TEST REPORT

of the accredited test laboratory

TÜV Nr.: 2023-IN-AT-TICL-E-EX-0-000230-FG-003

Applicant:	PDi Digital GmbH Kalsdorfer Strasse 6 A – 8072 Fernitz-Mellach
Tested Product:	Electronic shelf labelling system
Product Name:	Sepioo D12.2 B NB-IoT Outdoor
Model:	PDNB-1220-C2
FCC ID:	2A3HY-PDNB-1220-C2
IC ID:	27854-PDNB1220C2
Manufacturer:	PDi Digital GmbH Kalsdorfer Strasse 6 A – 8072 Fernitz-Mellach

Output power	0,87 mW EIRP 0,35 mW EIRP	**power supply:**	3,7 VDC via Battery
Frequency range:	2402 - 2480 MHz 2401 - 2481 MHz	**Channel separation:**	2 MHz 1 MHz / 2 MHz

Accredited Standards: FCC: 47 CFR Parts 15, 22, 24, 27 and 90 (eCFR 9.1.2024); RSS-130 Issue 2; RSS-132 Issue 4; RSS-133 Issue 4, February 2008; RSS-139 Issue 4, September 2022; RSS-247 Issue 3, August 2023; ANSI C63.10-2013

TÜV AUSTRIA GMBH

Test laboratory for EMC

Ing. Andreas Malek

examined by / Testing Laboratory TÜV AUSTRIA GMBH

26.01.2024

Ing. Michael Emminger

approved by / Testing Laboratory TÜV AUSTRIA GMBH

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Technik

TÜV ®

Testing Laboratory,
Inspection Body,
Certification Body,
Calibration Laboratory,
Verifizierungsstelle

Notified Body 0408
IC 2932K-1

Non-executive Board of Directors:
KR DI Johann Marihart

Management:
DI Dr. Stefan Haas
Mag. Christoph Wenninger

Registered Office:
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Vienna / FN 288476 f

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IBAN
AT131200052949001066
BIC BKAUATWW

VAT ATU63240488
DVR 3002476

Contents

1. Applicant

Company:	PDi Digital GmbH
Department:	/
Address:	A – 8072 Fernitz-Mellach; Kalsdorfer Strasse 6
Contact person:	Mr. Klaus Niederl

EUT received on:	22.01.2024
Tests were performed on:	22.01. to 26.01.2024

2. Description of EUT

EUT:	Electronic shelf labelling system
Product Name:	Sepioo D12.2 B NB-IoT Outdoor
Model:	PDNB-1220-C2
Serial Number:	prototype
Manufacturer:	PDi Digital GmbH
Description:	PDi Digital GmbH provided the following configuration for the measurements: Prototype with special firmware for continuous transmission
Operating mode:	The measurements were carried out at the following running states: test-firmware running, transmitting continuously
Technical data EUT:	Rated voltage: 3VDC Rated frequency: DC Mains voltage during the tests: 3VDC
Climatic conditions in the emc laboratory:	Relative humidity: 18% Temperature: 24°C

3. Standards / Final result

Name	Title	Deviation	Result
FCC: 47 CFR Part 15 (eCFR 9.1.2024)	Radio Frequency Devices	none	OK
FCC: 47 CFR Part 22 (eCFR 9.1.2024)	Public Mobile Services	*)	OK
FCC: 47 CFR Part 24 (eCFR 9.1.2024)	Personal Communications Services	*)	OK
FCC: 47 CFR Part 27 (eCFR 9.1.2024)	Miscellaneous Wireless Communications Services	*)	OK
FCC: 47 CFR Part 90 (eCFR 9.1.2024)	Private Land Mobile Radio Services	*)	OK
RSS-130 Issue 2, February 2019	Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz	*)	OK
RSS-132 Issue 4, January 2023	Cellular Systems Operating in the Bands 824-849 MHz and 869-894 MHz	*)	OK
RSS-133 Issue 4, February 2008	2 GHz Personal Communications Servic	*)	OK
RSS-139 Issue 4, September 2022	Advanced Wireless Services Equipment Operating in the Bands 1710-1780 MHz and 2110-2200 MHz	*)	OK
RSS-247 Issue 3, August 2023	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices	none	OK
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	none	OK

Result: Opinions and interpretation of testing laboratory
OK: EUT passed
NOK: EUT failed

*) Only out of band emissions for simultaneous transmission with module FCC ID: XMR2020BG95M2, IC: 10224A-2020BG95M2 were tested.

4. TEST RESULTS

4.1. TEST OBJECT DATA (Bluetooth Low Energy, BLE)

General EUT Description
The device is a display for electronic shelf labelling. The device is equipped with a passive NFC chip onboard which does not have its own rf generation. It works as a tag and can receive information from the NFC reader station. This device incorporates different communication protocols. The device uses Bluetooth Low Energy (BLE) protocol and Quuppa protocol which are generated by separate chips, but use a common antenna. Simultaneous transmission between BLE and Quuppa is not possible. The first part of this test report is for Bluetooth Low Energy (BLE) Protocol, the second part includes measurements for Quuppa protocol. Further, the device contains a licensed module (FCC ID: XMR2020BG95M2, IC: 10224A-2020BG95M2). Simultaneous transmission with BLE and Quuppa is possible and is considered in the respective subsections.

2.1033 (c) Technical description

2.1033 (4) Type of emission: 1M00F1D – Channel spacing 2 MHz

2.1033 (5) Frequency range: 2402 to 2480 MHz (channel center frequencies).

2.1033 (6) Power range and Controls: The maximum peak output power is 0,87 mW EIRP and there is no power regulation.

2.1033 (7) Maximum output power rating: 0,87 mW EIRP.

2.1033 (8) DC Voltage and Current: 3V DC

RSS-135 This standard does not apply to:
1.1.(a) a receiver that scans radio frequencies for the purpose of enabling its associated transmitter to avoid transmitting in an occupied frequency but which does not have the capability of decoding the message (e.g. converting it to audio voice) contained in the radio signal

Worst case Spurious Emissions: 44,74 dBµV/m Average at 7319,5 MHz.

Tests were performed from January 22nd to January 26th 2024.

4.2. Number of channels and channel spacing § 2.1033

Conducted Measurement

Rated output power: 0,87 mW EIRP

There are 40 Channels used, starting at 2402 till 2480 MHz each separated by 2 MHz channel spacing.

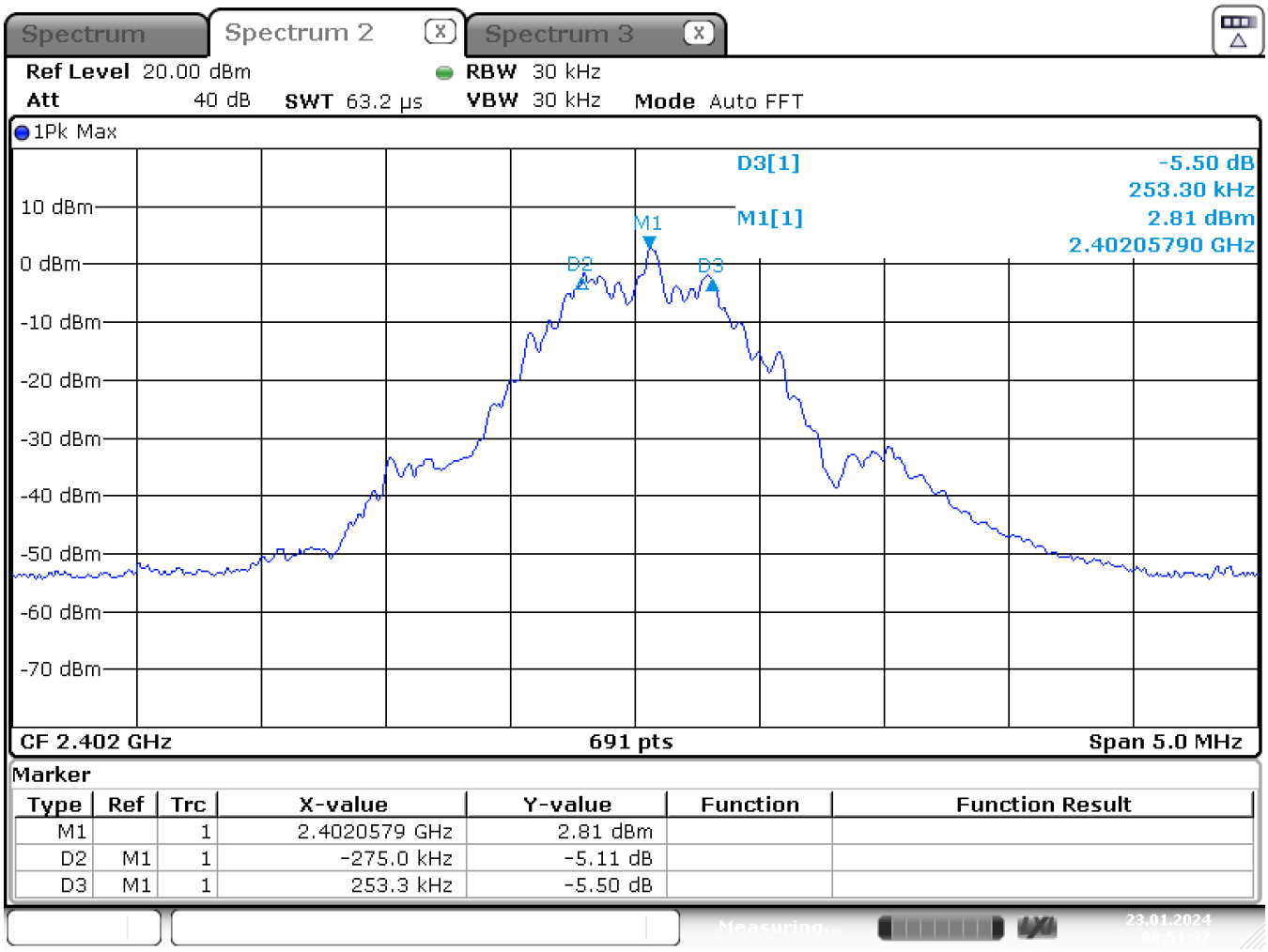
Test Equipment used: N/A

4.3. 6 dB Bandwidth

§ 15.247(a)(2)
5.2.a

Conducted Measurement

Rated output power: 0,87 mW Channel 0 (2402 MHz center frequency)



Date: 23.JAN.2024 08:51:38

6dB Bandwidth: 528,3 kHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2.a)**

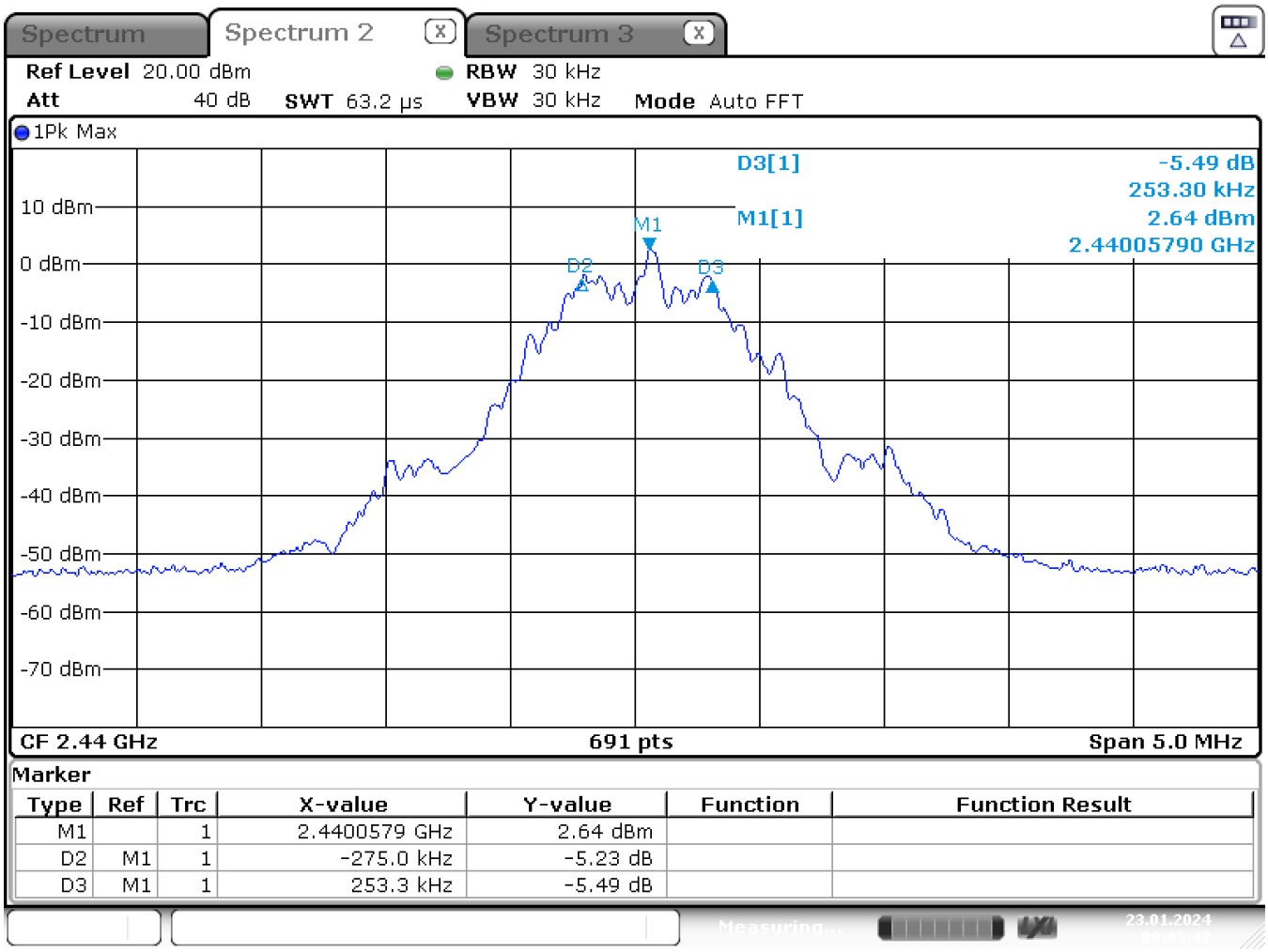
Under normal test conditons	6 dB Bandwidth at least 500 kHz

