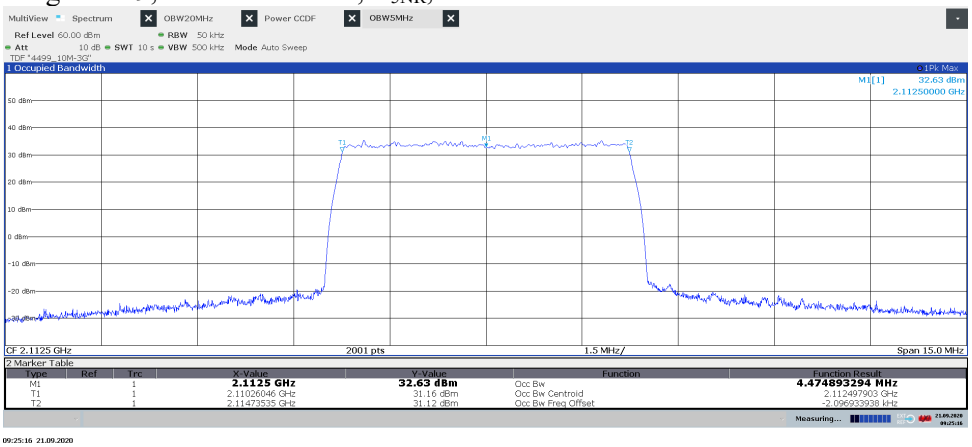


Diagram 1.10, NR-FR1-TM1.1, B_{20NR}, Port A:

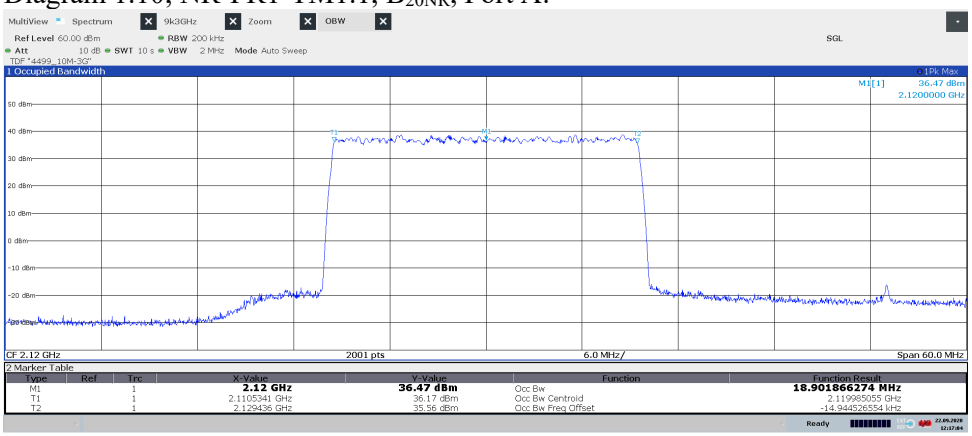


Diagram 1.11, NR-FR1-TM1.1, M_{5NR}, Port A:

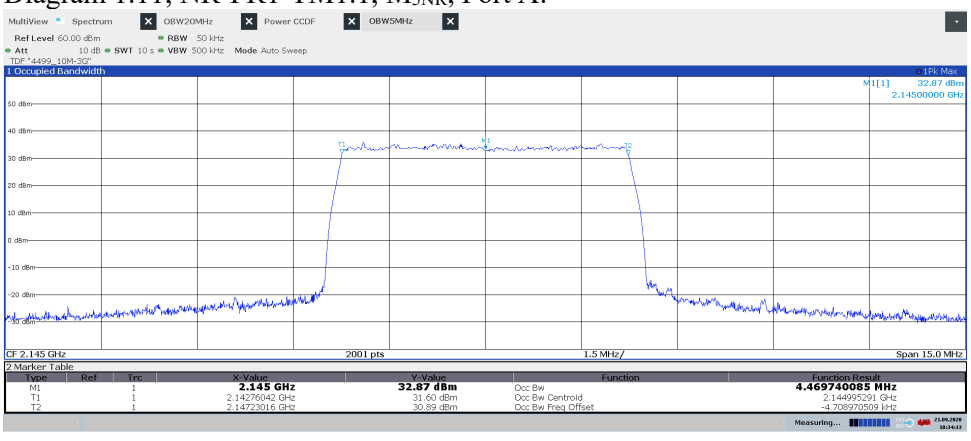


Diagram 1.12, NR-FR1-TM1.1, M_{10NR}, Port A:

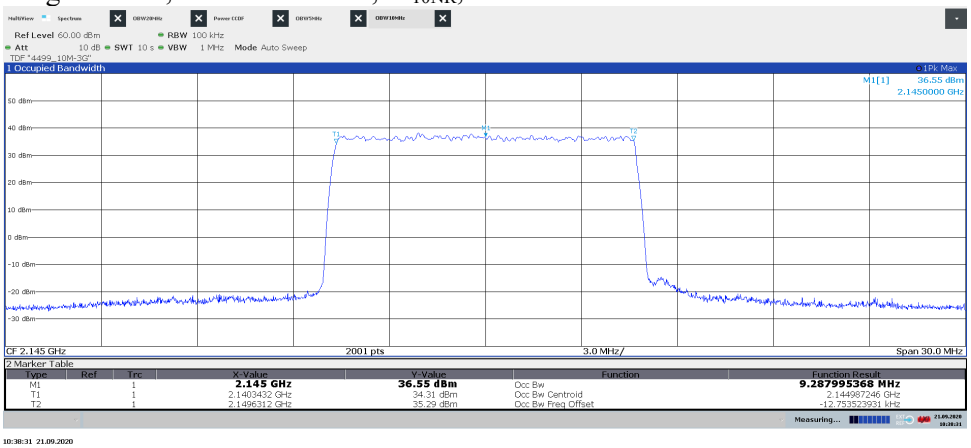


Diagram 1.13, NR-FR1-TM1.1, M_{15NR}, Port A:

Diagram 1.14, NR-FR1-TM1.1, M_{20NR}, Port A:

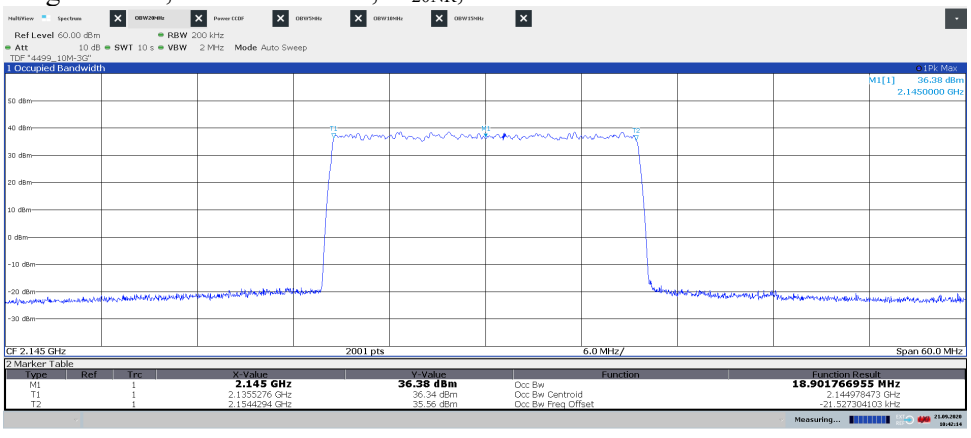


Diagram 1.15, NR-FR1-TM1.1, T_{5NR}, Port A:

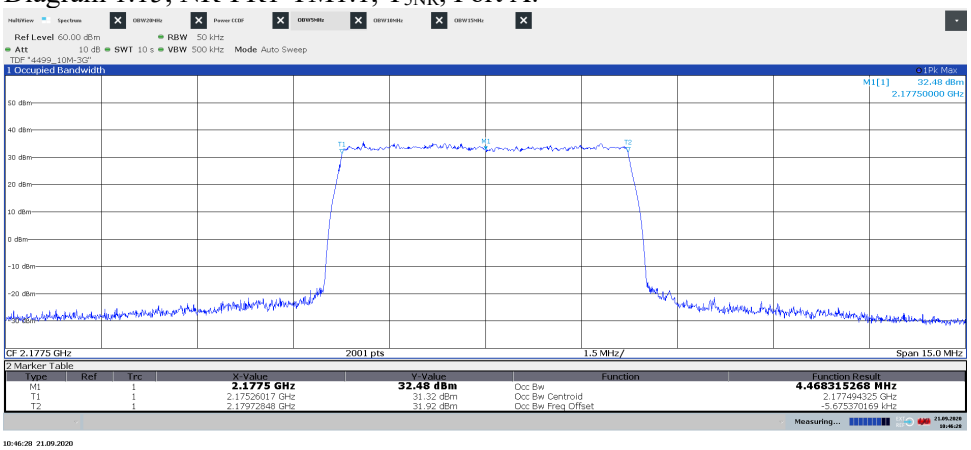


Diagram 1.16, NR-FR1-TM1.1, T_{20NR}, Port A:

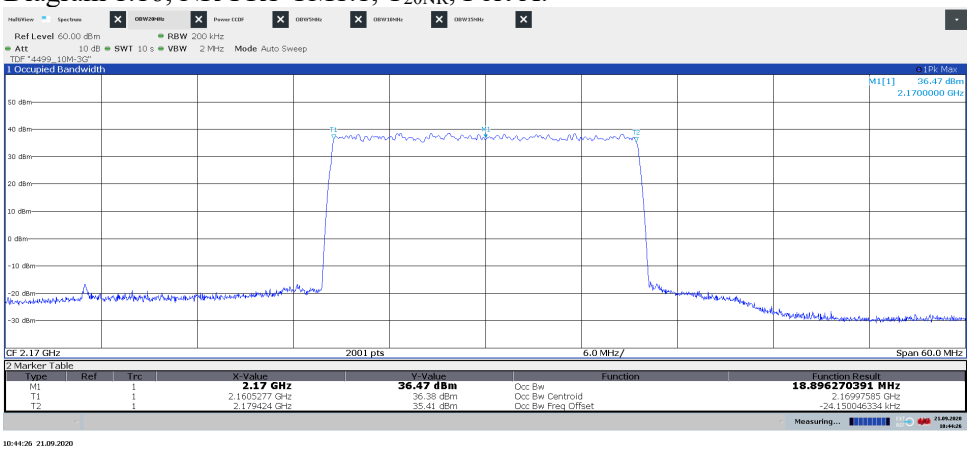
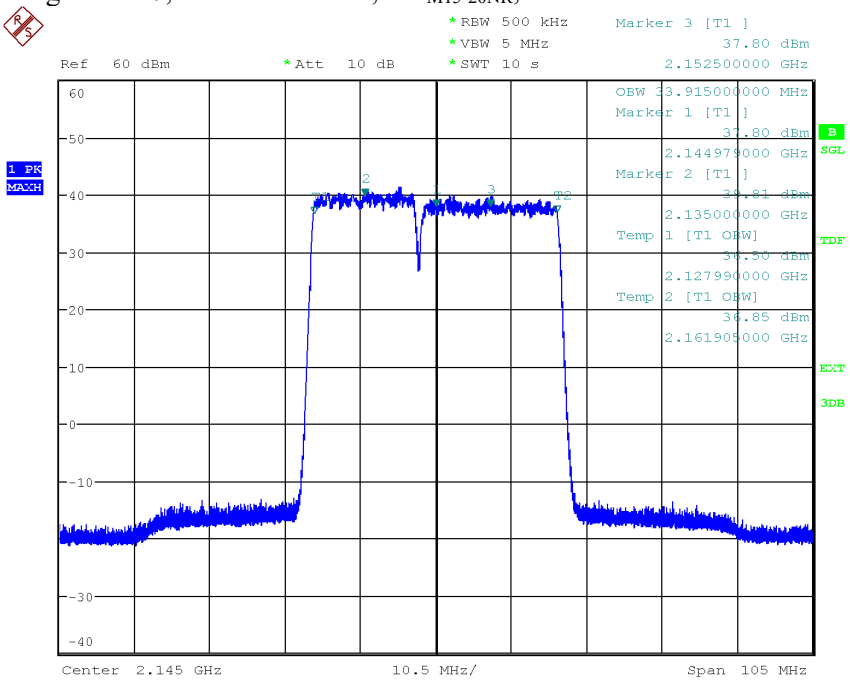


Diagram 1.17, NR-FR1-TM1.1, $CA_{M15\text{-}20NR}$, Port A:



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Band edge measurements according to CFR 47 §24.238 and §27.53/ RSS-133 6.5, RSS-139 6.6

Date	Temperature	Humidity
2020-06-17	22 °C ± 3 °C	52 % ± 5 %
2020-06-18	22 °C ± 3 °C	56 % ± 5 %
2020-06-24	23 °C ± 3 °C	40 % ± 5 %

Test set-up and procedure

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

A RBW of at least 1% of the EBW is to be used up to 1 MHz away from the band edges and for measurements more than 1 MHz from the band edges a RBW of 1 MHz is to be used.