Test Equipment used: EMV-205;

6 dB Bandwidth **§ 15.247(a)(2)**
5.2.a

Conducted Measurement

Rated output power: 0,87 mW Channel 19 (2440 MHz center frequency)



Date: 23.JAN.2024 09:05:47

6dB Bandwidth: 528,3 kHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2.a)**

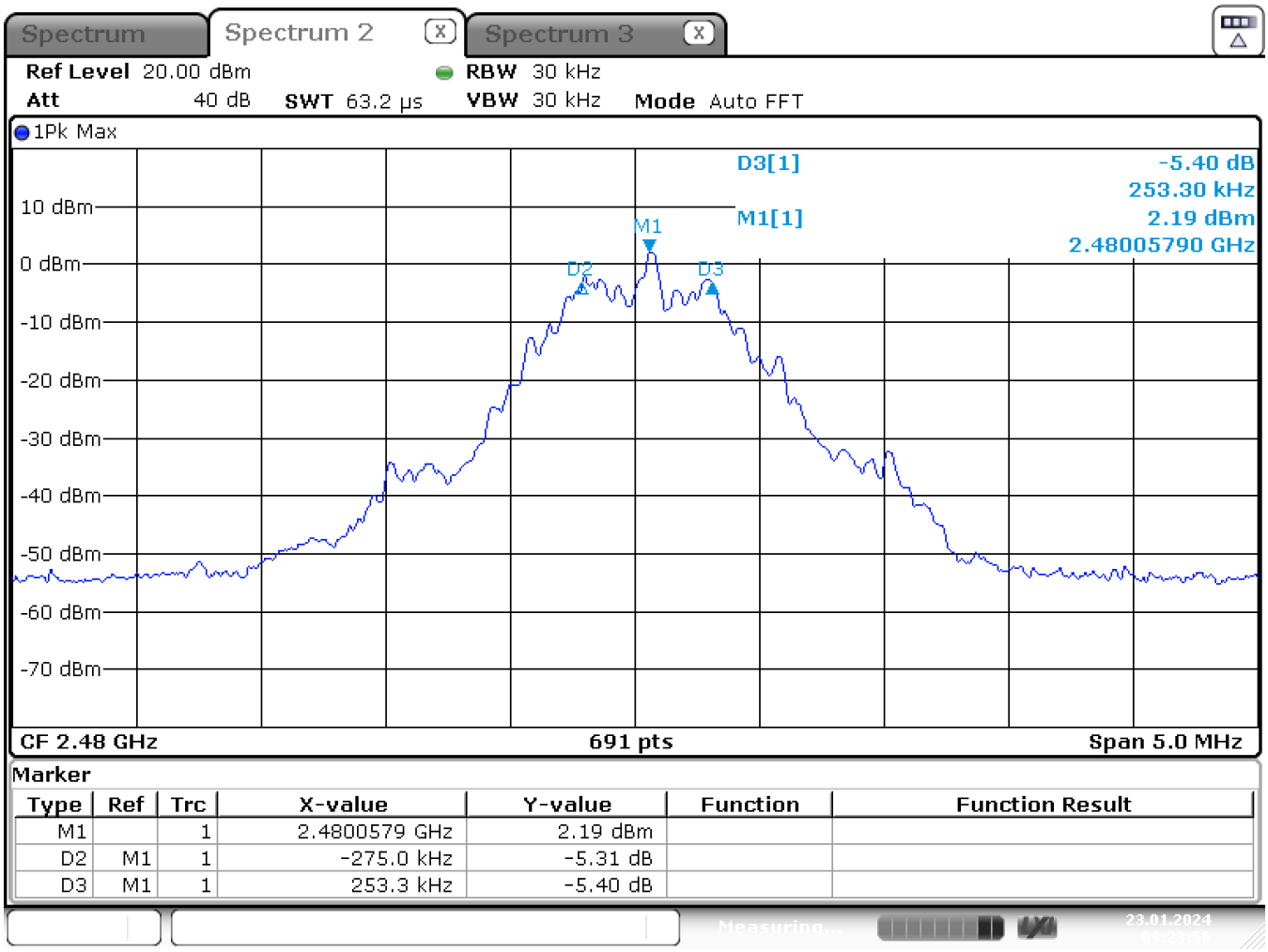
Under normal test conditons	6 dB Bandwidth at least 500 kHz

Test Equipment used: EMV-205;

6 dB Bandwidth **§ 15.247(a)(2)**
5.2.a

Conducted Measurement

Rated output power: 0,87 mW Channel 39 (2480 MHz center frequency)



Date: 23.JAN.2024 09:23:57

6dB Bandwidth: 528,3 kHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2.a)**

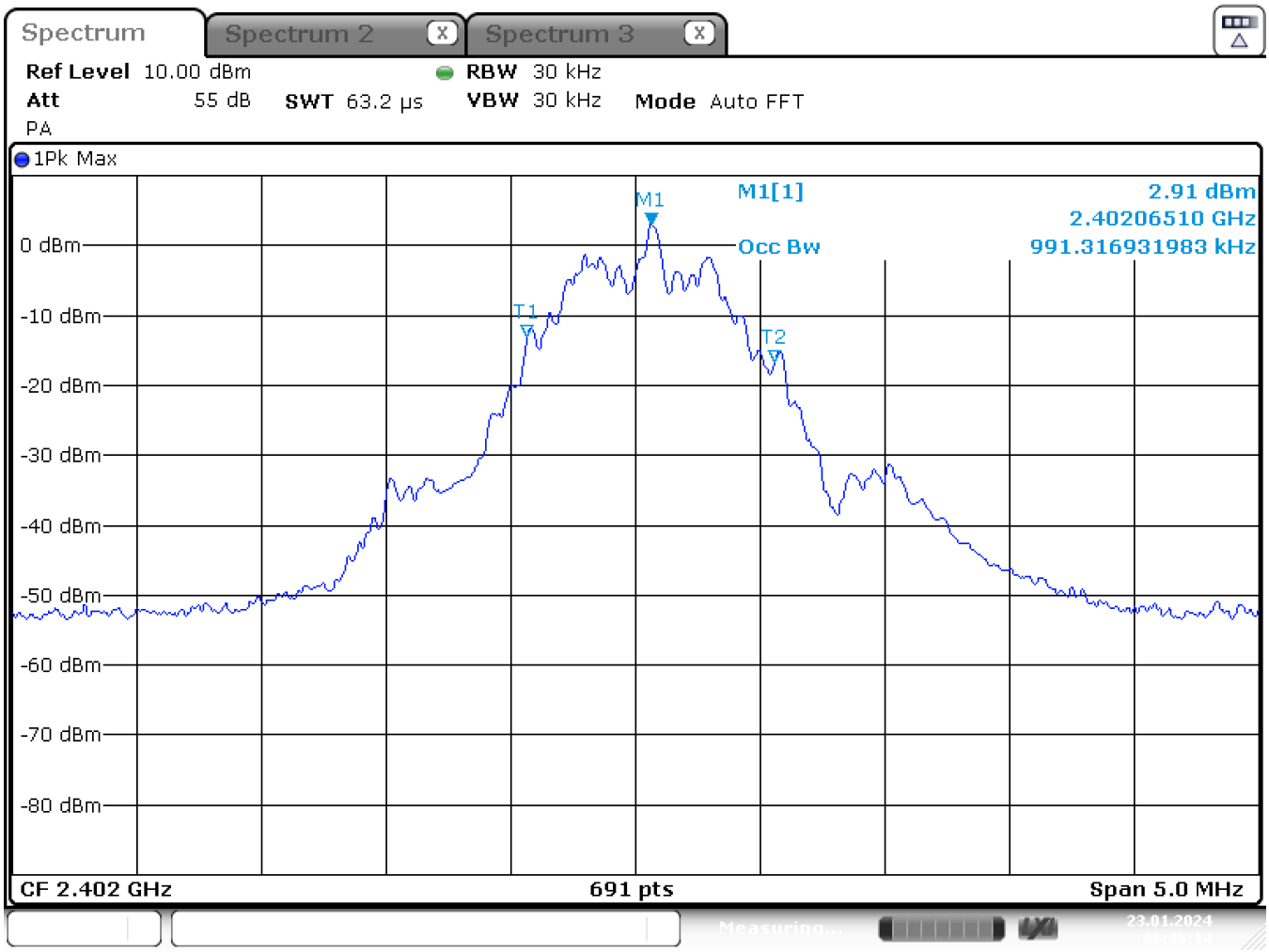
Under normal test conditons	6 dB Bandwidth at least 500 kHz

Test Equipment used: EMV-205;

4.4. 99% Bandwidth RSS 247

Conducted Measurement

Rated output power: 0,87 mW Channel 0 (2402 MHz center frequency)



Date: 23.JAN.2024 08:49:14

99% Bandwidth: 991,3 kHz

LIMIT **RSS 247**

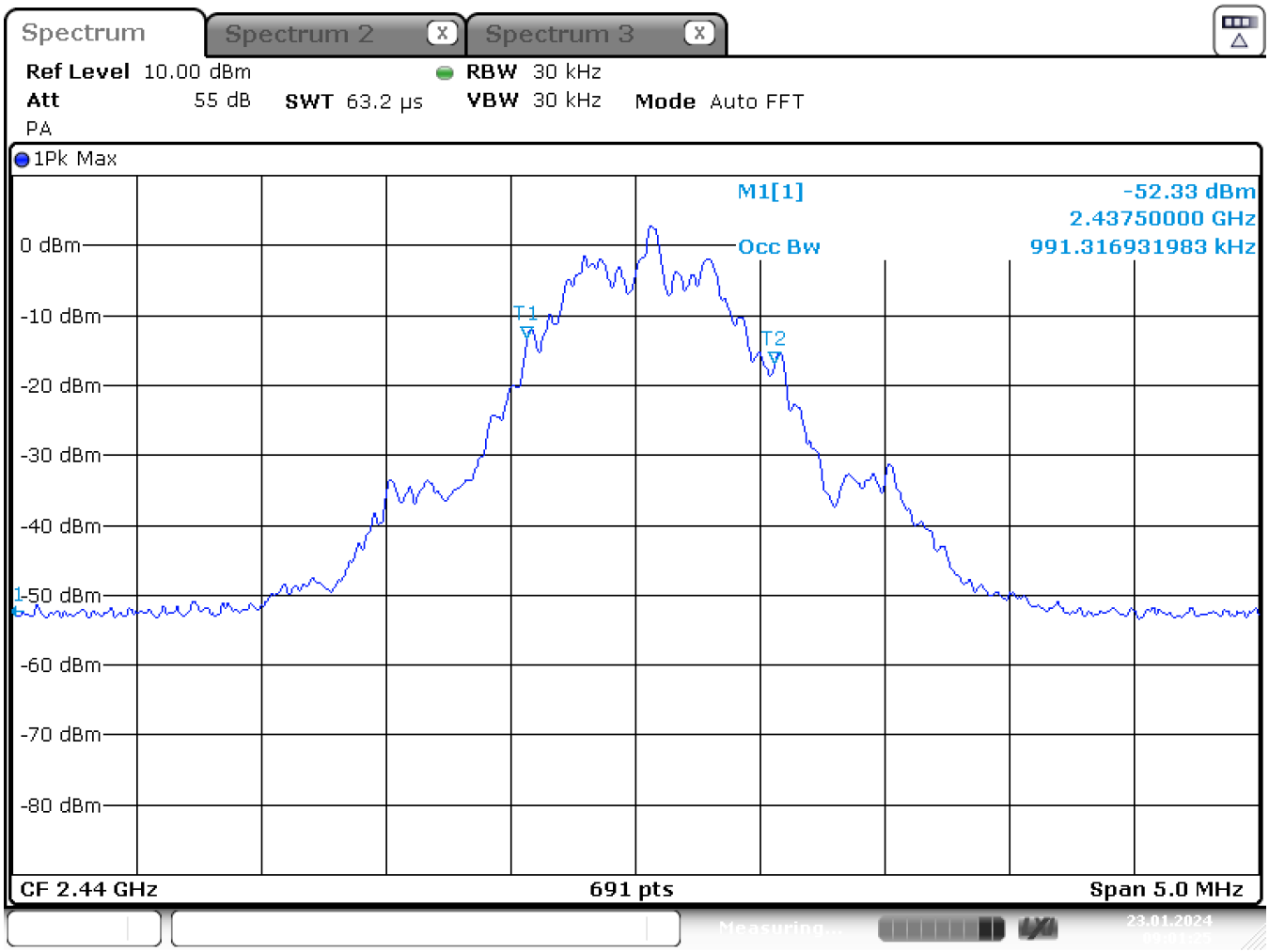
None; for IC reporting purposes only

Test Equipment used: EMV-205;

99% Bandwidth **RSS 247**

Conducted Measurement

Rated output power: 0,87 mW Channel 19 (2440 MHz center frequency)



Date: 23.JAN.2024 09:01:26

99% Bandwidth: 991,3 kHz

LIMIT **RSS 247**

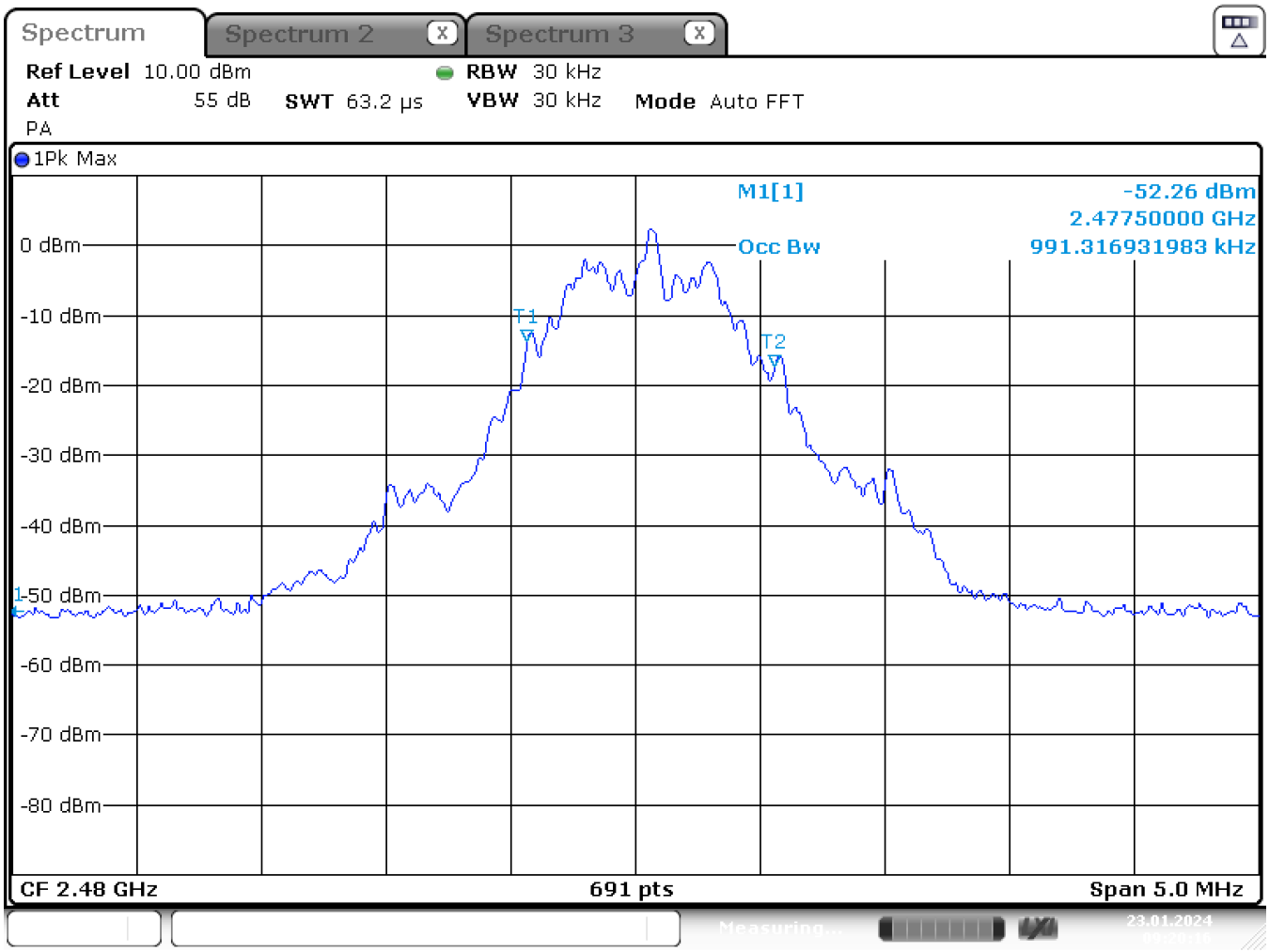
None; for IC reporting purposes only

Test Equipment used:EMV-205;

99% Bandwidth **RSS 247**

Conducted Measurement

Rated output power: 0,87 mW Channel 39 (2480 MHz center frequency)



Date: 23.JAN.2024 09:20:16

99% Bandwidth: 991,3 kHz

LIMIT **RSS 247**

None; for IC reporting purposes only

Test Equipment used: EMV-205;

4.5. Maximum Peak RF Power Output

§ 15.247(b)(3)
5.4.d

Conducted Measurement

Rated output power: 0,87 mW

Test conditions		Transmitter power (mW)		
		2402 MHz	2440 MHz	2480 MHz
T_{nom} (23)°C	V_{nom} (3) V	2,03	1,95	1,79
Measurement uncertainty		± 0,75 dB		

Radiated Measurement

Rated output power: 0,87 mW

Test conditions		Transmitter power (mW) EIRP		
		2402 MHz	2440 MHz	2480 MHz
T_{nom} (23)°C	V_{nom} (3) V	0,87	0,85	0,74
Measurement uncertainty		± 2 dB		

Maximum Gain derived from EIRP and conducted measurement:		Maximum Gain (dBi)		
Test condition		2402 MHz	2440 MHz	2480 MHz
T_{nom} 23 °C	V_{nom} (3)V	-3,67	-3,59	-3,82

LIMIT **SUBCLAUSE 15.247(b)(3) – 5.4.4**

Under normal test conditons	1W conducted (4W eirp)

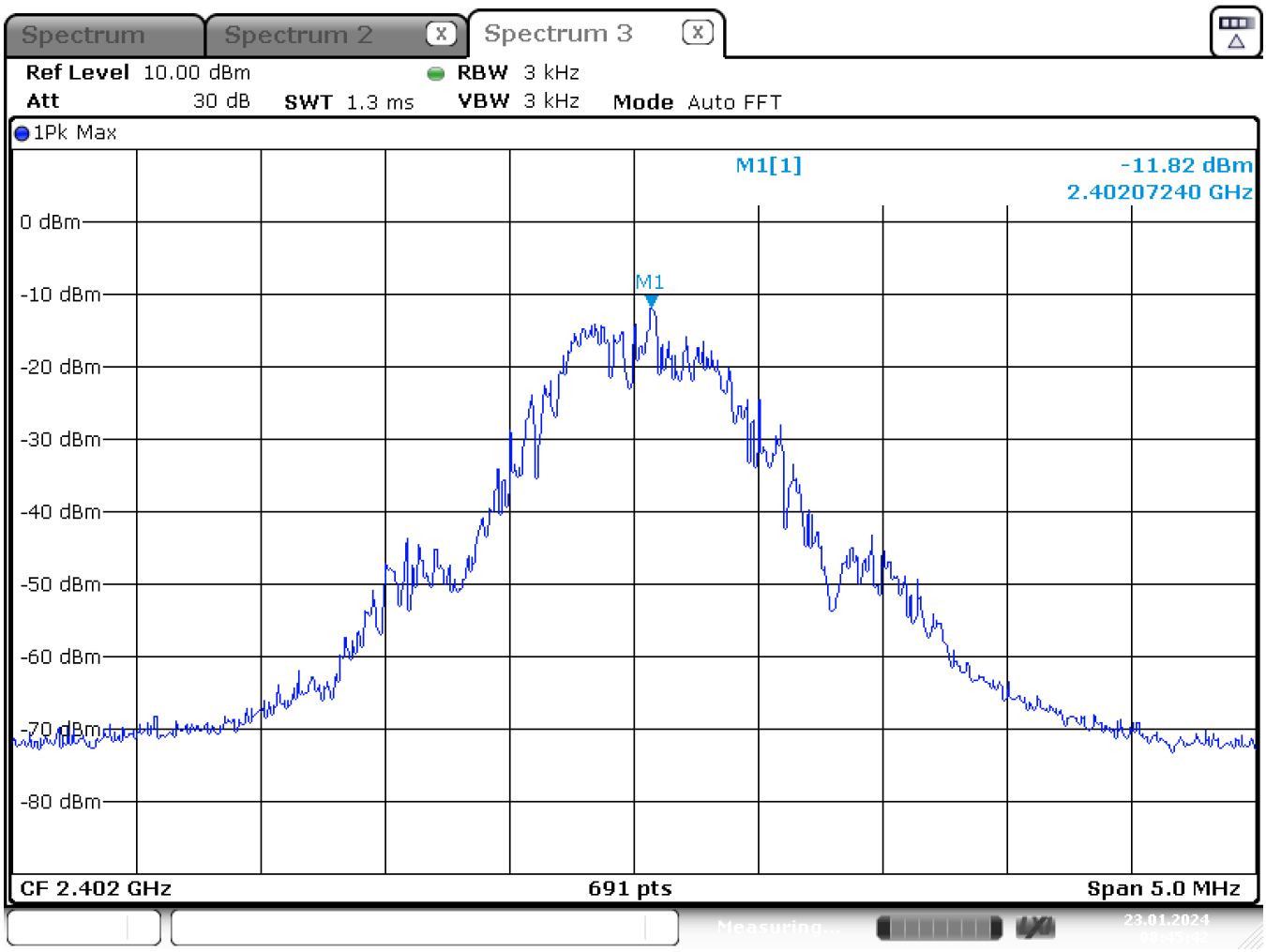
Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-139; NT-207/1; EMV-205

4.6. Power spectral density

§ 15.247(e)
5.2.b

Conducted Measurement

Rated output power: 0,87 mW Channel 0 (2402 MHz center frequency)



Date: 23.JAN.2024 08:45:42

Power Spectral density: -11,82 dBm @ 2402,07 MHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2 b)**

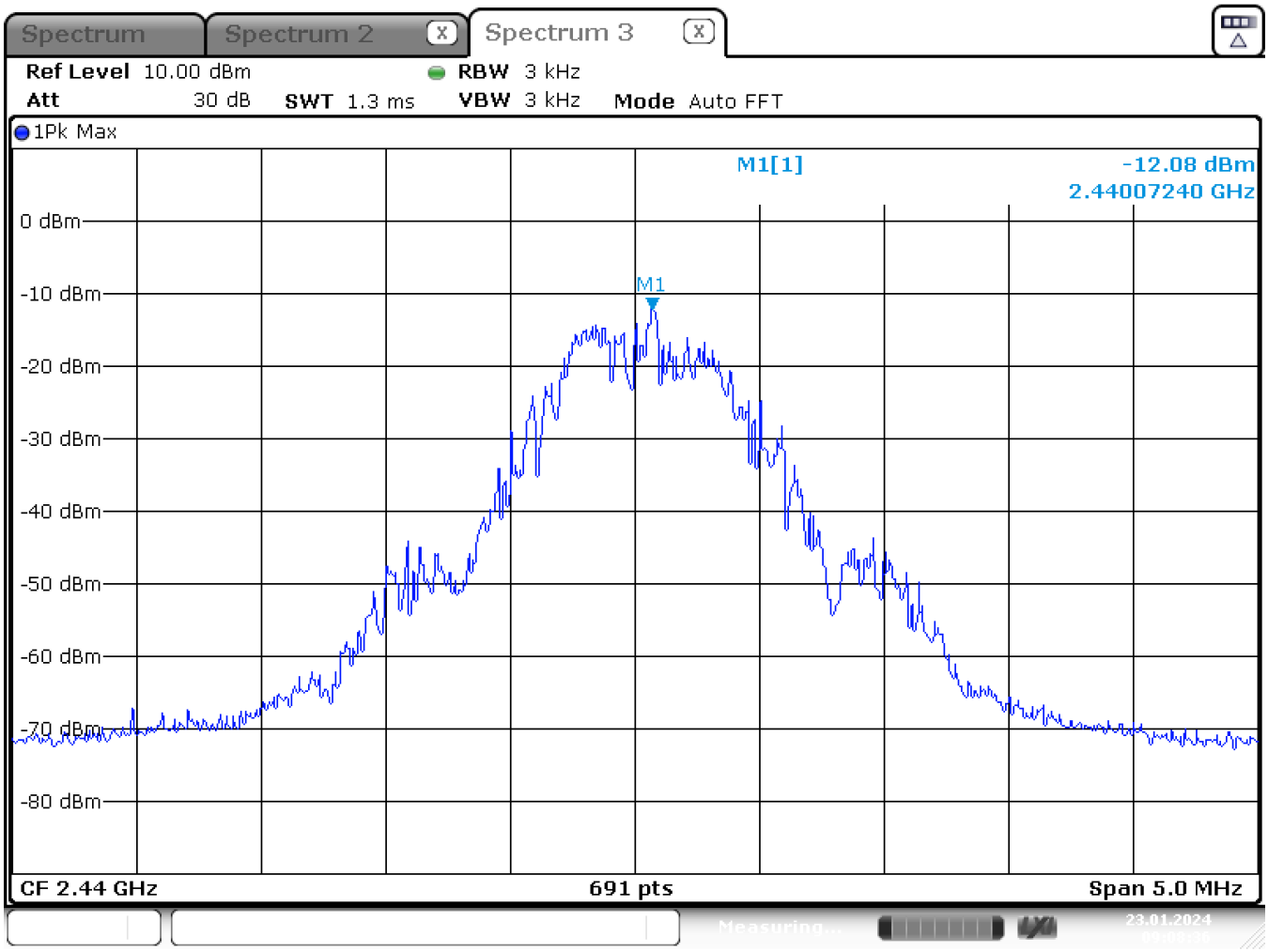
Under normal test conditons	+8dBm in any 3 kHz band