A smaller resolution bandwidth is permitted provided that the measured power is integrated over the full required measurement bandwidth. Measurements up to 1 MHz from the band edge where a smaller RBW was used the limit in the plot is adjusted by 10 $\log_{10}$ ($RBW_{used}/RBW_{specified}$) [dB] according to the following table:

Carrier BW:	RBW_{used}	$RBW_{specified}$ (1% of EBW)	Limit correction	Adjusted limit
15 MHz	100 kHz	148.7 kHz	-1.72 dBm	-14.72 dBm
20 MHz	100 kHz	198.5 kHz	-2.98 dBm	-15.98 dBm

From 1 MHz to 30 MHz away from the band edges a RBW of 100 kHz was used. To compensate for the reduced RBW the limit was adjusted by 10 dB to -23 dBm in this frequency range.

Before comparing the results to the limit, 6 dB [10 $\log_{10}$ (4)] to cover 4x4 MIMO, should be added according to ANSI C63.26 6.4.4.1 c “measure and add 10 $\log_{10}$ (N_{ANT})”.

Measurement equipment	RISE number
R&S FSW 43	902 073
R&S FSQ 40	504 143
Directional coupler	901 496
RF attenuator	902 282
Coaxial cable Megaphase	BX50191
Coaxial cable Sucoflex 102EA	BX50237
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 2.6 dB

Results NR

B25 max power configuration:

Single carrier NR-FR1-TM1.1

Diagram	Symbolic name	Tested Port
2.1 a-b	B_{5NR}	RF D
2.2 a-b	B_{10NR}	RF D
2.3 a-b	B_{15NR}	RF D
2.4 a-b	B_{20NR}	RF D
2.5 a-b	T_{5NR}	RF D
2.6 a-b	T_{10NR}	RF D
2.7 a-b	T_{15NR}	RF D
2.8 a-b	T_{20NR}	RF D

Multi carrier NR-FR1-TM1.1

Diagram	Symbolic name	Tested Port
2.9 a-b	Bim_{NR}	RF D
2.10 a-b	Tim_{NR}	RF D

B2 max power configuration:

Single carrier TM1

Diagram	Symbolic name	Tested Port
2.11 a-b	T_{5NR}	RF D
2.12 a-b	T_{10NR}	RF D
2.13 a-b	T_{15NR}	RF D
2.14 a-b	T_{20NR}	RF D

B66 max power configuration:

Single carrier TM1

Diagram	Symbolic name	Tested Port
2.15 a-b	B_{5NR}	RF A
2.16 a-b	B_{10NR}	RF A
2.17 a-b	B_{15NR}	RF A
2.18 a-b	B_{20NR}	RF A
2.19 a-b	T_{5NR}	RF A
2.20 a-b	T_{10NR}	RF A
2.21 a-b	T_{15NR}	RF A
2.22 a-b	T_{20NR}	RF A

Multi carrier TM1

Diagram	Symbolic name	Tested Port
2.23 a-b	Bim_{NR}	RF A
2.24 a-b	Tim_{NR}	RF A

Limits

CFR 47 §24.238, §27.53(h) and RSS-133 6.5, RSS-139 6.6

i. In the 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 (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P(\text{watts})$.

ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} P(\text{watts})$. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

Complies?	Yes

Diagram 2.1a, NR-FR1-TM1.1, B_{5NR}, Port D:

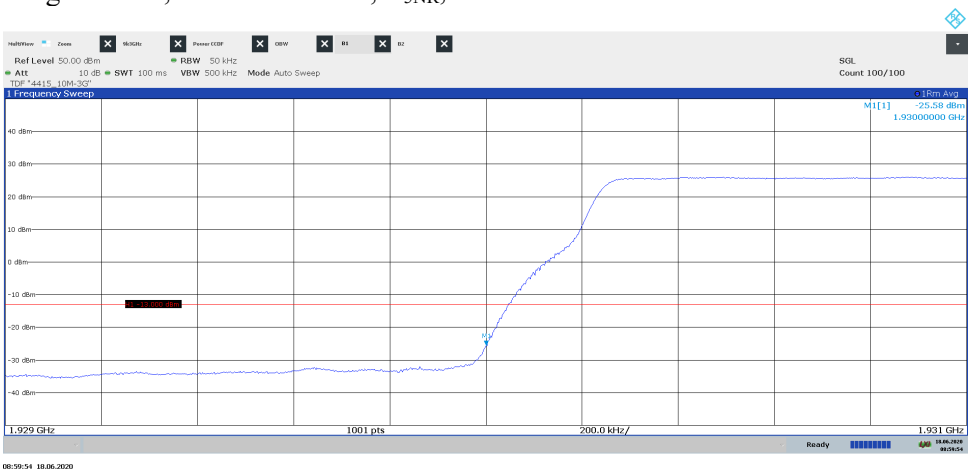

Diagram 2.1b, NR-FR1-TM1.1, B_{5NR}, Port D:

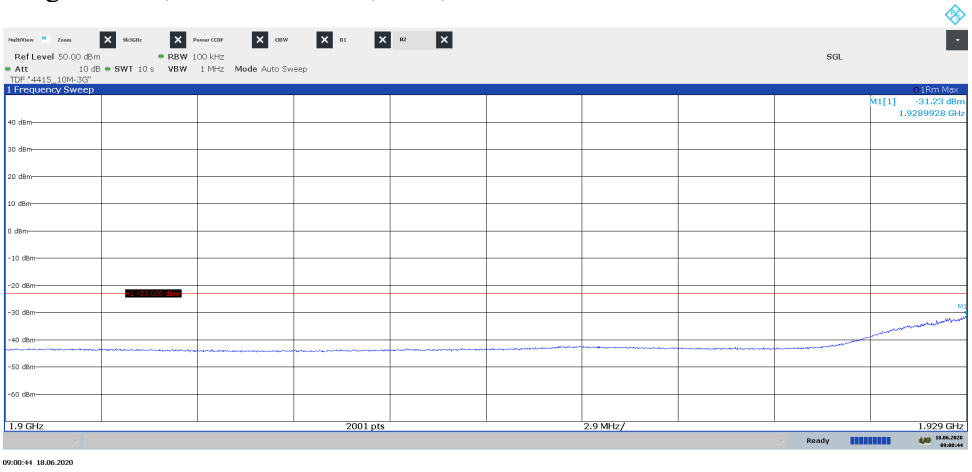

Diagram 2.2a, NR-FR1-TM1.1, B_{10NR}, Port D:

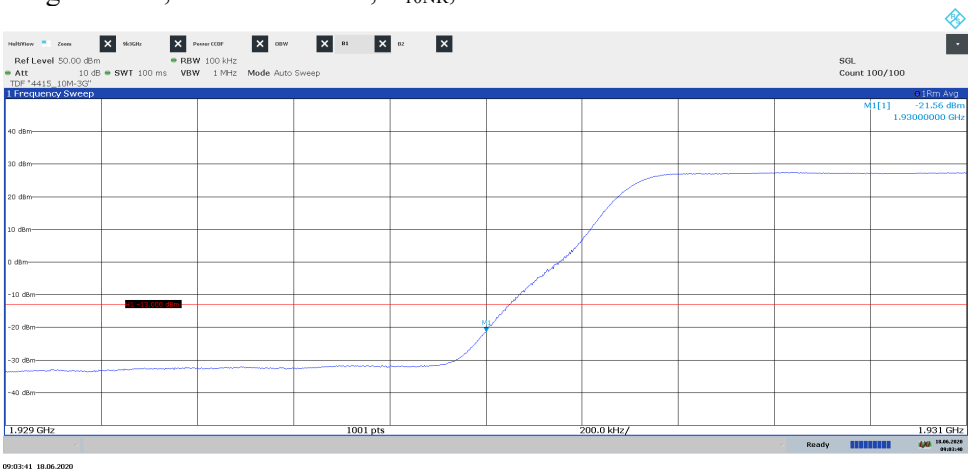

Diagram 2.2b, NR-FR1-TM1.1, B_{10NR}, Port D:

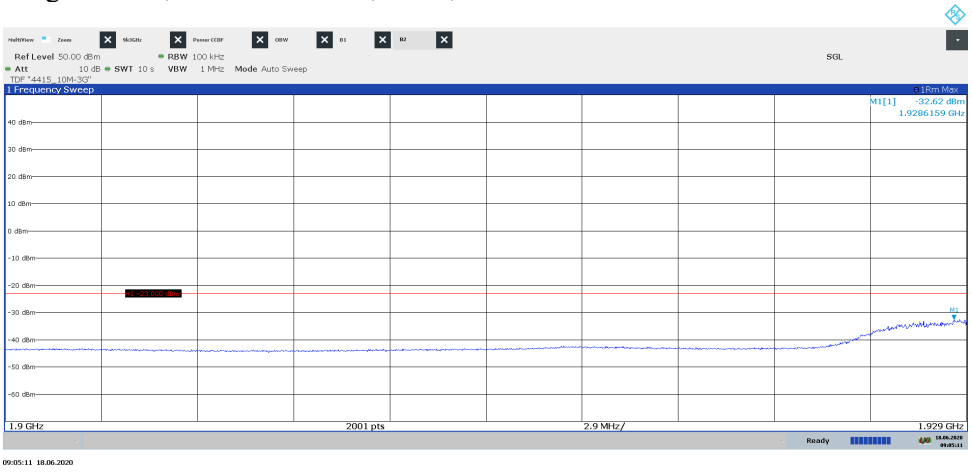

Diagram 2.3a, NR-FR1-TM1.1, B_{15NR}, Port D:

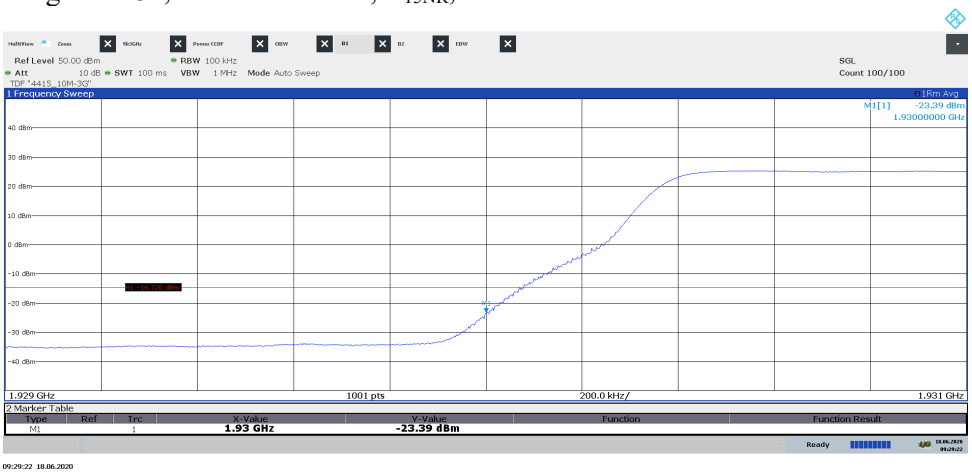

Diagram 2.3b, NR-FR1-TM1.1, B_{15NR}, Port D:

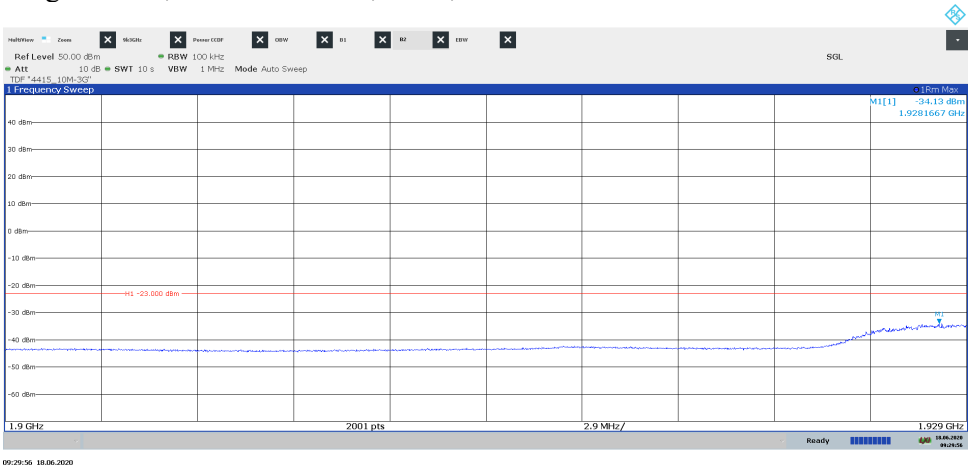

Diagram 2.4a, NR-FR1-TM1.1, B_{20NR}, Port D:

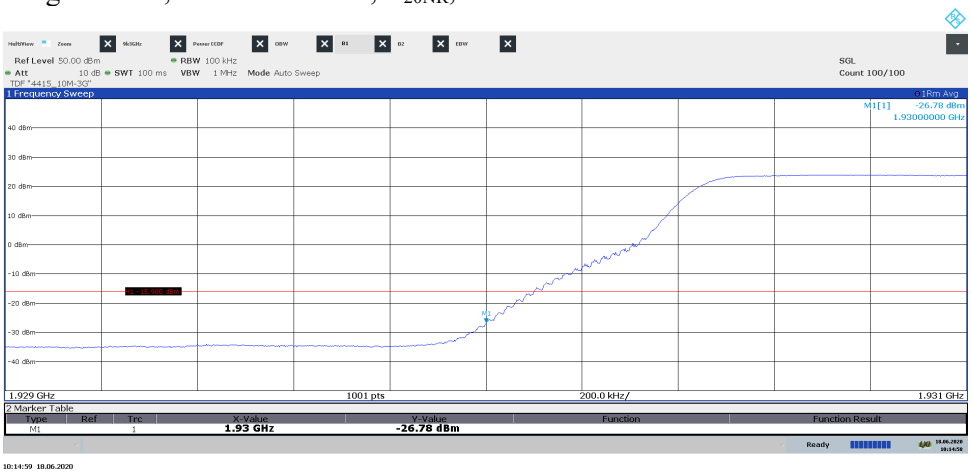

Diagram 2.4b, NR-FR1-TM1.1, B_{20NR}, Port D:

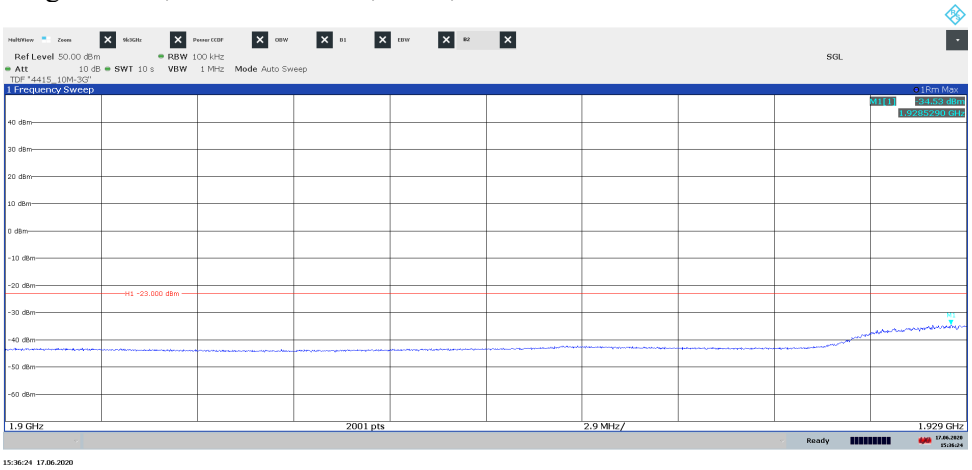

Diagram 2.5a, NR-FR1-TM1.1, T_{5NR}, Port D:

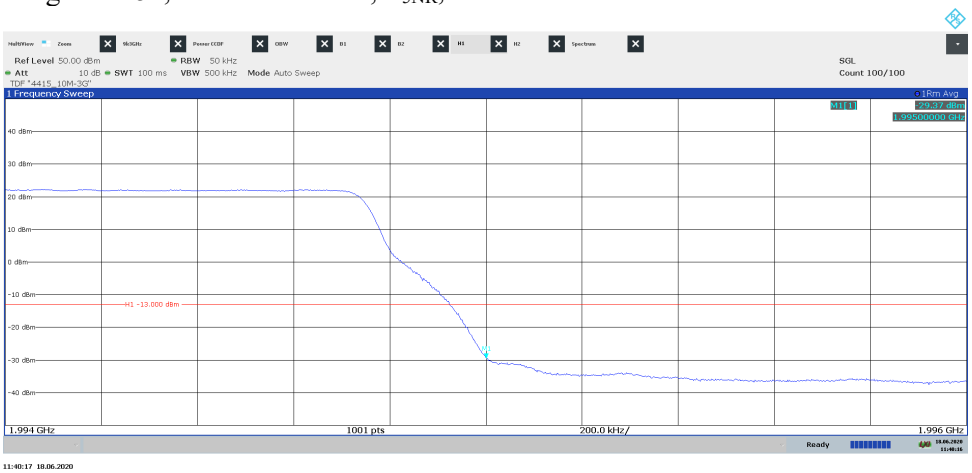

Diagram 2.5b, NR-FR1-TM1.1, T_{5NR}, Port D:

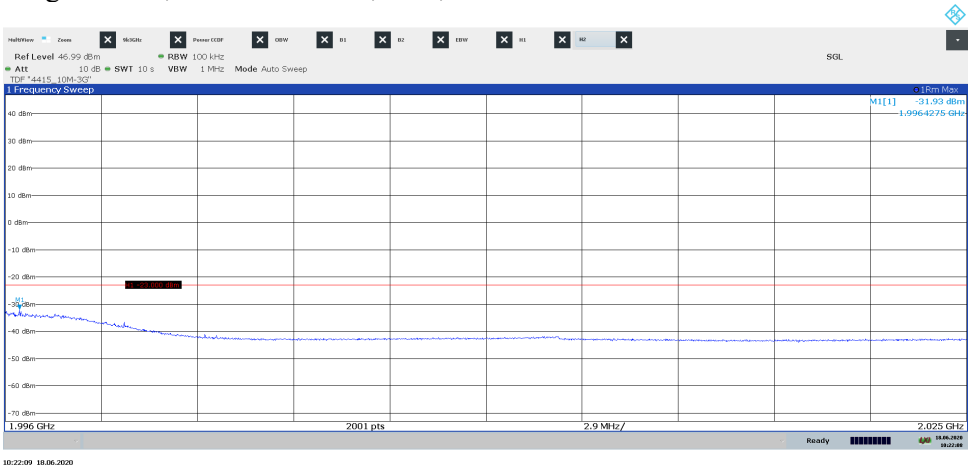

Diagram 2.6a, NR-FR1-TM1.1, T_{10NR}, Port D:

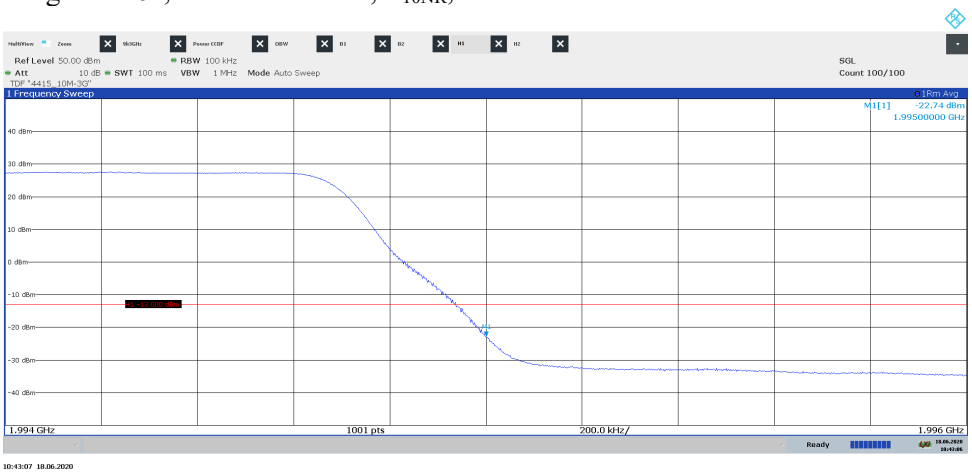

Diagram 2.6b, NR-FR1-TM1.1, T_{10NR}, Port D:

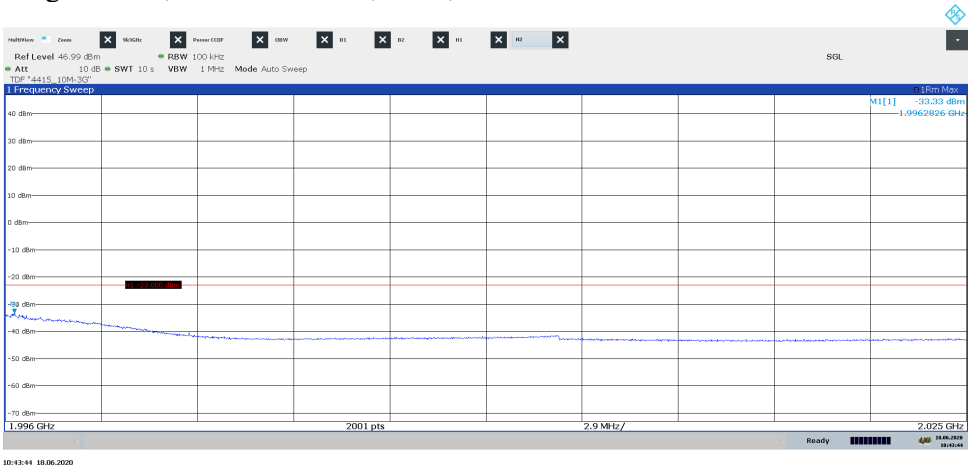

Diagram 2.7a, NR-FR1-TM1.1, T_{15NR}, Port D:

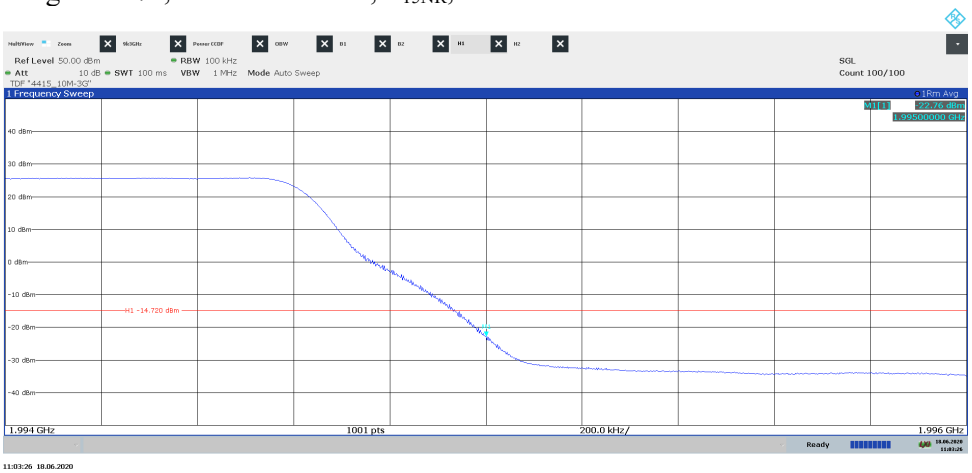

Diagram 2.7b, NR-FR1-TM1.1, T_{15NR}, Port D:

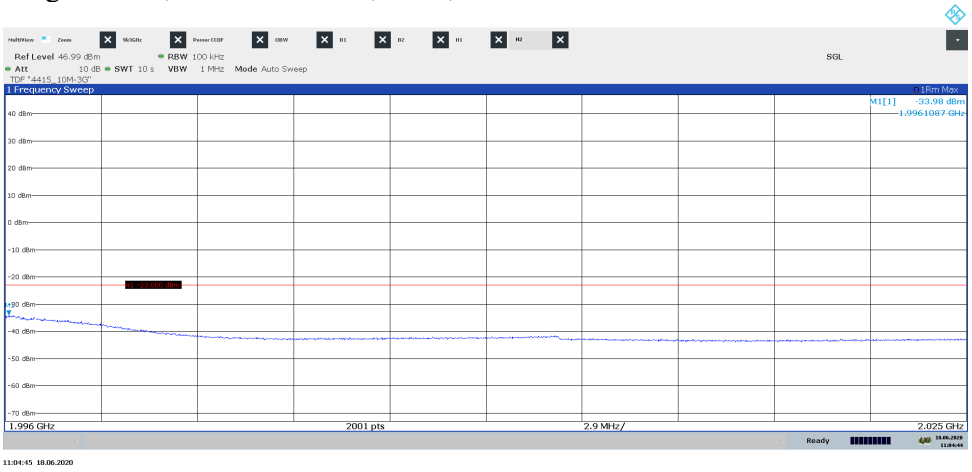

Diagram 2.8a, NR-FR1-TM1.1, T_{20NR}, Port D:

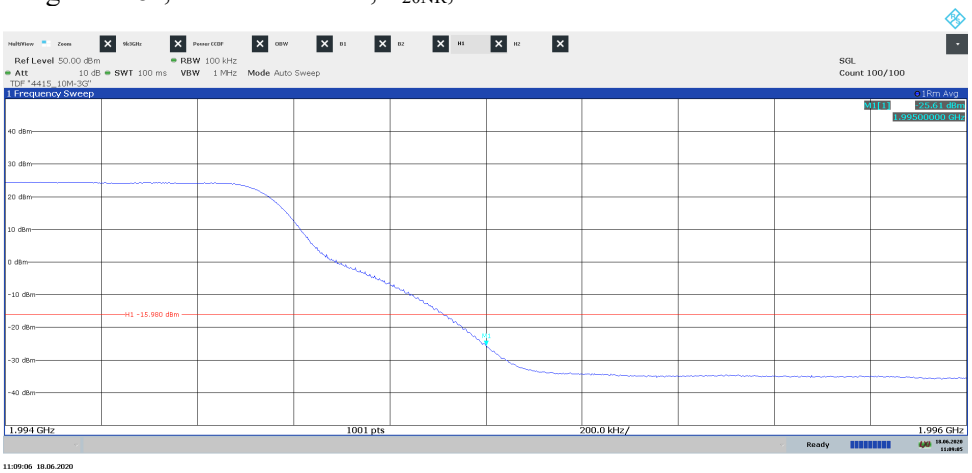

Diagram 2.8b, NR-FR1-TM1.1, T_{20NR}, Port D:

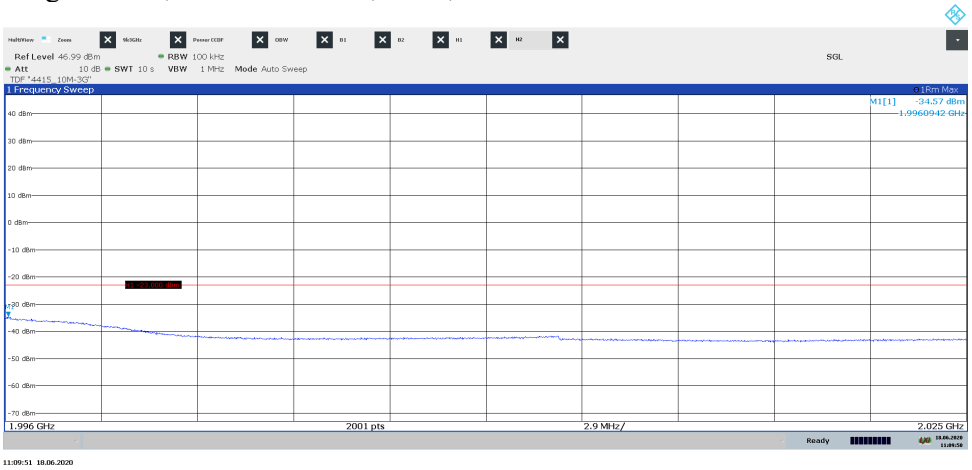

Diagram 2.9a, NR-FR1-TM1.1, Bim_{NR}, Port D:

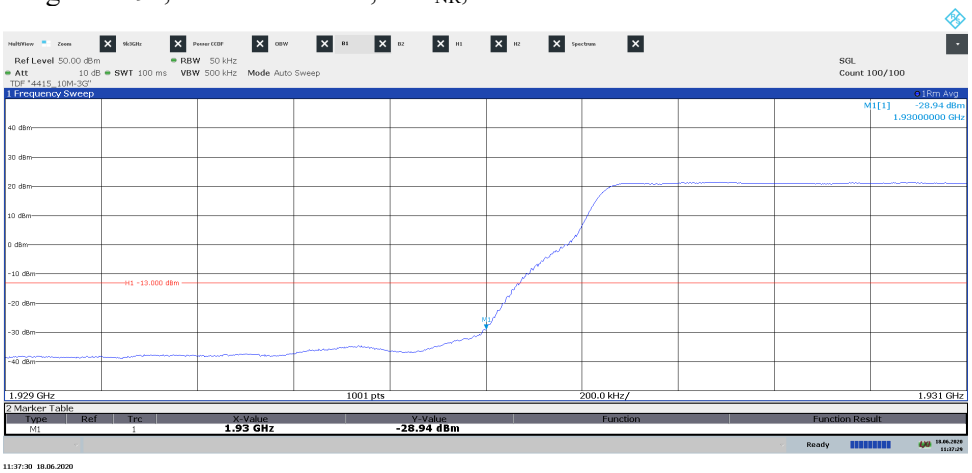

Diagram 2.9b, NR-FR1-TM1.1, Bim_{NR}, Port D:

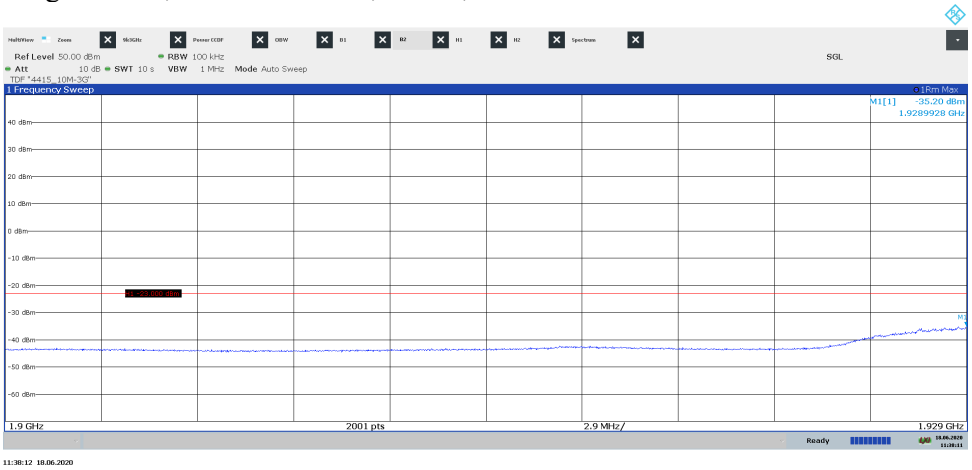

Diagram 2.10a, NR-FR1-TM1.1, Tim_{NR}, Port D:

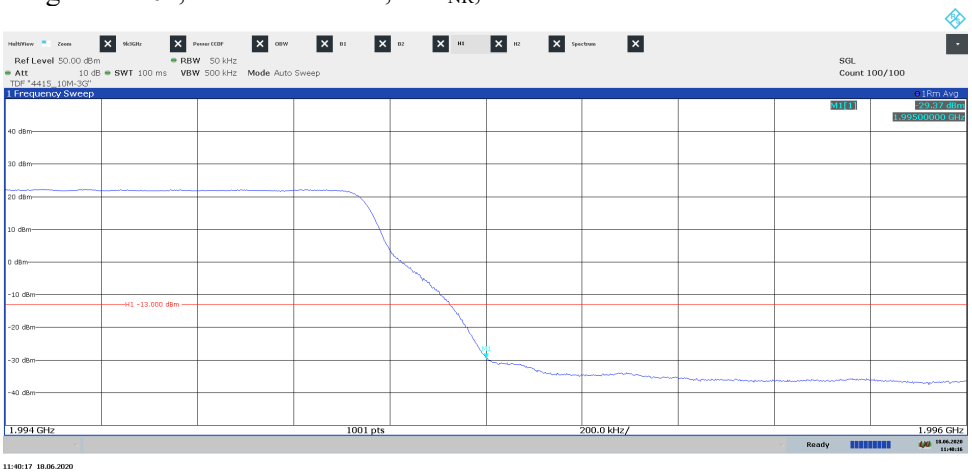

Diagram 2.10b, NR-FR1-TM1.1, Tim_{NR}, Port D:

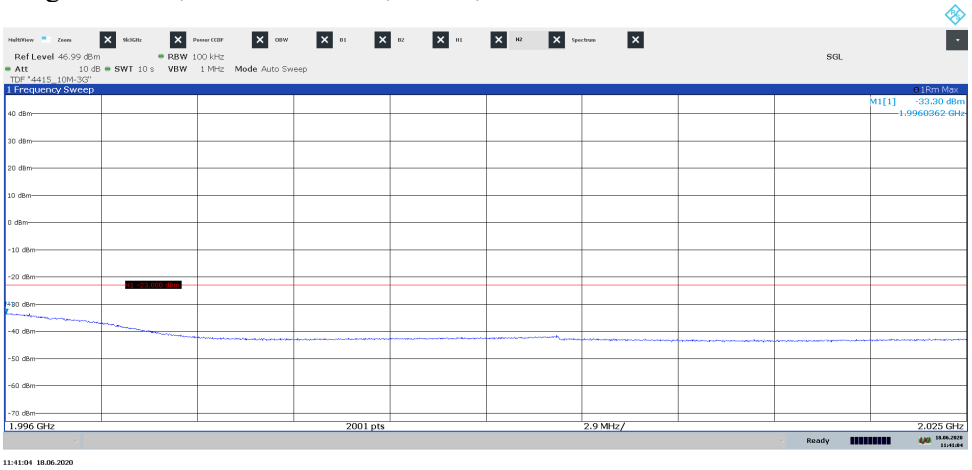

Diagram 2.11a, NR-FR1-TM1.1, T_{5NR}, Port D:

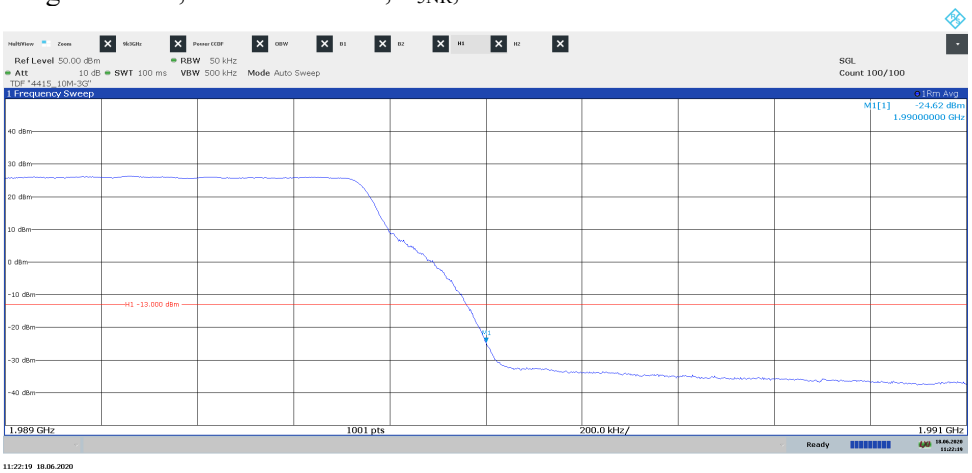

Diagram 2.11b, NR-FR1-TM1.1, T_{5NR}, Port D:

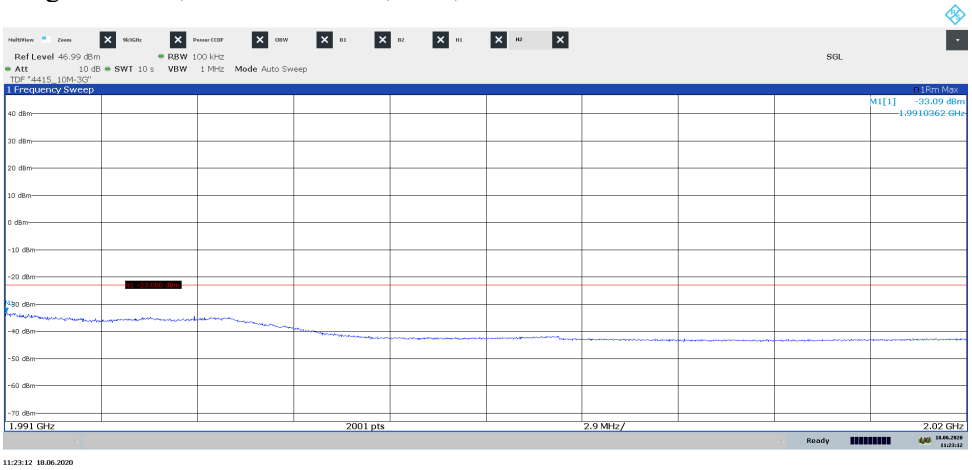

Diagram 2.12a, NR-FR1-TM1.1, T_{10NR}, Port D:

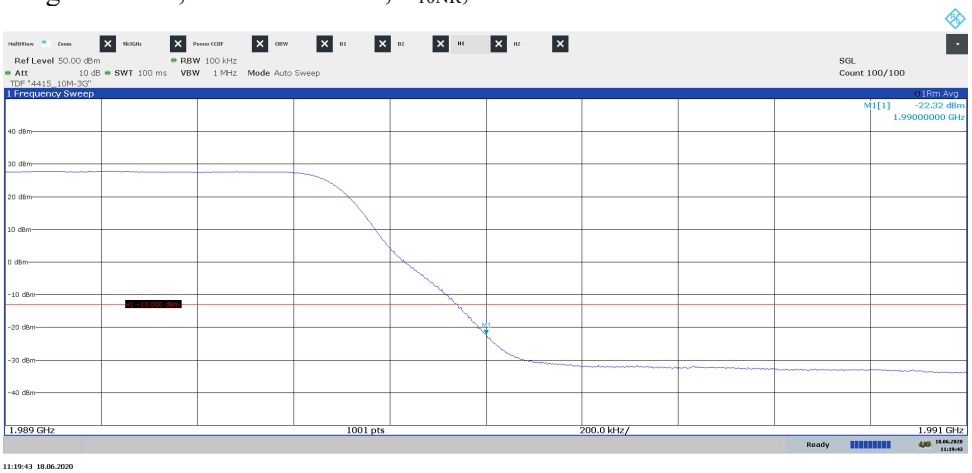

Diagram 2.12b, NR-FR1-TM1.1, T_{10NR}, Port D:

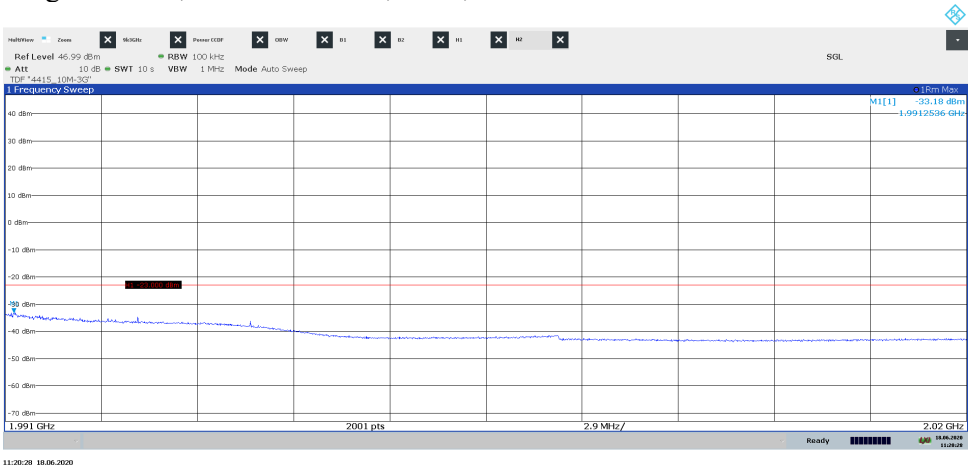

Diagram 2.13a, NR-FR1-TM1.1, T_{15NR}, Port D:

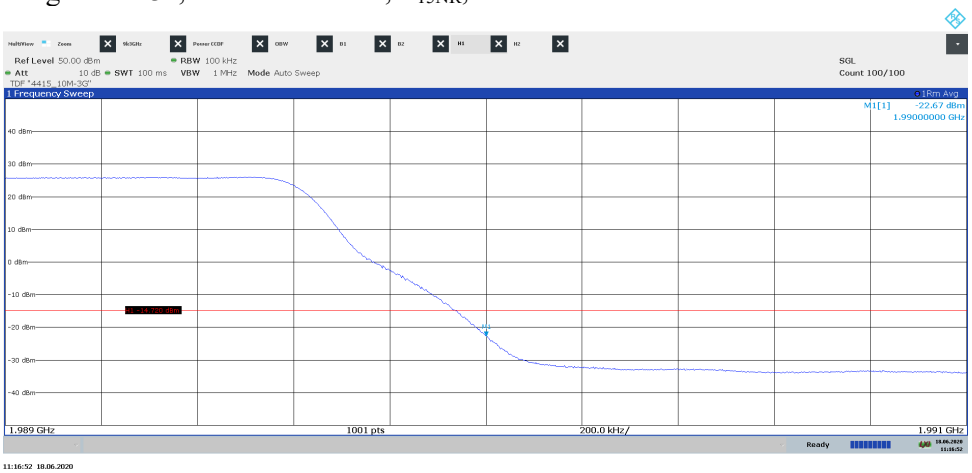

Diagram 2.13b, NR-FR1-TM1.1, T_{15NR}, Port D:

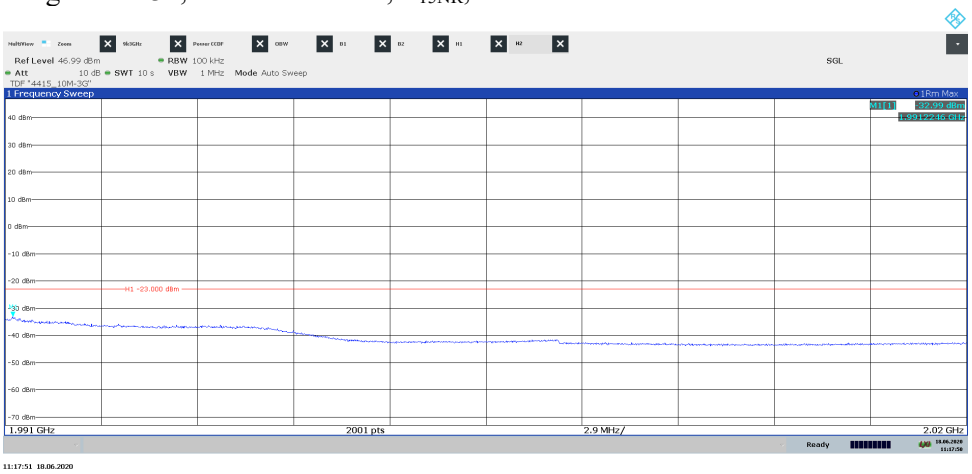

Diagram 2.14a, NR-FR1-TM1.1, T_{20NR}, Port D:

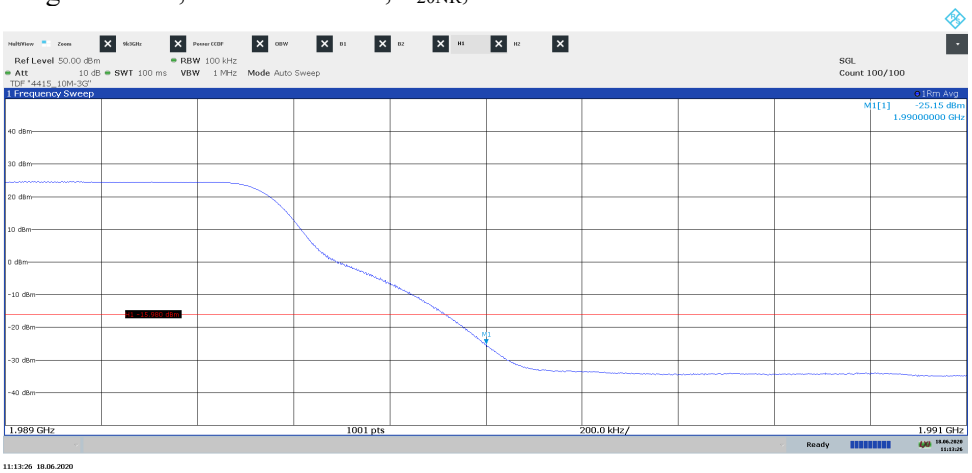

Diagram 2.14b, NR-FR1-TM1.1, T_{20NR}, Port D:

Diagram 2.15a, NR-FR1-TM1.1, B_{5NR}, Port D:

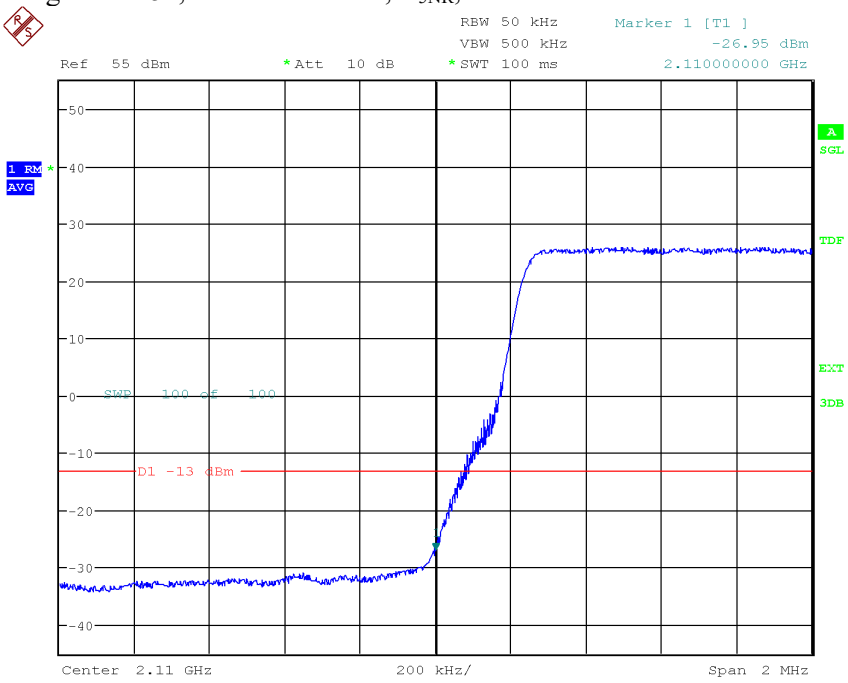

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Diagram 2.15b, NR-FR1-TM1.1, B_{5NR}, Port D:

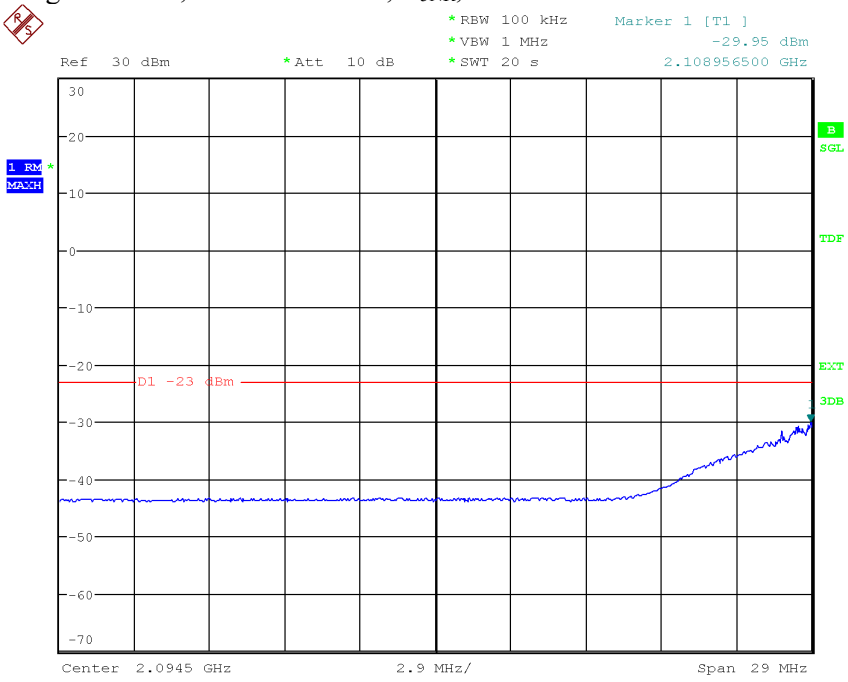

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Diagram 2.16a, NR-FR1-TM1.1, B_{10NR}, Port D:

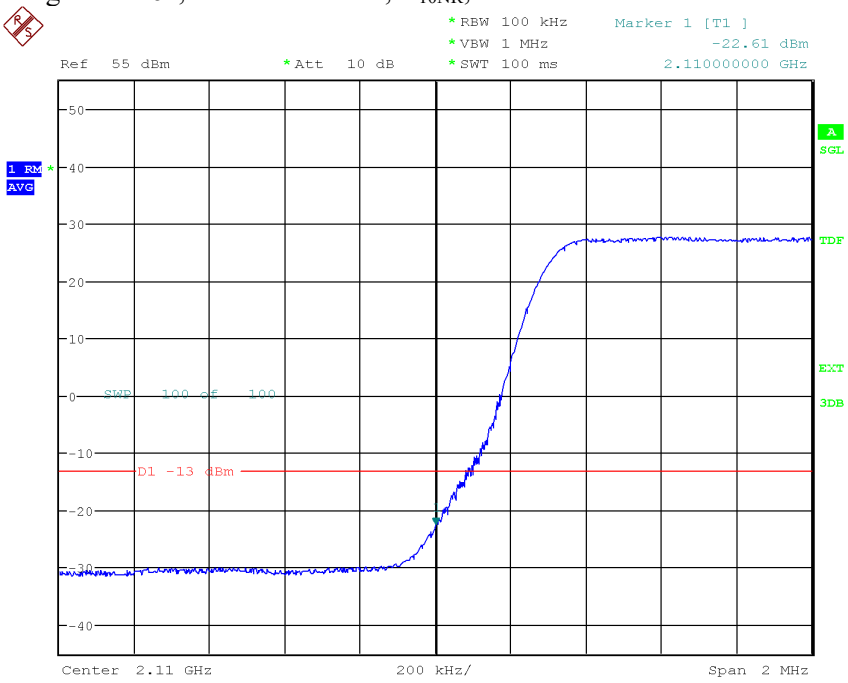

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Diagram 2.16b, NR-FR1-TM1.1, B_{10NR}, Port D:

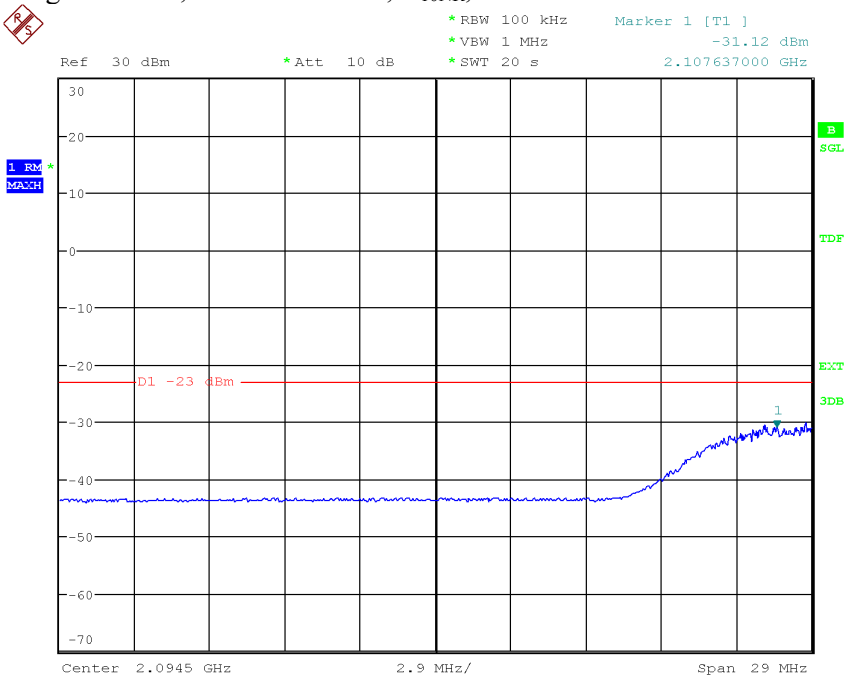

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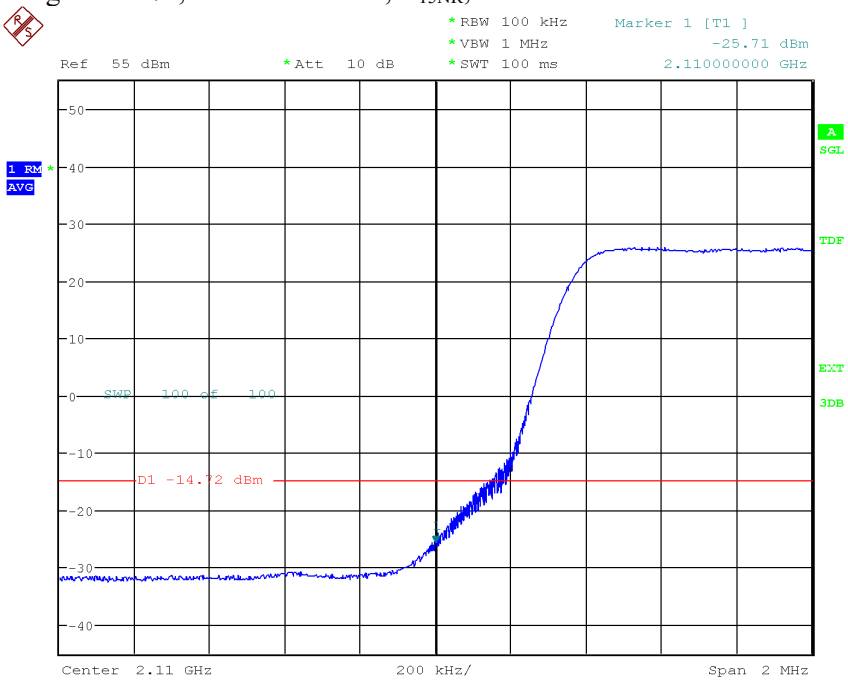
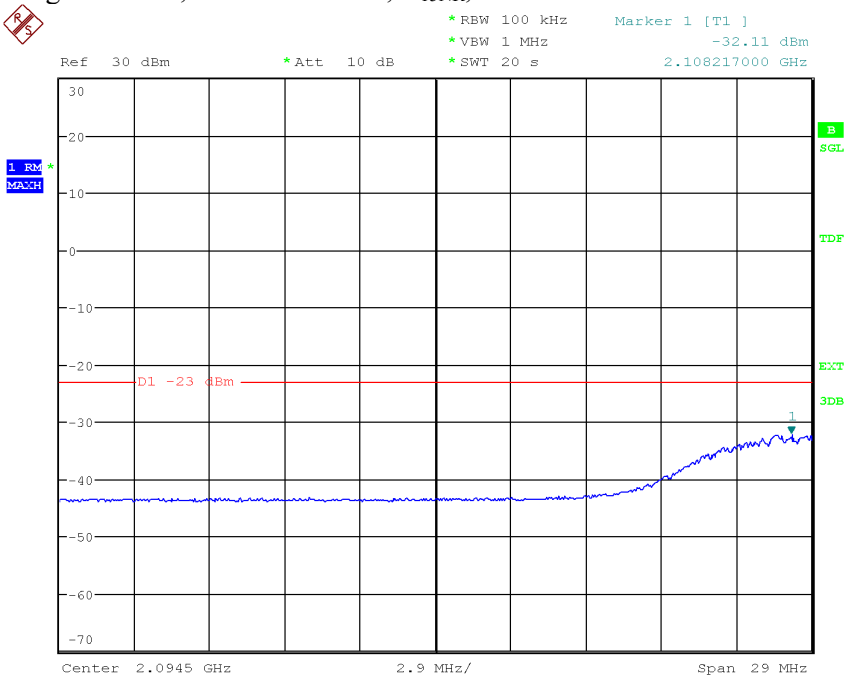
Diagram 2.17a, NR-FR1-TM1.1, B_{15NR}, Port D:



Date: 24.JUN.2020 12:37:40

Diagram 2.17b, NR-FR1-TM1.1, B_{15NR}, Port D:



Date: 24.JUN.2020 13:53:19

Diagram 2.18a, NR-FR1-TM1.1, B_{20NR}, Port D:

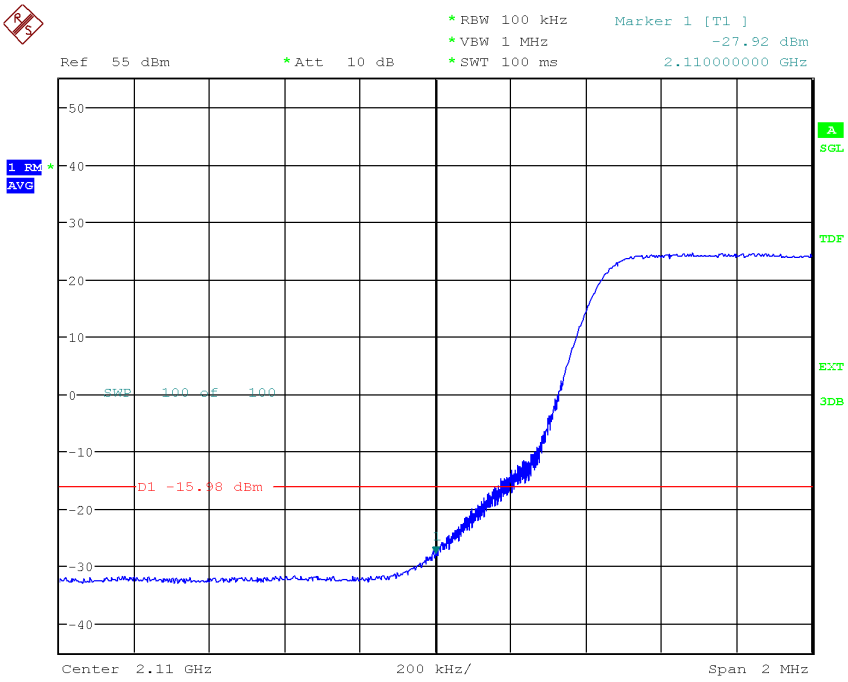


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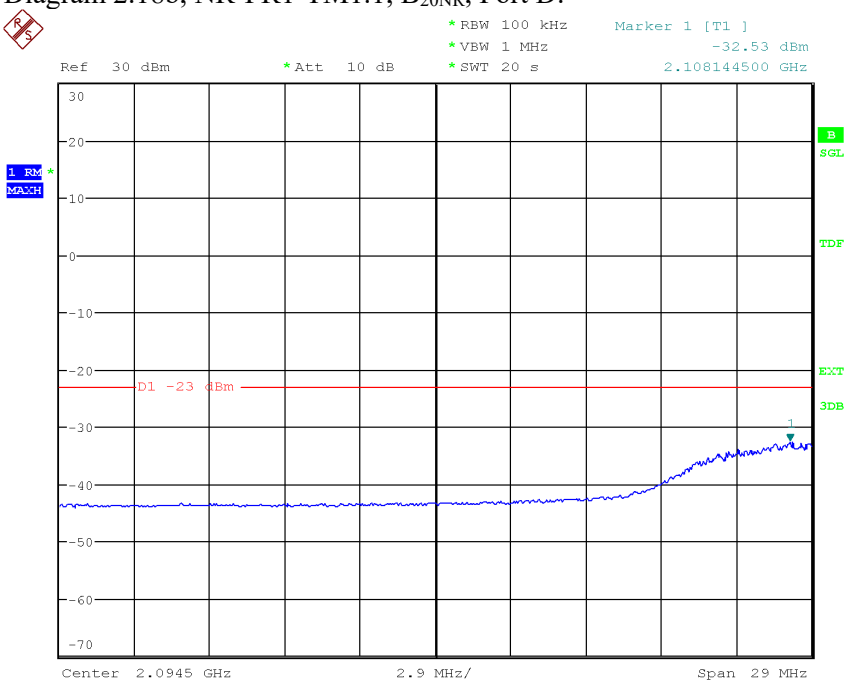
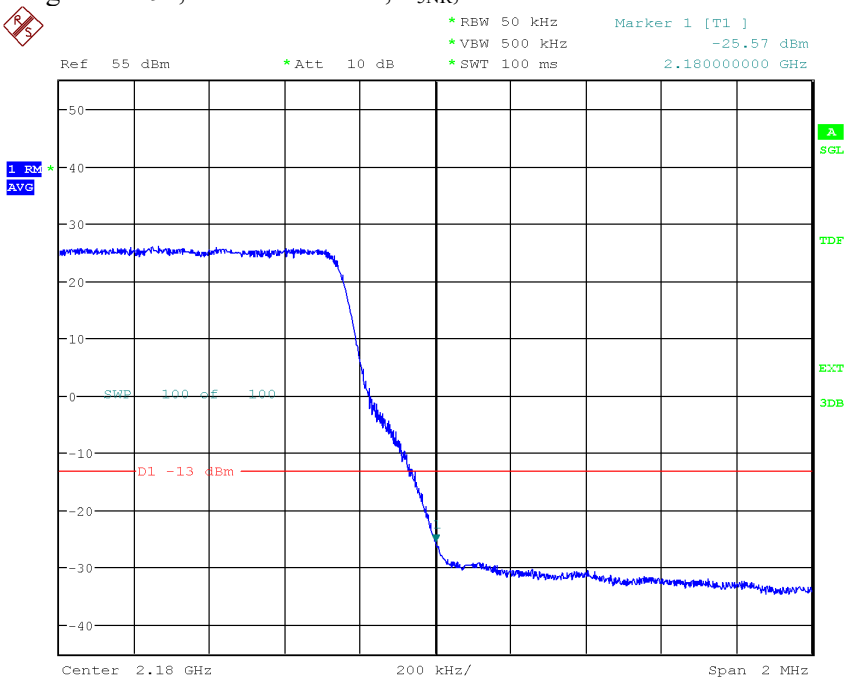
Diagram 2.18b, NR-FR1-TM1.1, B_{20NR}, Port D:



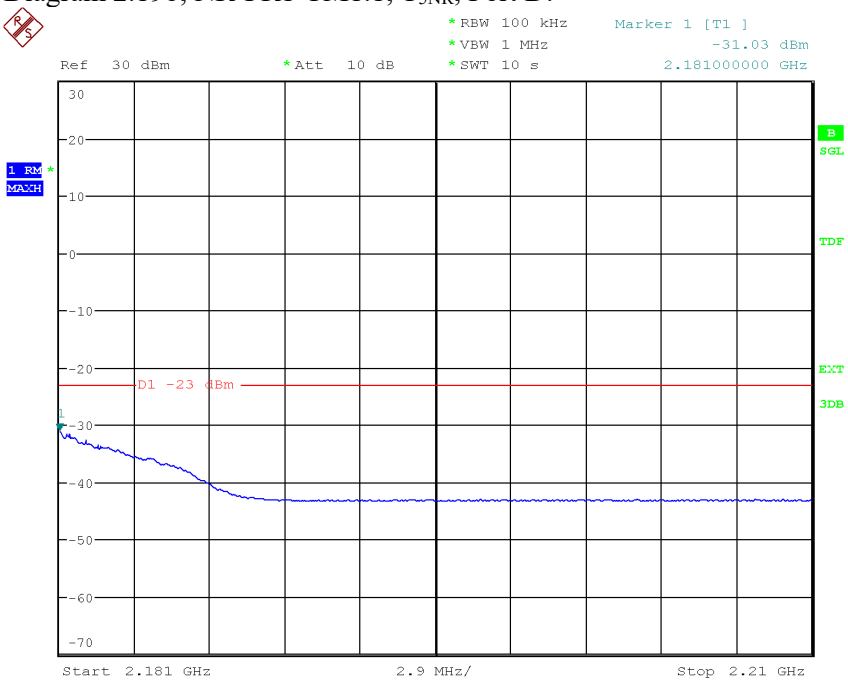
Date: 24.JUN.2020 13:57:33

Diagram 2.19a, NR-FR1-TM1.1, T_{5NR}, Port D:



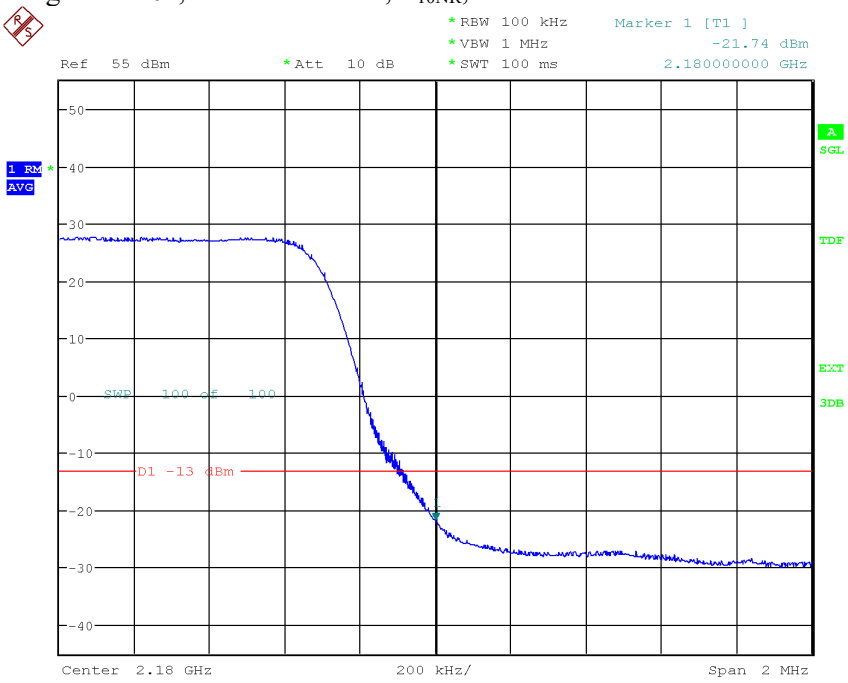
Date: 24.JUN.2020 12:54:25

Diagram 2.19b, NR-FR1-TM1.1, T_{5NR}, Port D:



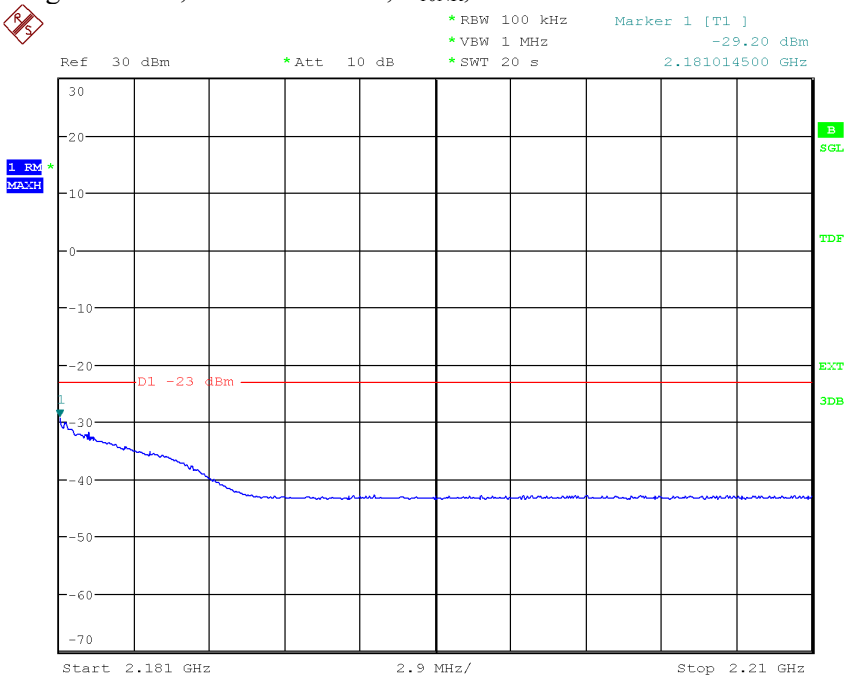
Date: 24.JUN.2020 12:56:47

Diagram 2.20a, NR-FR1-TM1.1, T_{10NR}, Port D:



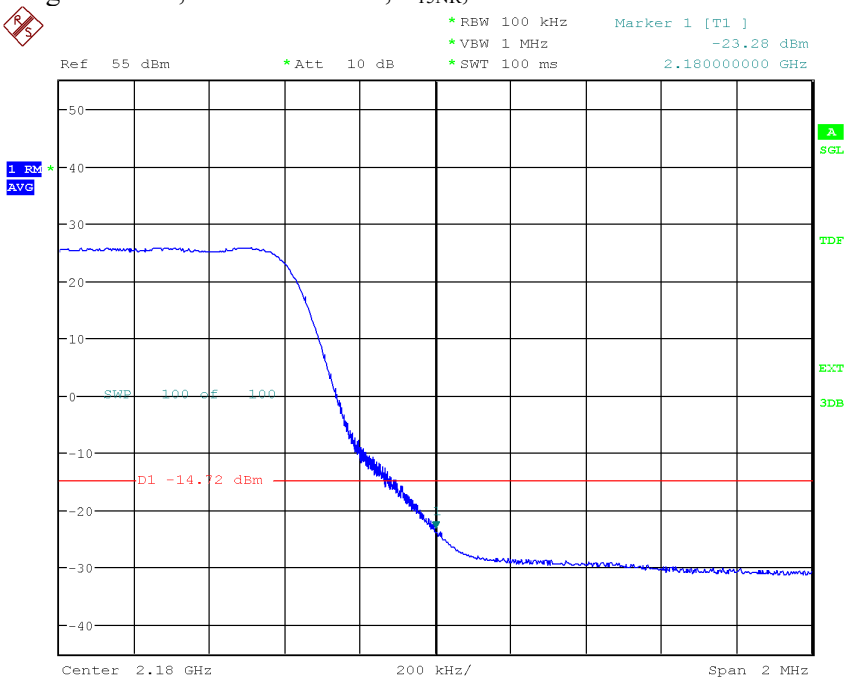
Date: 24.JUN.2020 14:09:38

Diagram 2.20b, NR-FR1-TM1.1, T_{10NR}, Port D:



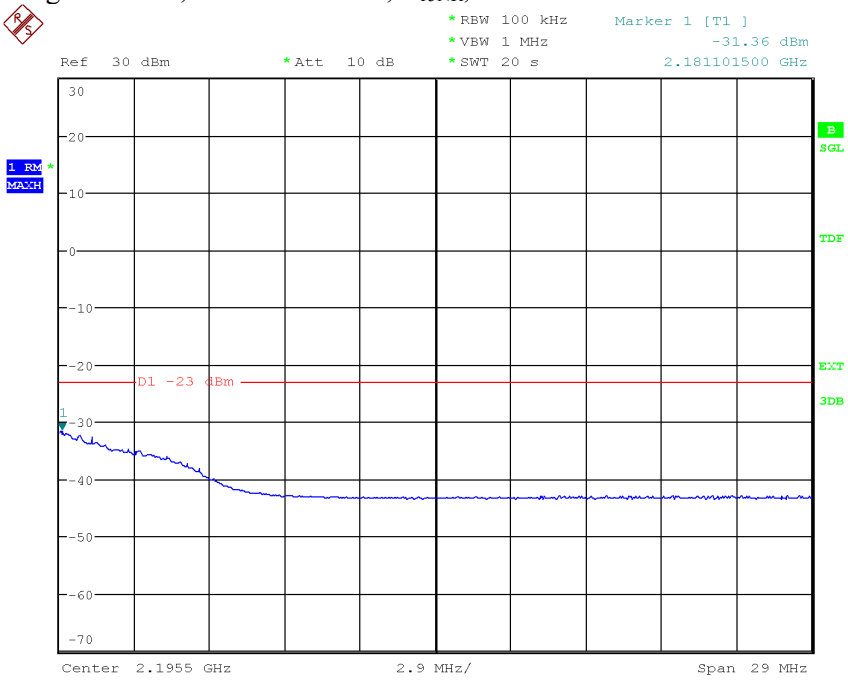
Date: 24.JUN.2020 14:11:23

Diagram 2.21a, NR-FR1-TM1.1, T_{15NR}, Port D:



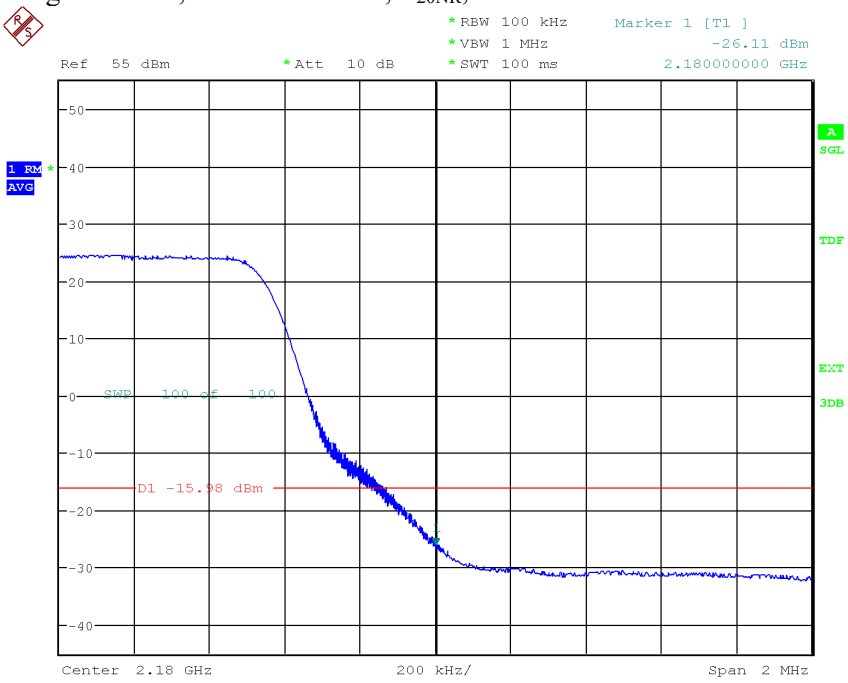
Date: 24.JUN.2020 14:18:39

Diagram 2.21b, NR-FR1-TM1.1, T_{15NR}, Port D:



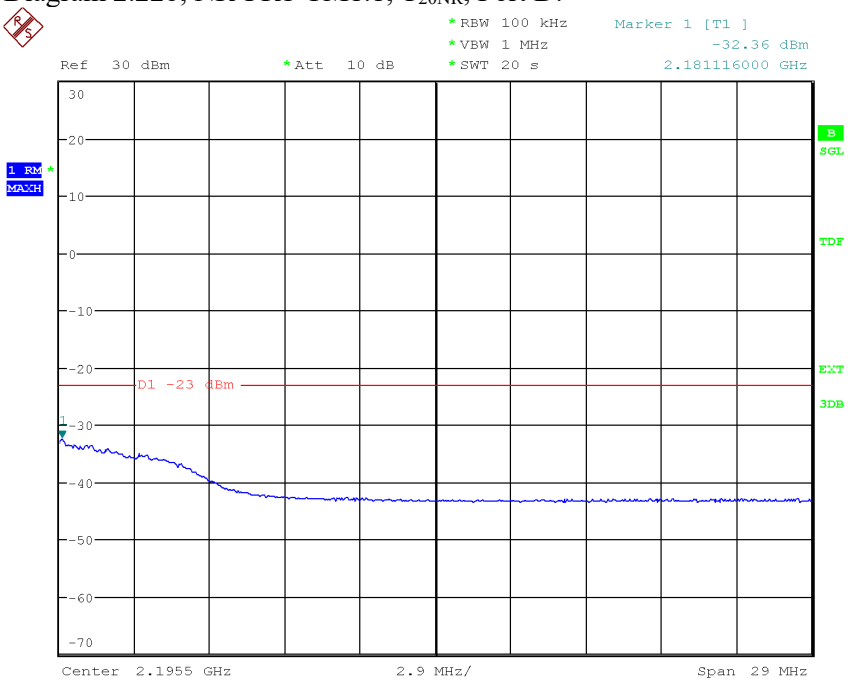
Date: 24.JUN.2020 14:20:03

Diagram 2.22a, NR-FR1-TM1.1, T_{20NR}, Port D:



Date: 24.JUN.2020 14:24:04

Diagram 2.22b, NR-FR1-TM1.1, T_{20NR}, Port D:



Date: 24.JUN.2020 14:25:15

Diagram 2.23a, NR-FR1-TM1.1, Bim_{NR}, Port D:

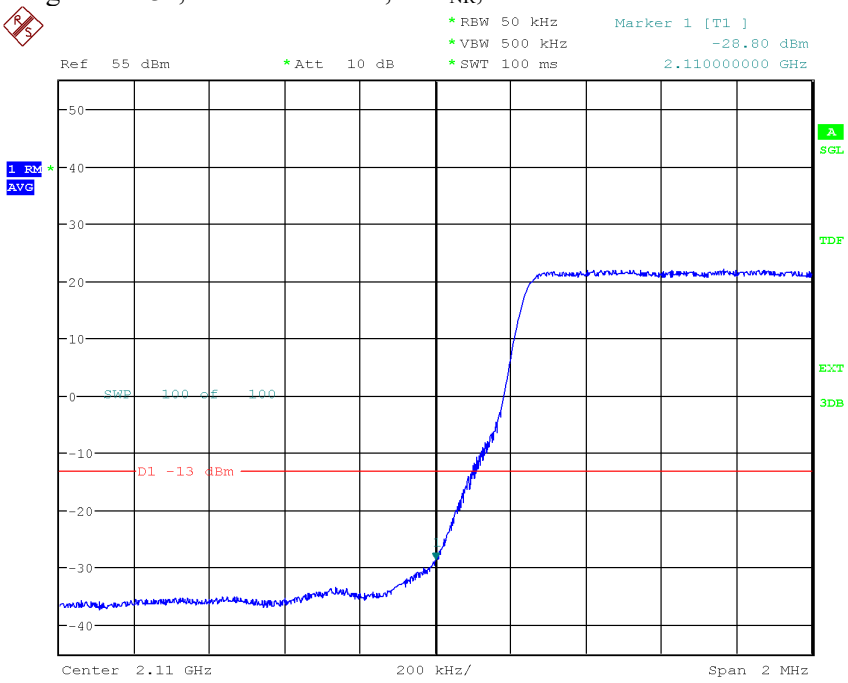


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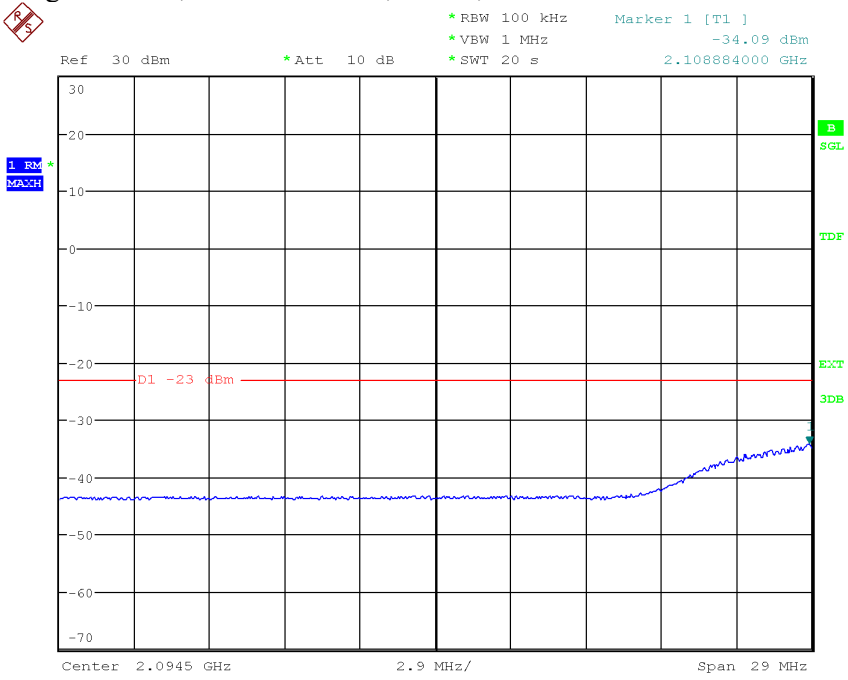
Diagram 2.23b, NR-FR1-TM1.1, Bim_{NR}, Port D:



Date: 24.JUN.2020 13:59:46

Diagram 2.24a, NR-FR1-TM1.1, Tim_{NR}, Port D:

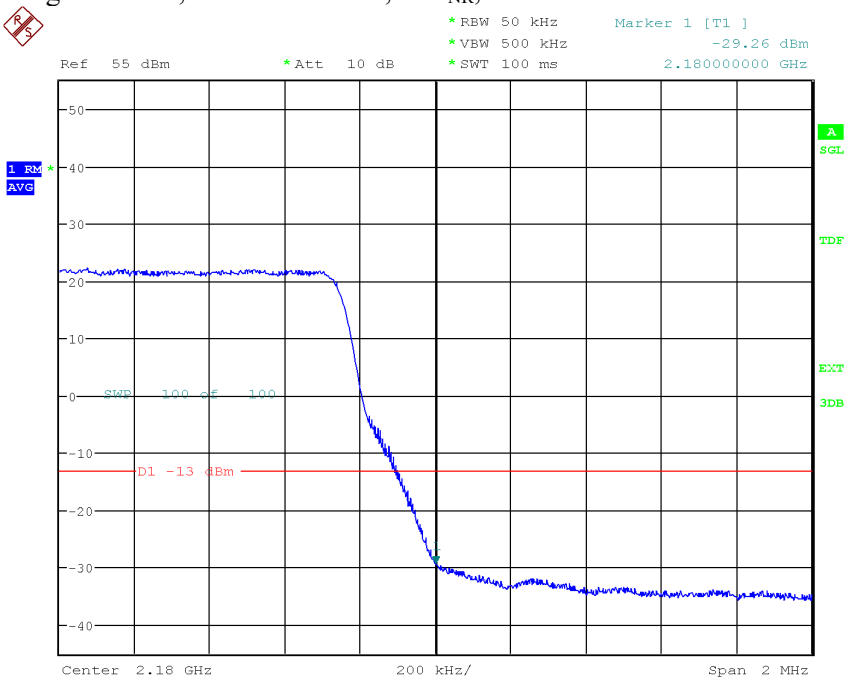


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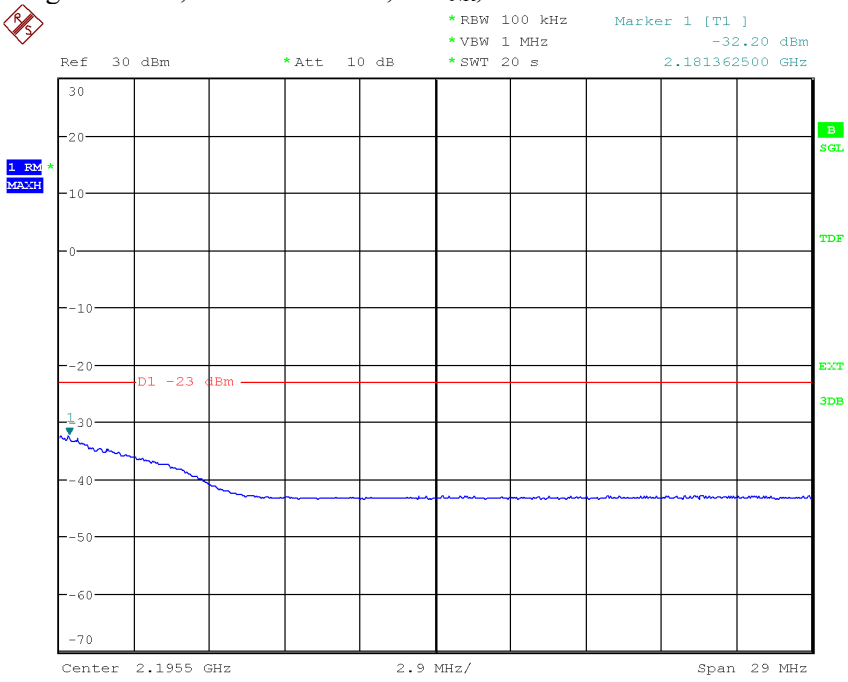
Diagram 2.24b, NR-FR1-TM1.1, Tim_{NR}, Port D:



Date: 24.JUN.2020 14:30:43