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-139; NT-207/1;

Power spectral density **§ 15.247(e)**
5.2.b

Conducted Measurement

Rated output power: 0,87 mW Channel 19 (2440 MHz center frequency)



Date: 23.JAN.2024 09:08:36

Power Spectral density: -12,08 dBm @ 2440,07 MHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2 b)**

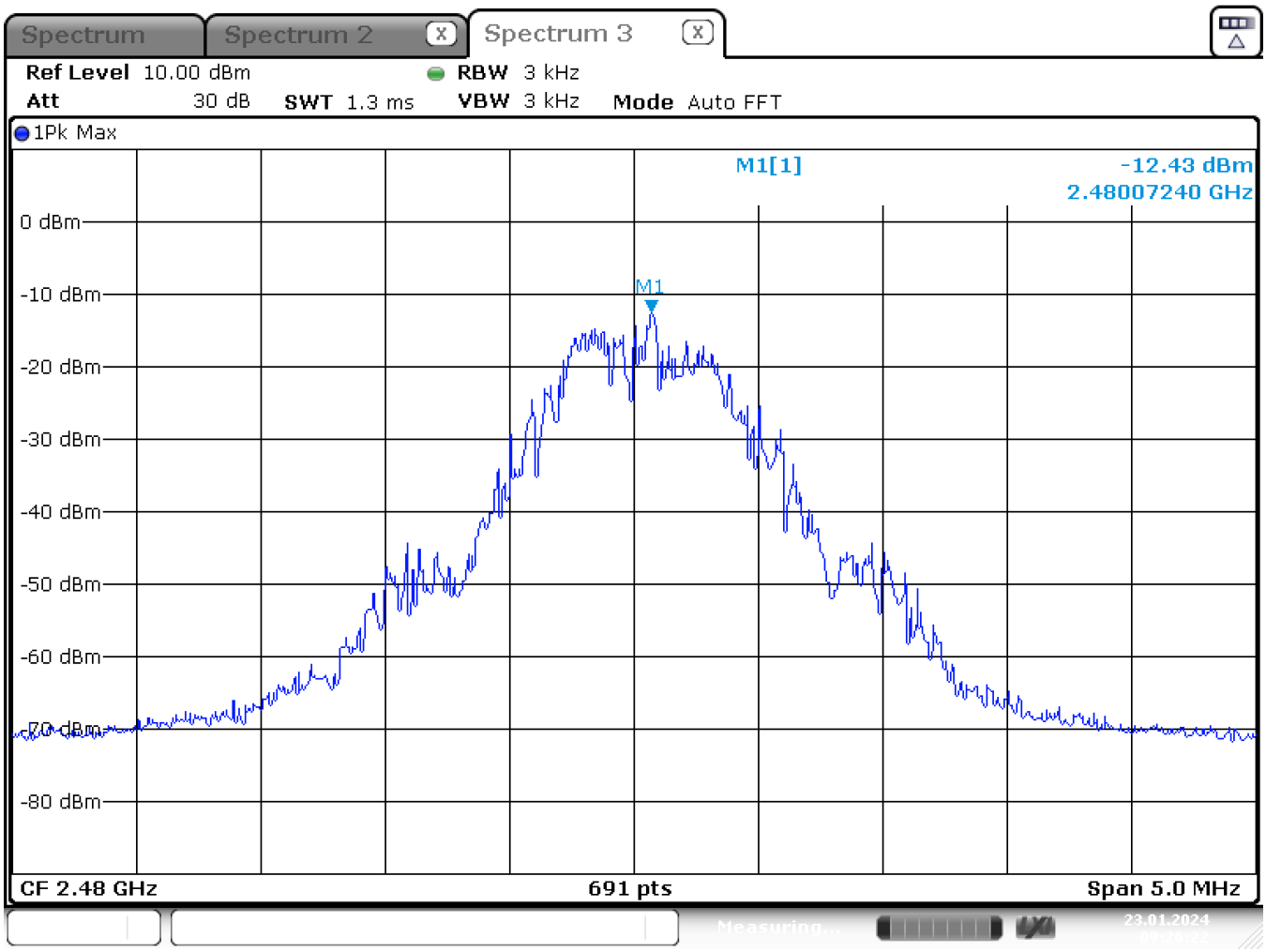
Under normal test conditons	+8dBm in any 3 kHz band

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-139; NT-207/1;

Power spectral density **§ 15.247(e)**
5.2.b

Conducted Measurement

Rated output power: 0,87 mW Channel 39 (2480 MHz center frequency)



Date: 23.JAN.2024 09:26:22

Power Spectral density: -12,43 dBm @ 2480,07 MHz

LIMIT **SUBCLAUSE 15.247(e) – 5.2 b)**

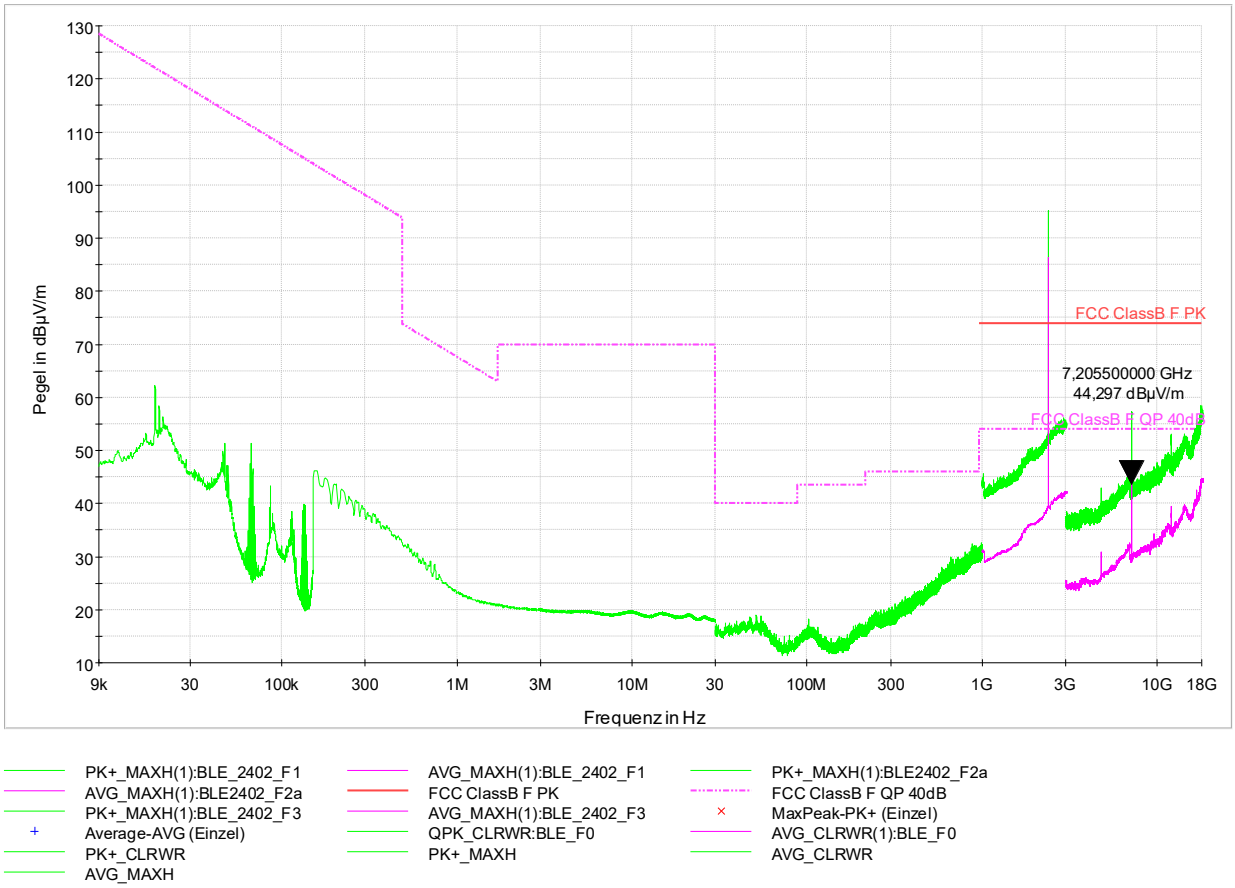
Under normal test conditons	+8dBm in any 3 kHz band

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-139; NT-207/1;

4.7. Emissions in restricted bands **§ 15.209(a)**
Emissions falling within restricted frequency bands **RSS-Gen**

Measurement with Peak-Detector (green line) and Average detector (magenta line):

Setup: CH 0: 2402 MHz



Worst case emission: Average @ 7205,5 MHz: 44,30 dBµV/m
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **SUBCLAUSE 15.209(a) – RSS-Gen**

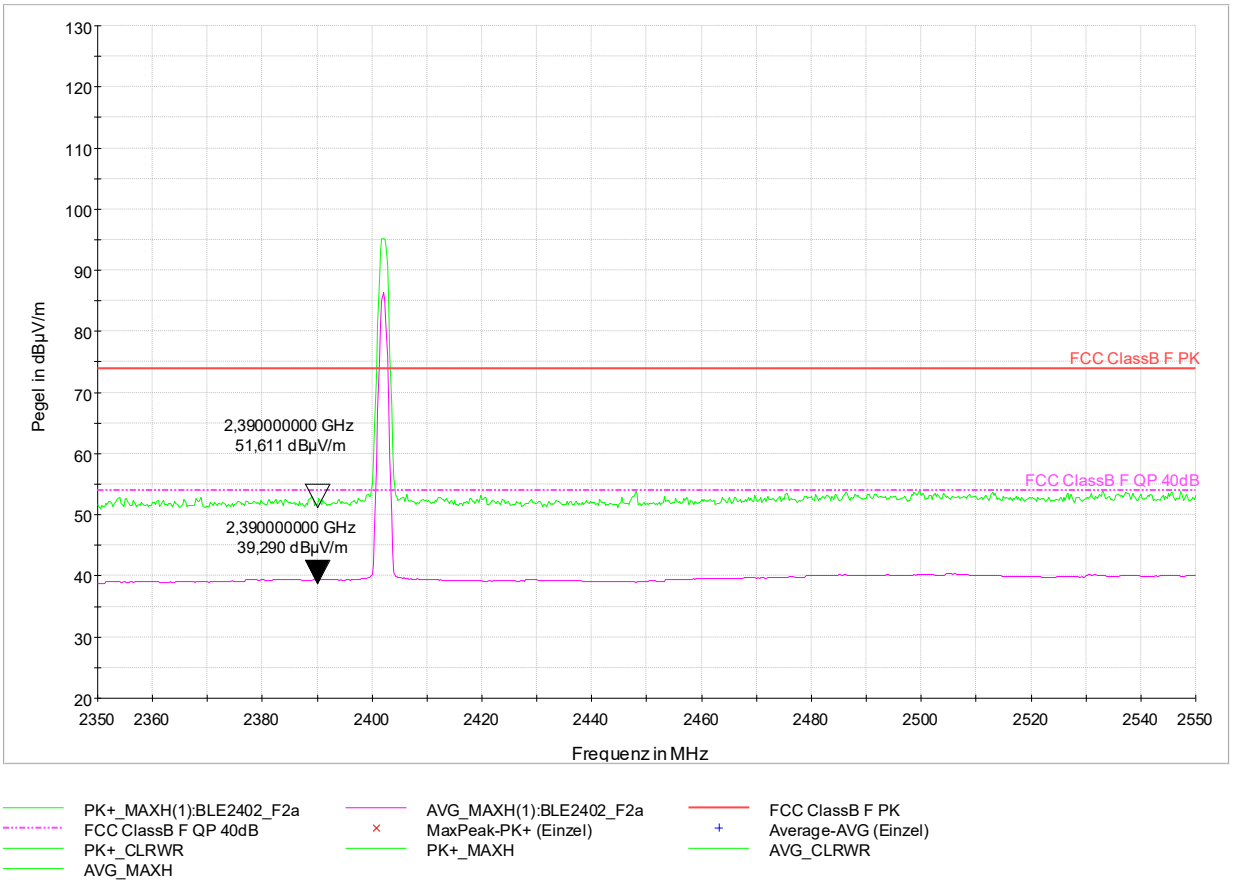
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands § 15.209(a)
Emissions falling within restricted frequency bands RSS-Gen

Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: CH 0: 2402 MHz



LIMIT SUBCLAUSE 15.209(a) – RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

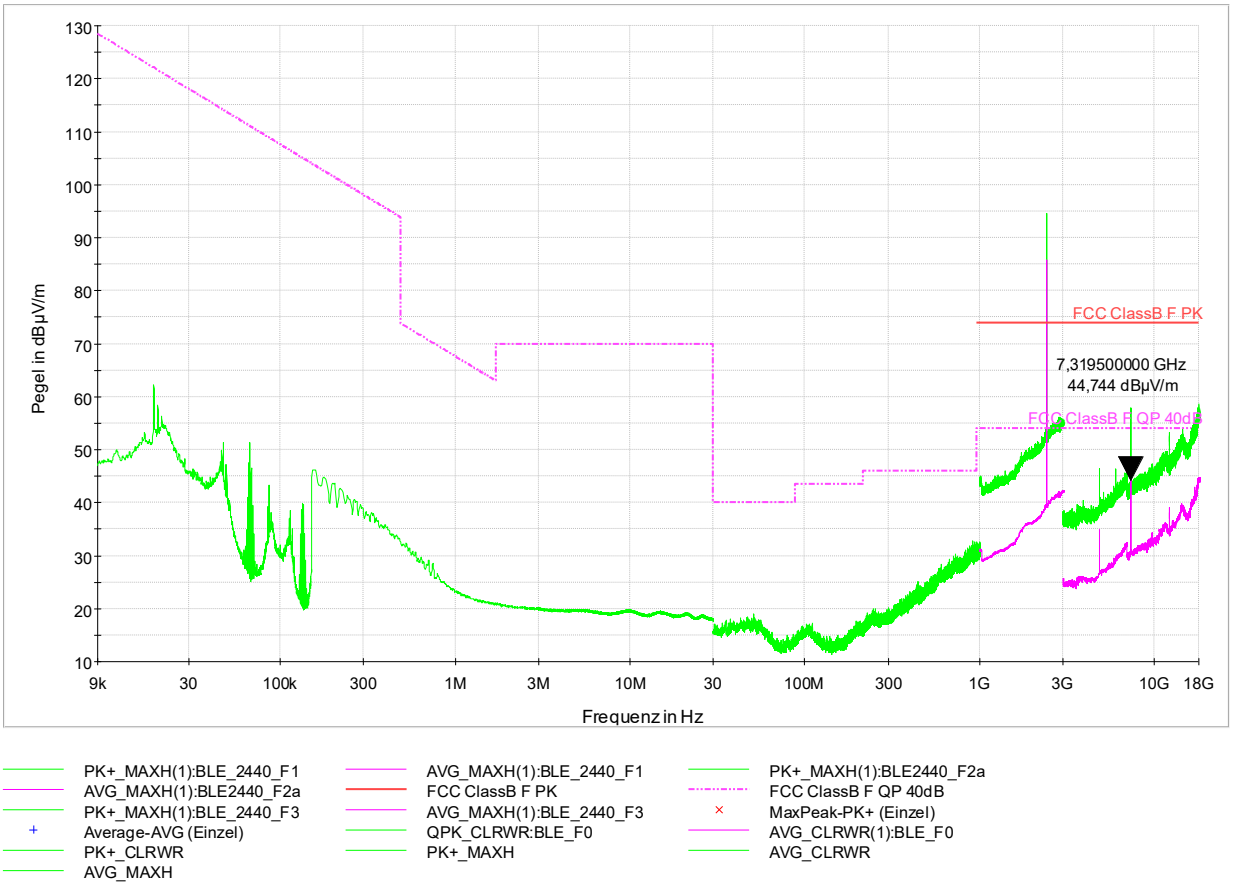
Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-131/1; NT-139; NT-207/1;

Emissions in restricted bands **§ 15.209(a)**
Emissions falling within restricted frequency bands **RSS-Gen**

Measurement with Peak-Detector (green line) and Average detector (magenta line):

Setup: CH 19: 2440 MHz



Worst case emission: Average @ 7319,5 MHz: 44,74 dBµV/m
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **SUBCLAUSE 15.209(a) – RSS-Gen**

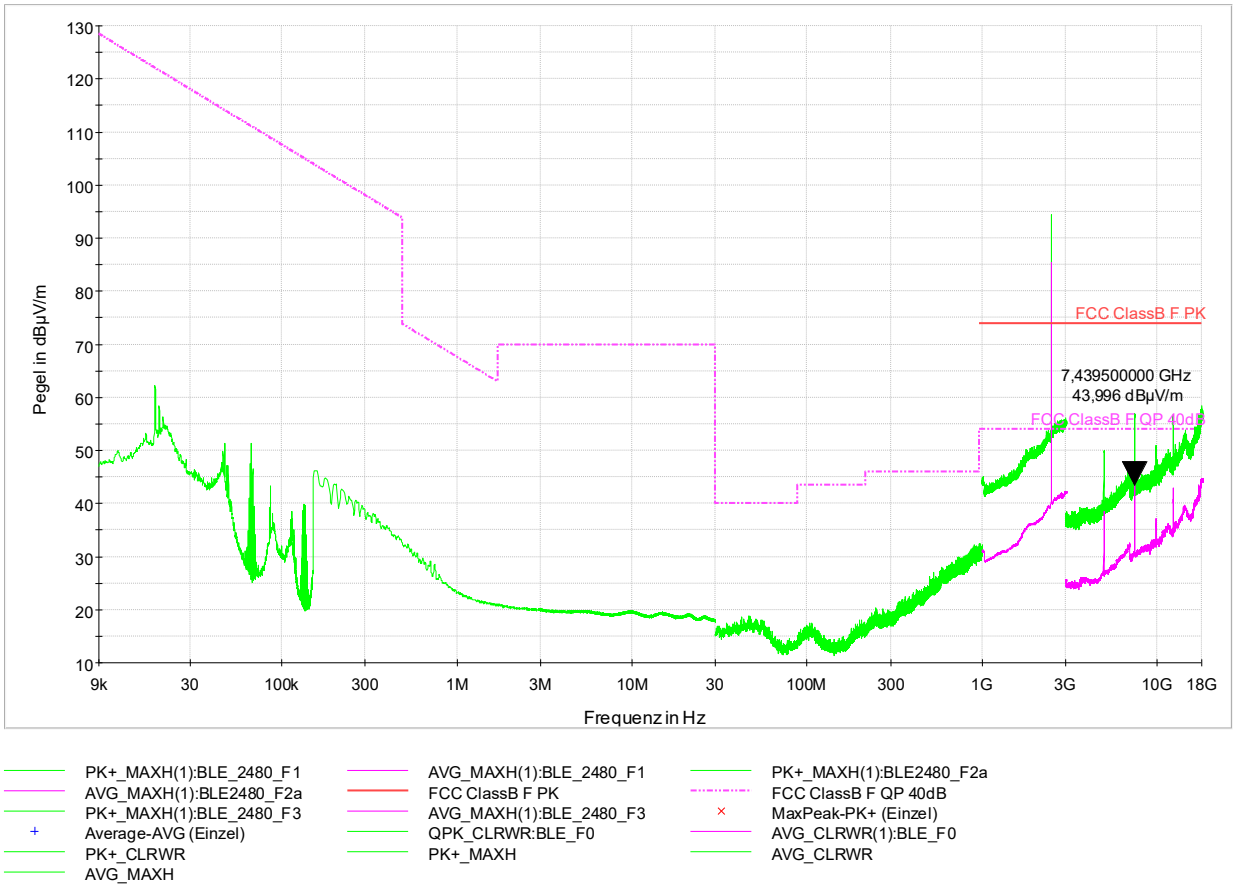
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 15.209(a)**
Emissions falling within restricted frequency bands **RSS-Gen**

Measurement with Peak-Detector (green line) and Average detector (magenta line):

Setup: CH 39: 2480 MHz



Worst case emission: Average @ 7439,5 MHz: 44,00 dBµV/m
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **SUBCLAUSE 15.209(a) – RSS-Gen**

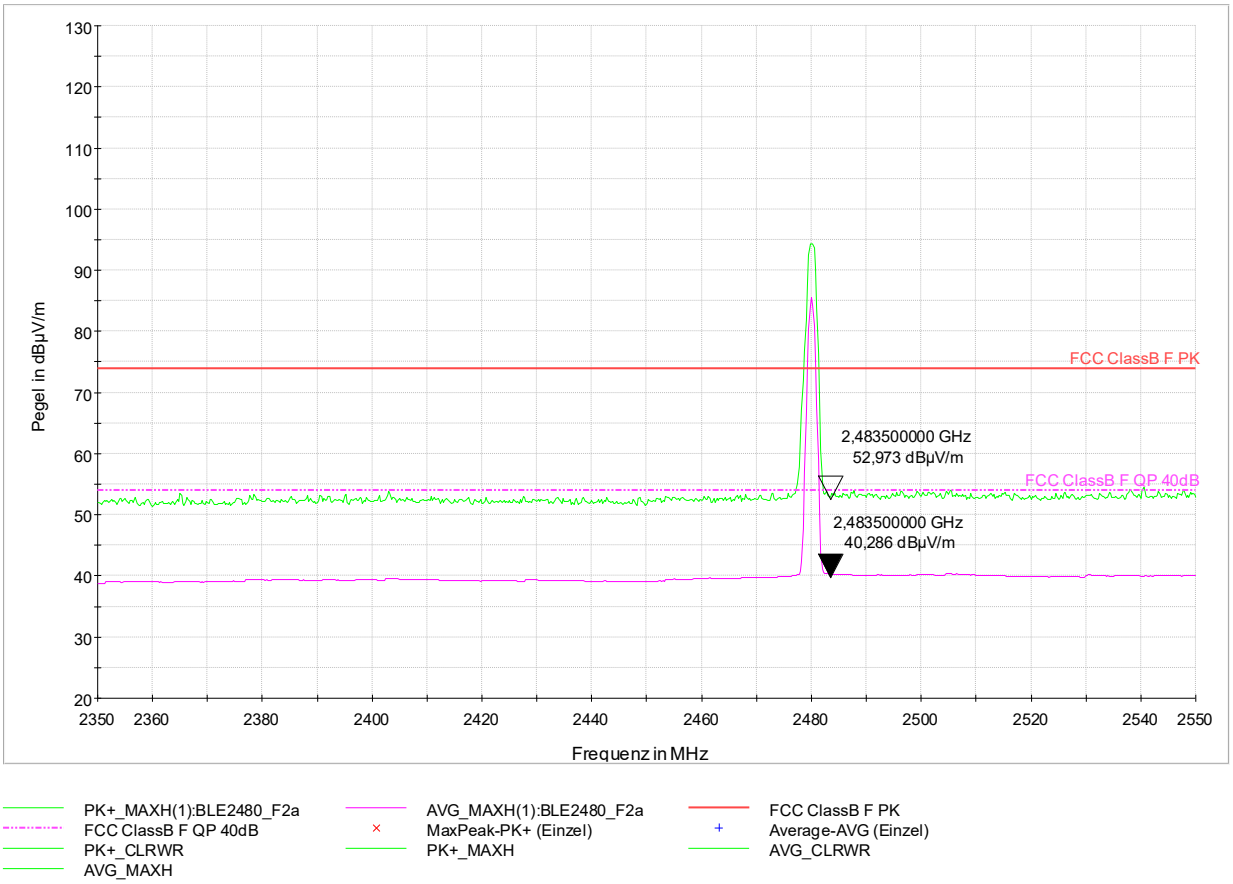
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 15.209(a)**
Emissions falling within restricted frequency bands **RSS-Gen**

Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: CH 39: 2480 MHz



LIMIT **SUBCLAUSE 15.209(a) – RSS-Gen**

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

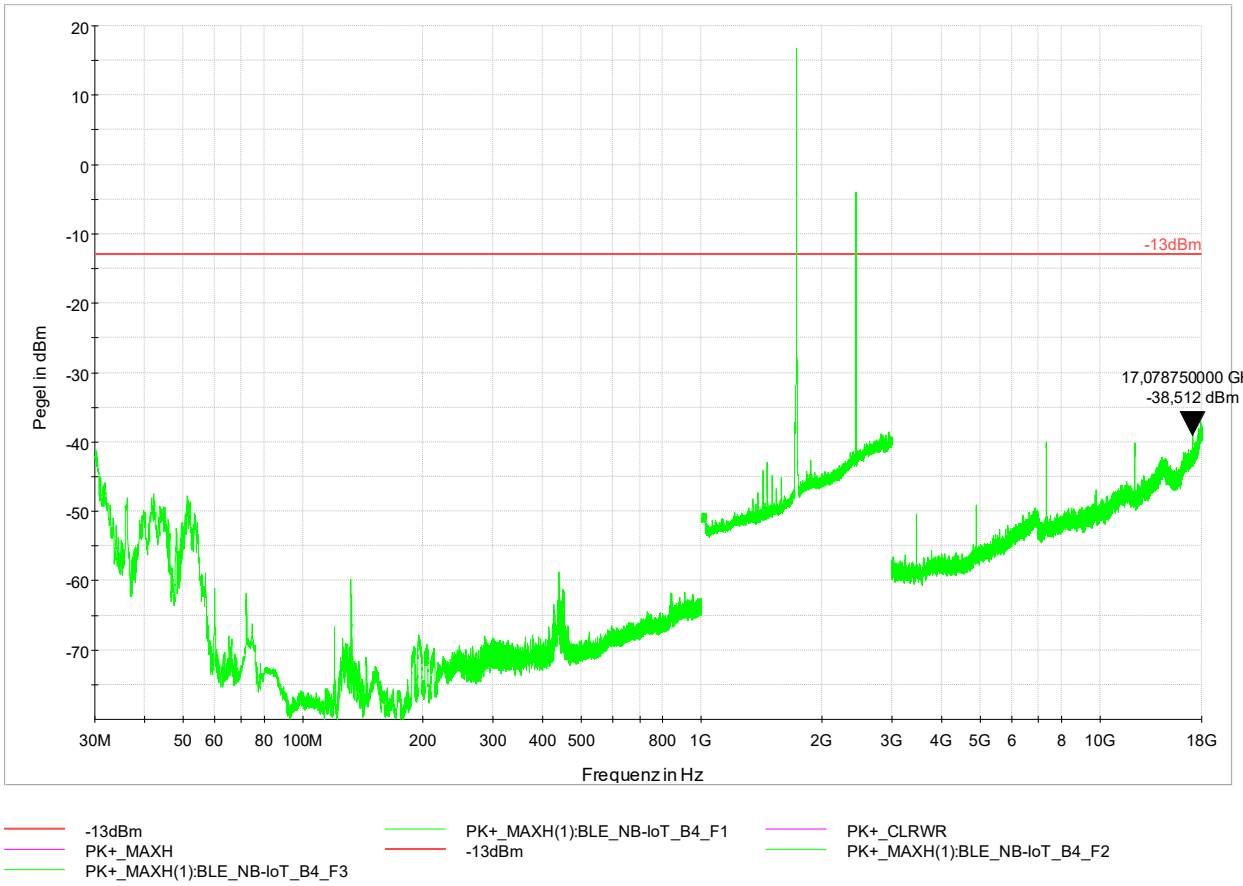
Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-131/1; NT-139; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-139**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission NB-IoT B4 / B66 and BLE 2440 MHz



Worst case emission: Peak @ 17,1 GHz: -38,51 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(h)(1)**

General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

LIMIT **RSS-139 5.6**

Unwanted emissions shall be measured in terms of average values.
For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table 6.

Table 6: Unwanted emission limits

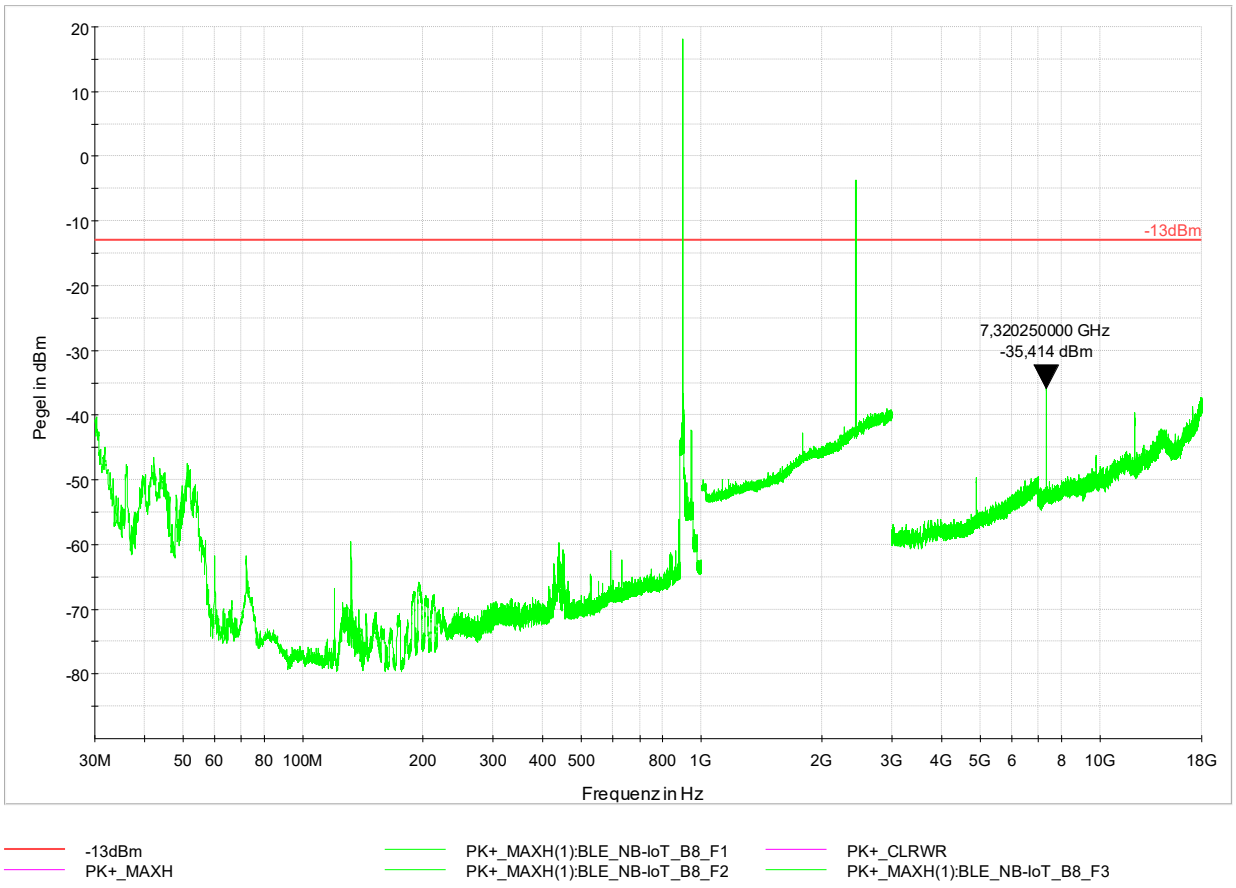
Offset from the edge of the frequency block or frequency block group	Unwanted emission limits
1 MHz	-13 dBm/(1 % of Occupied Bandwidth)
> 1 MHz	-13 dBm/MHz

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.1509**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission NB-IoT B8 and BLE 2440 MHz



Worst case emission: Peak @ 7320,3 MHz: -35,41 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.1509(a)**

For 900 MHz broadband operations in 897.5–900.5 MHz band by at least 43 + 10 log (P) dB.

LIMIT **RSS-130 4.7.1**

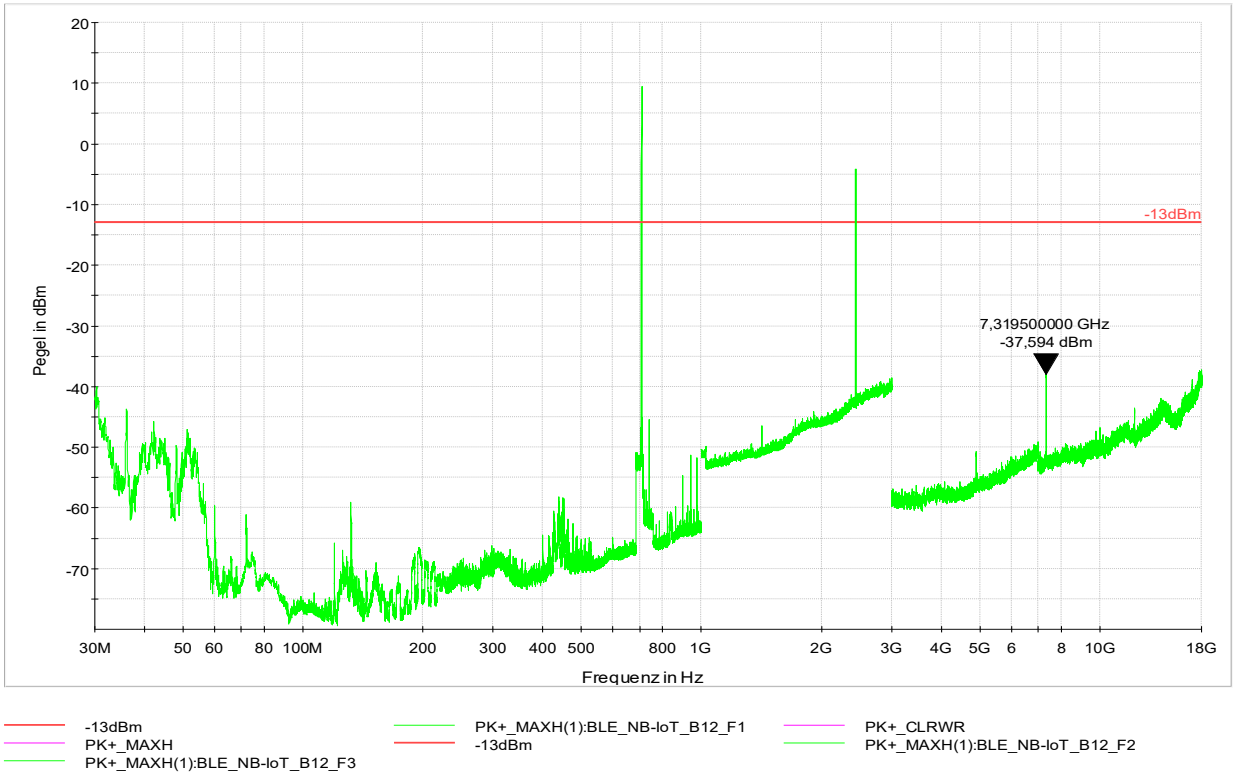
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission NB-IoT B12 / B85 and BLE 2440 MHz



Worst case emission: Peak @ 7319,5 MHz: -37,59 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(g)**

For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a 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, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LIMIT **RSS-130 4.7.1**

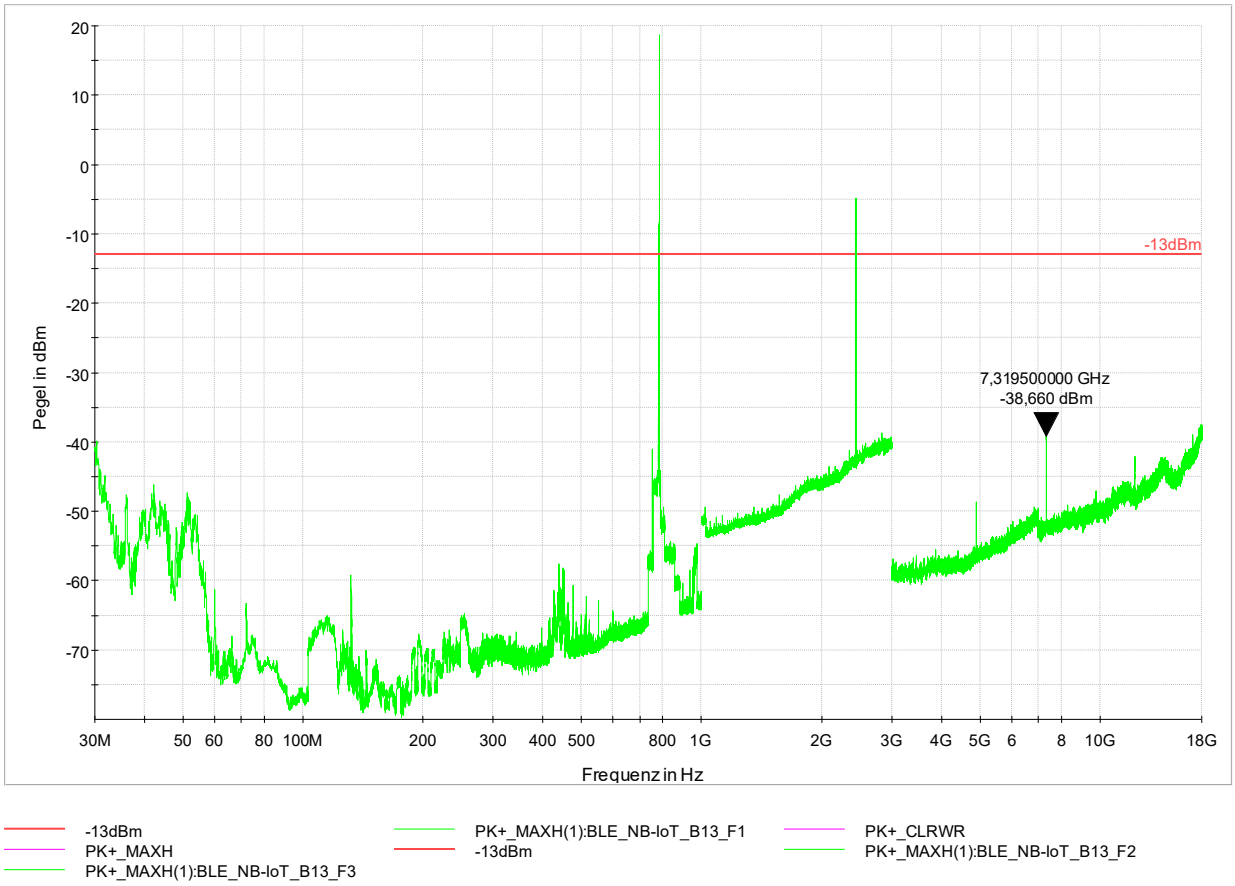
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission NB-IoT B13 and BLE 2440 MHz



Worst case emission: Peak @ 7319,5 MHz: -38,66 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(c)(2)**

On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

LIMIT **RSS-130 4.7.1**

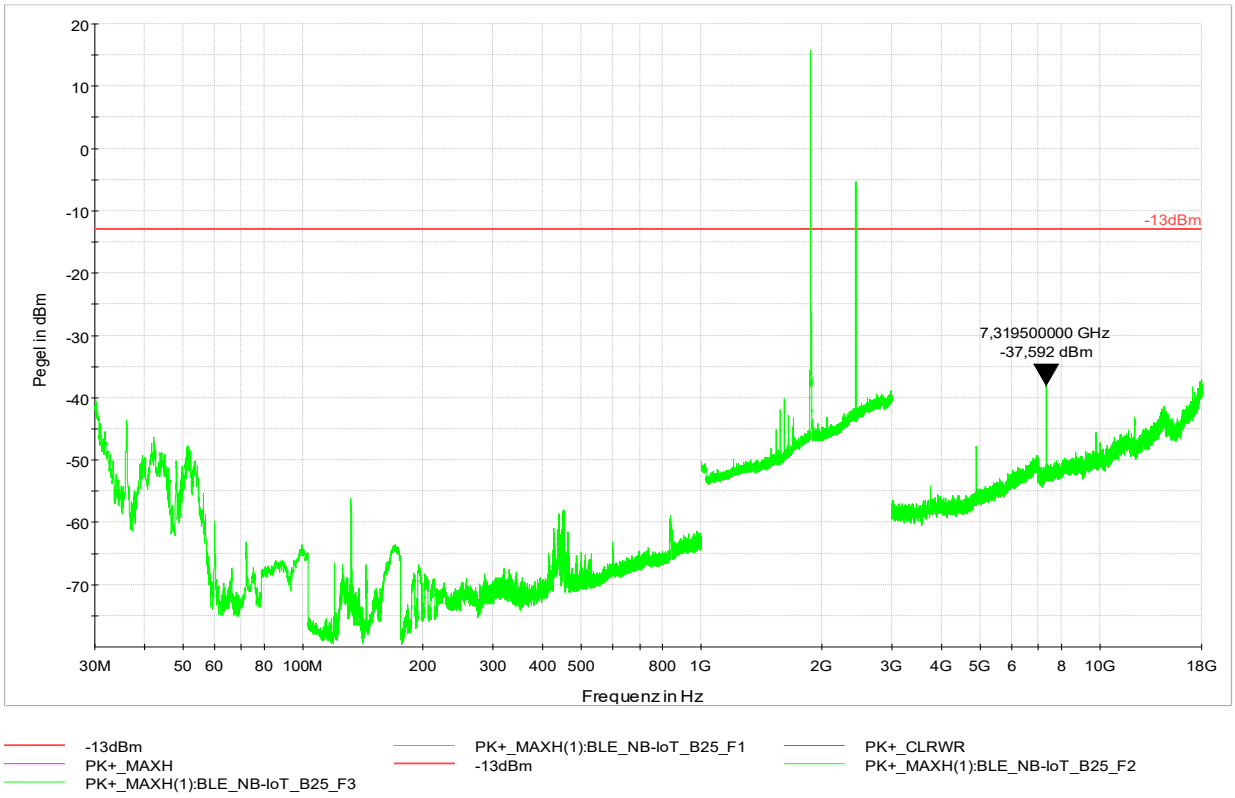
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 24.238**
Emissions falling within restricted frequency bands **RSS-133**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission NB-IoT B25 and BLE 2440 MHz



Worst case emission: Peak @ 7319,5 MHz: -37,59 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 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.

LIMIT **RSS-133 6.5.1(a)(i) and RSS-133 6.5.1(b)**

In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least 43 + 10 log10(P), dB.

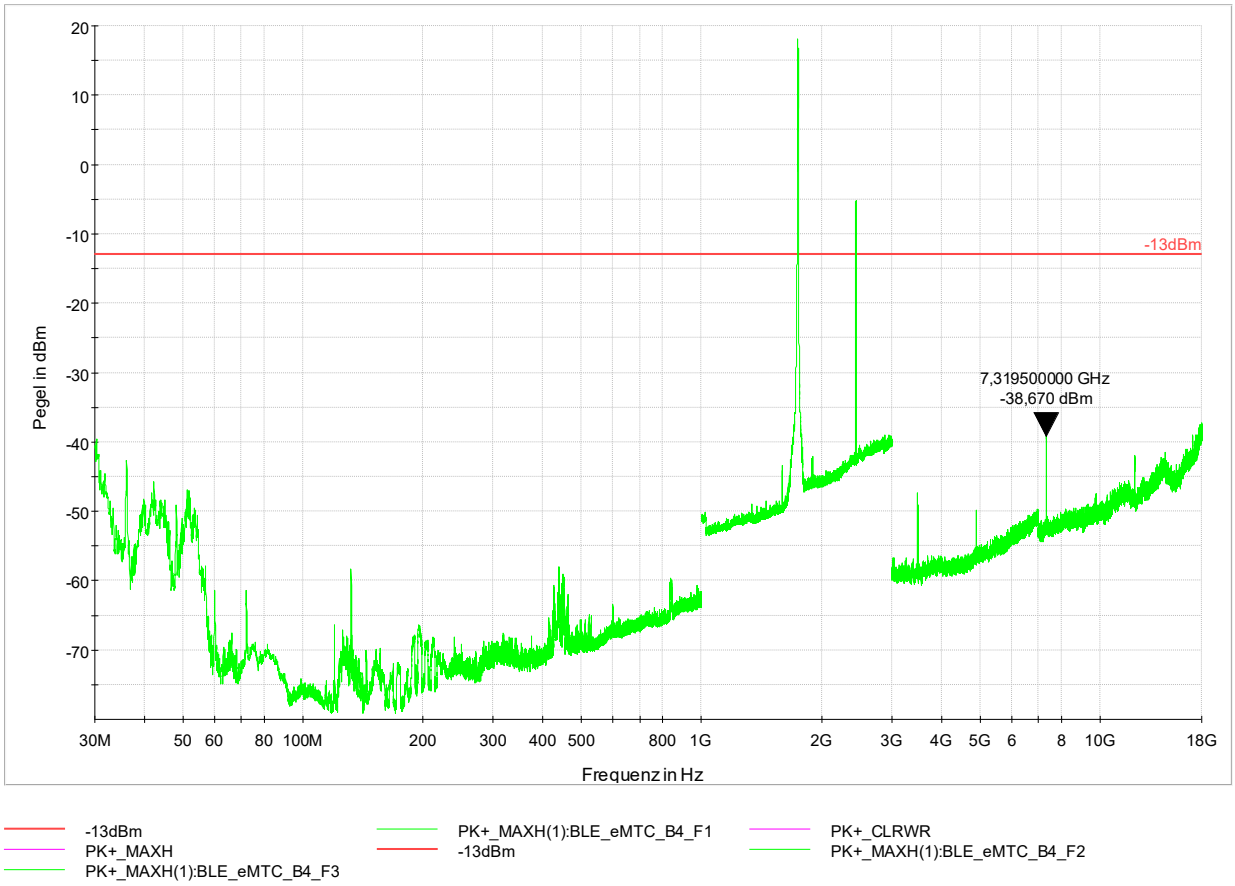
(b) After the first 1.0 MHz (for equipment that complies with (a)(i) of this subsection) or 1.5 MHz (for equipment that complies with (a)(ii) of this subsection), the power of emissions in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in watts) by at least 43 + 10 log10(P), dB. (Note: If the test result using 1% of the emission bandwidth is used, power integration over 1.0 MHz is required; alternatively, the spectrum analyzer resolution and video bandwidths can be increased to 1.0 MHz for this measurement).

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-139**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission CAT-M1 B4 / B66 and BLE 2440 MHz



Worst case emission: Peak @ 7319,5 MHz: -38,67 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(h)(1)**

General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

LIMIT **RSS-139 5.6**

Unwanted emissions shall be measured in terms of average values.
For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table 6.

Table 6: Unwanted emission limits

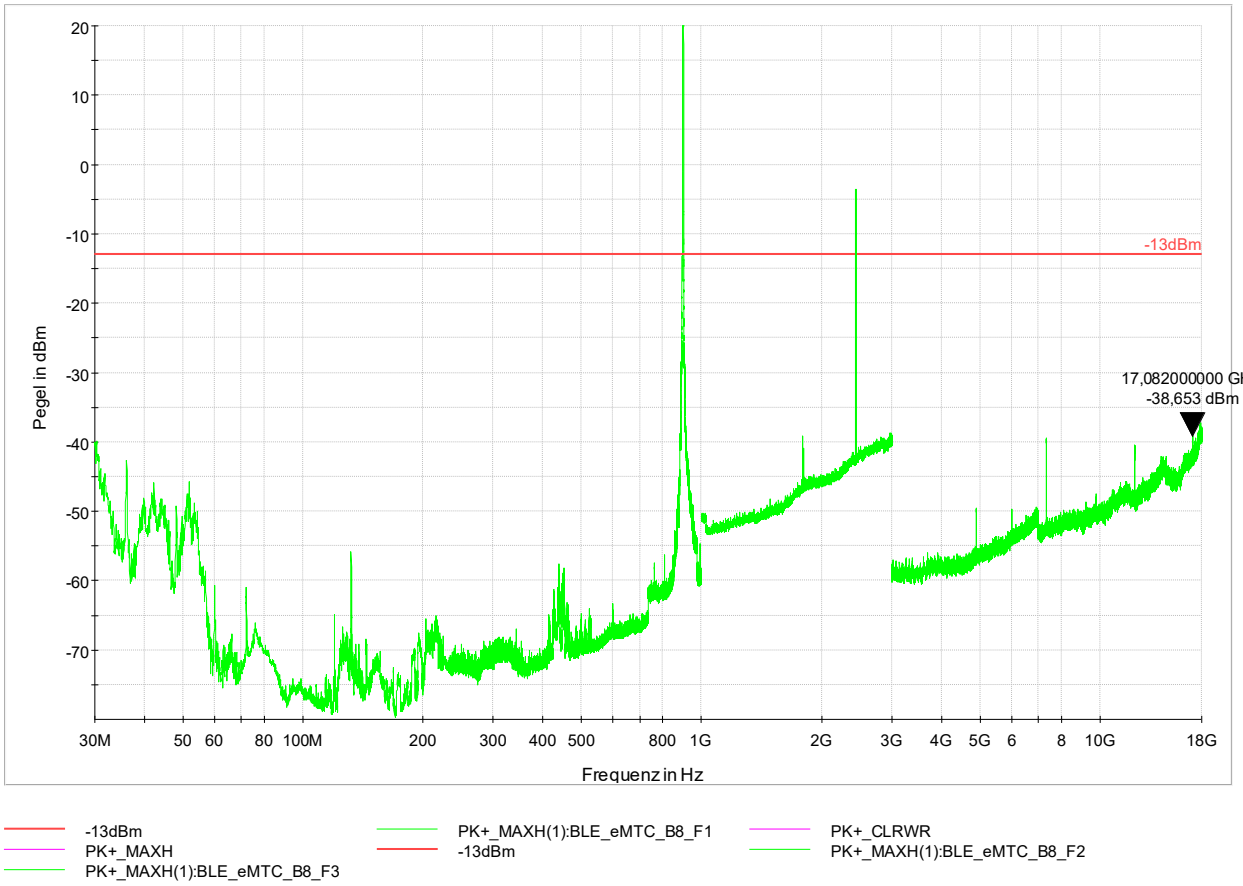
Offset from the edge of the frequency block or frequency block group	Unwanted emission limits
1 MHz	-13 dBm/(1 % of Occupied Bandwidth)
> 1 MHz	-13 dBm/MHz

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.1509**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission CAT-M1 B8 and BLE 2440 MHz



Worst case emission: Peak @ 17,082 GHz: -38,65 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.1509(a)**

For 900 MHz broadband operations in 897.5–900.5 MHz band by at least 43 + 10 log (P) dB.

LIMIT **RSS-130 4.7.1**

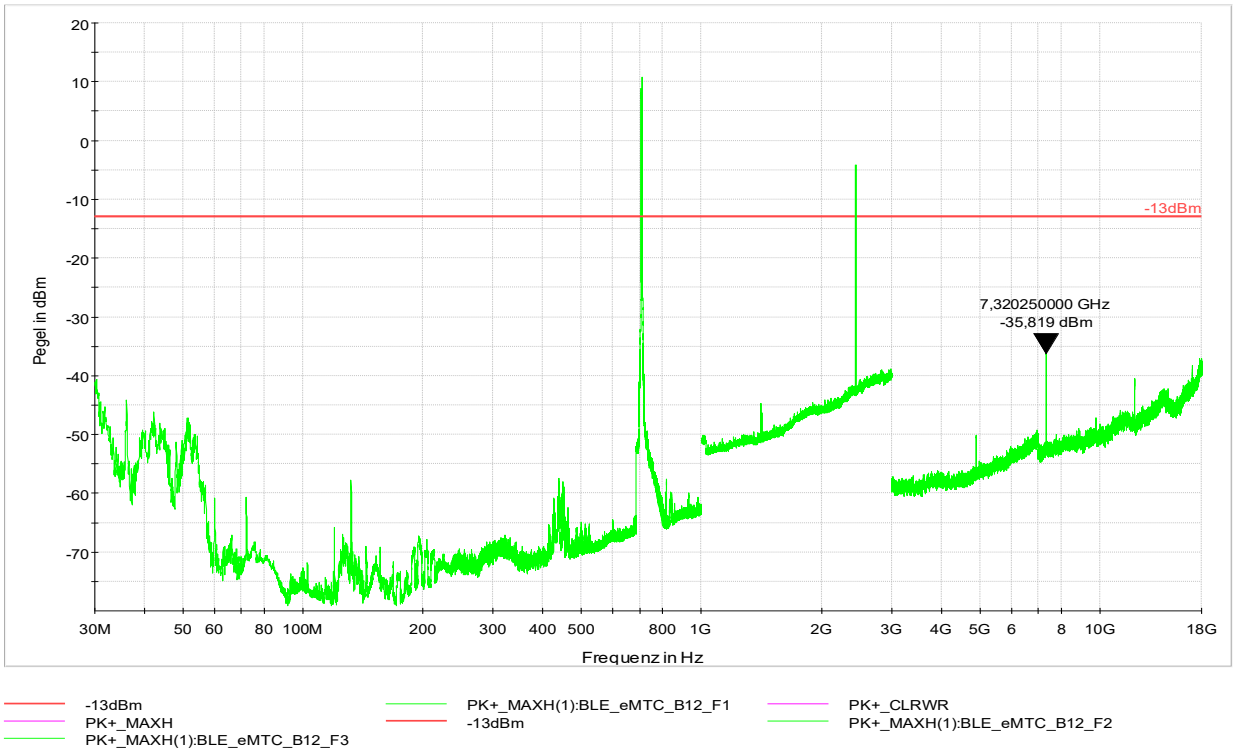
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission LTE CAT-M1 B12 and BLE 2440 MHz



Worst case emission: Peak @ 7320,3 MHz: -35,82 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(g)**

For operations in the 600 MHz band and the 698–746 MHz band, the power of any emission outside a 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, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LIMIT **RSS-130 4.7.1**

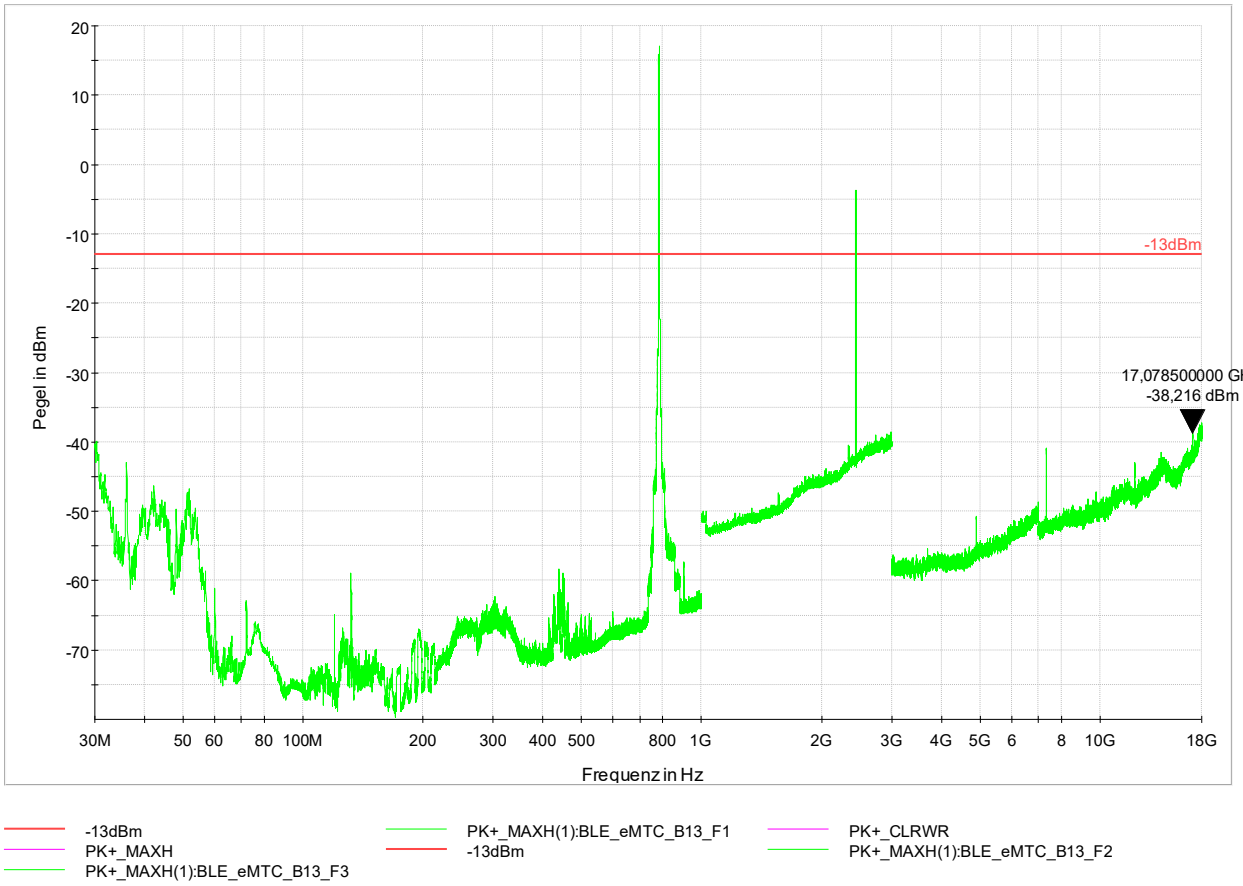
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 27.53**
Emissions falling within restricted frequency bands **RSS-130**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission LTE CAT-M1 B13 and BLE 2440 MHz



Worst case emission: Peak @ 17,079 GHz: -38,22 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 27.53(c)(2)**

On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

LIMIT **RSS-130 4.7.1**

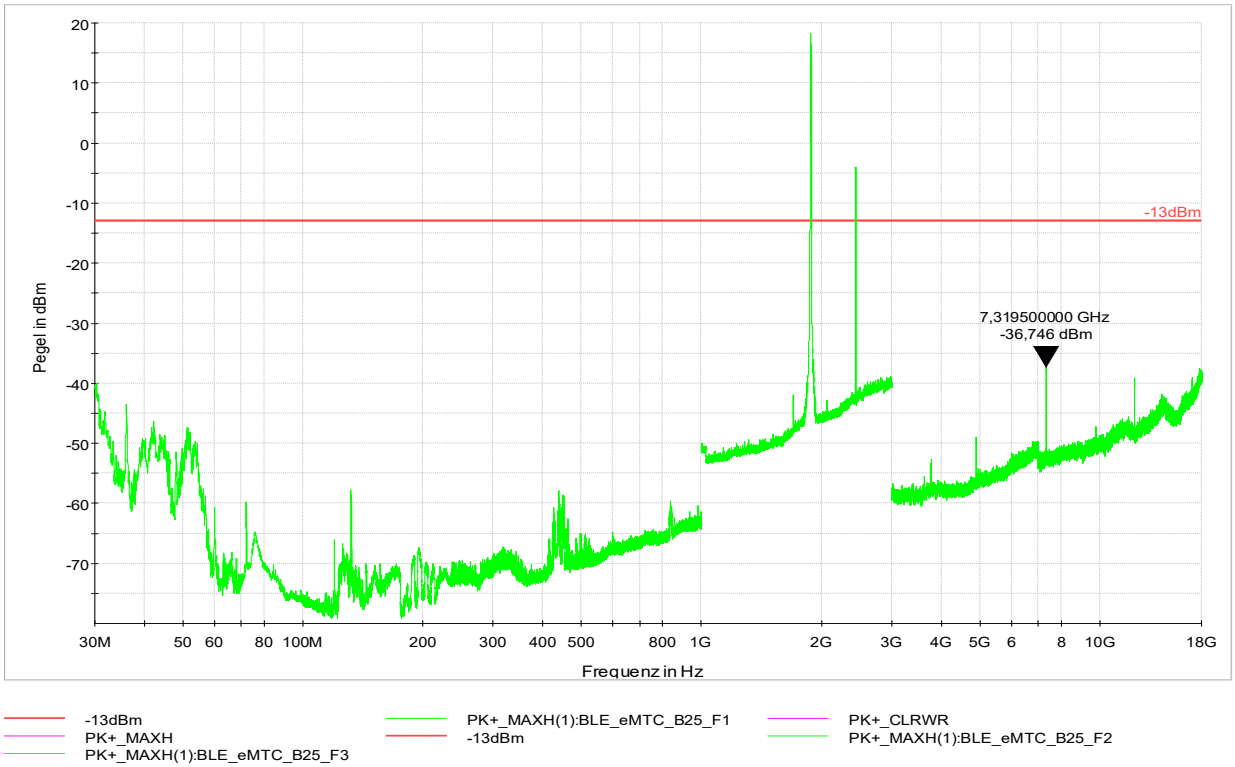
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 24.238**
Emissions falling within restricted frequency bands **RSS-133**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission LTE CAT-M1 B2/B25 and BLE 2440 MHz



Worst case emission: Peak @ 7319,5 MHz: -36,75 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 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.

LIMIT **RSS-133 6.5.1(a)(i) and RSS-133 6.5.1(b)**

In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least 43 + 10 log10(P), dB.

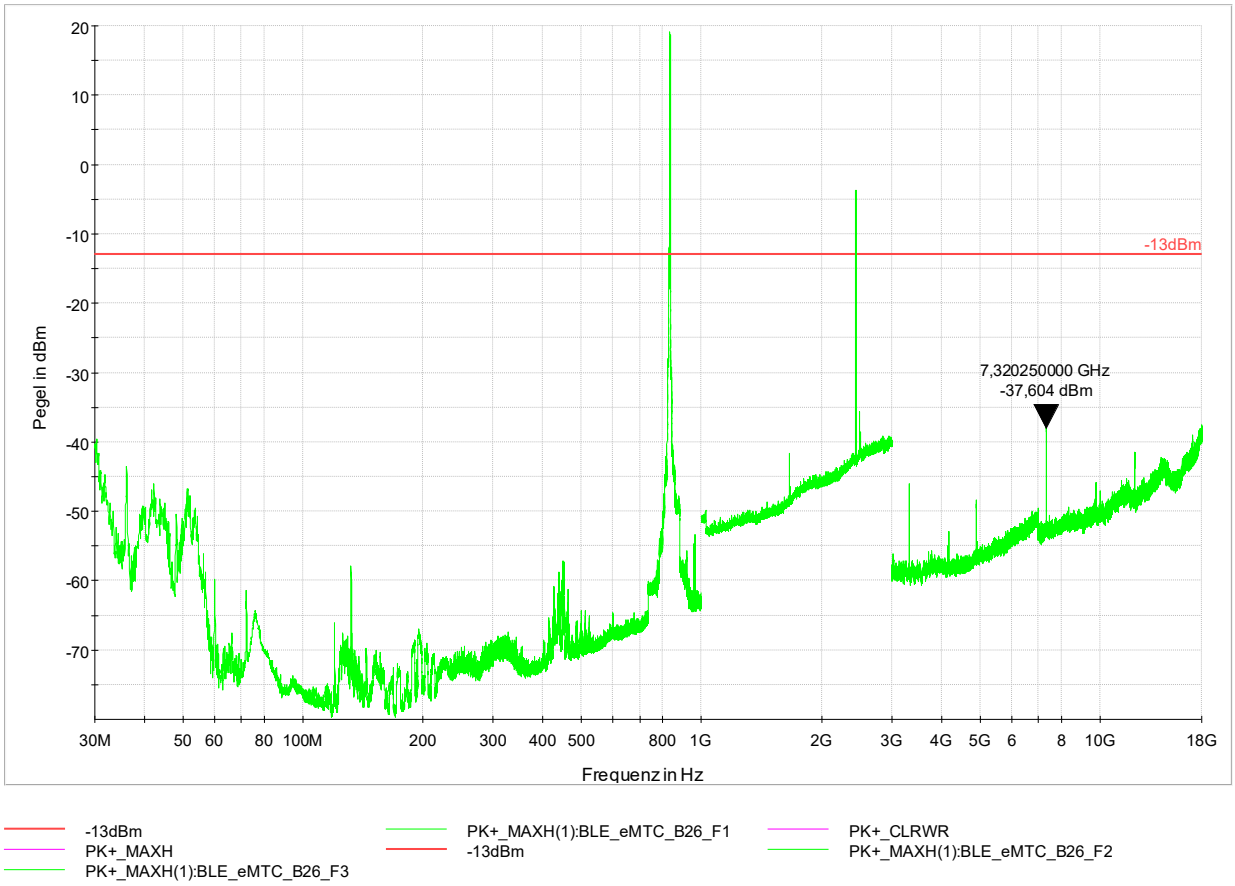
(b) After the first 1.0 MHz (for equipment that complies with (a)(i) of this subsection) or 1.5 MHz (for equipment that complies with (a)(ii) of this subsection), the power of emissions in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in watts) by at least 43 + 10 log10(P), dB. (Note: If the test result using 1% of the emission bandwidth is used, power integration over 1.0 MHz is required; alternatively, the spectrum analyzer resolution and video bandwidths can be increased to 1.0 MHz for this measurement).

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;

Emissions in restricted bands **§ 22.917, § 90.669**
Emissions falling within restricted frequency bands **RSS-132**

Measurement with Peak-Detector (green line):

Setup: Simultaneous transmission LTE CAT-M1 B5 (B26 only FCC) and BLE 2440 MHz



Worst case emission: Peak @ 7320,3 MHz: -37,60 dBm
Remark: Although the measurement above ends at 18 GHz, all measurements were performed up to the thenth harmonics of the transmitter frequency.

LIMIT **FCC Part 22.917(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.

LIMIT **FCC Part 90.669(a)**

On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 plus 10 log10(P) decibels or 80 decibels, whichever is the lesser attenuation.

Note: The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

LIMIT **RSS-132 5.5**

Equipment shall meet the unwanted emission limits specified below:

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-132; NT-207/1;