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Test Report

Report Number:

F221265E1

Equipment under Test (EUT):

NB-IoT modem
ZSNB-L11

Applicant:

Gutermann Technology GmbH

Manufacturer:

Gutermann Technology GmbH

ilac-MRA DAkkS Deutsche Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

[1] **ANSI C63.26-2015** American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

[2] **CFR 47 Part 2** Frequency allocations and radio treaty matters; General rules and regulations

[3] **CFR 47 Part 22** Public mobile services, Subpart H – Cellular Radiotelephone service

[4] **CFR 47 Part 24** Public mobile services, Subpart E – Broadband PCS

[5] **CFR 47 Part 27** Miscellaneous wireless communications services

[6] **RSS-130 Issue 2** Equipment Operating in the Frequency Bands 617 - 652 MHz, 663 - 698 MHz, 698 - 756 MHz and 777 - 787 MHz

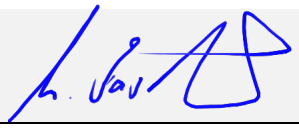
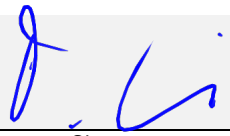
[7] **RSS-132 Issue 4** Cellular Systems Operating in the Bands 824 - 849 MHz and 869 - 894 MHz

[8] **RSS-133 Issue 6** 2 GHz Personal Communication Services

[9] **RSS-139 Issue 4** Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710 - 1780 MHz and 2110 - 2180 MHz

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

“Passed” indicates that the equipment under test conforms with the relevant limits of the testing standard without taking any measurement uncertainty into account as stated in clause 1.3 of ANSI C63.10 (2013). However, the measurement uncertainty is calculated and shown in this test report.

Tested and written by:		Manuel BASTERT 15.02.2023
	Signature	
Reviewed and approved by:		Thomas Kühn 15.02.2023
	Signature	

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The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents: Page

1 Identification

1.1 Applicant

Name:	Gutermann Technology GmbH
Address:	Gottlieb Daimler Str. 10, 88214 Ravensburg
Country:	Germany
Person for contact purposes:	Mr. Carles ESTELLERS CASAS
Phone:	+49 751 35 90 16 - 89
eMail address:	carles.estellers@gutermann-water.com
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	Gutermann Technology GmbH
Address:	Gottlieb Daimler Str. 10, 88214 Ravensburg
Country:	Germany
Name for contact purposes:	Mr. Carles ESTELLERS CASAS
Phone:	+49 751 35 90 16 - 89
eMail address:	carles.estellers@gutermann-water.com
Manufacturer represented during the test by the following person:	None

1.3 Test Laboratory

The tests were carried out at:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06 and D-PL-17186-01-05, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

EUT	
EUT: *	NB-IoT modem
PMN: *	ZSNB-L11
HVIN: *	ZSNB1x1
FVIN: *	NBGV03
IMEI: *	867997031407728
FCC ID: *	ZSS-ZSNBL10001
ISED: *	9789A-ZSNBL10001

* Declared by the applicant

Host device	
Host device: *	Leakage logger with NB-IoT modem
HMN: *	IoT Leak Logger ZSNB-L12
Serial number: *	500011993

* Declared by the applicant

One sample was used for all tests.

Note: Phoenix Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

Ports / Connectors				
Identification			Length during test	Shielding (Yes / No)
	EUT	Ancillary		
Antenna / programming port	RP-SMA male	RP-SMA female	0.6 m*	Yes

*: If setup with antenna rod was used

Ancillary Equipment	
Programming jig *2	ZSNB-JIG10
Laptop *2	Hewlett Packard TPN-126

*1 Provided by the laboratory
*2 Provided by the applicant

1.5 Technical Data of Equipment

General	
Supported GSM bands: * / **	None
Supported UMTS FDD bands: * / **	None
Supported E-UTRA FDD (NB-IoT) bands: * / **	1, 2, 3, 4, 5, 8, 12, 13, 17, 18, 19, 20, 25, 26, 28, 66
Max. output power (nom.): *	23 dBm

* Declared by the applicant
** Not all bands are used in the final application.

Cellular antennas (refer to Annex D for further details)	
Antenna type: *	External monopole antenna
Gain: * (max) (On a 10 cm x 10 cm groundplane with ANT-BASE-06)	ANT-ROD-30 (Band 1, 2, 3, 4, 25, 66): -0.9 dBi @ 1710 MHz -2.1 dBi @ 1845 MHz -4.2 dBi @ 1980 MHz
	ANT-ROD-76 (Band 5, 18, 19, 20, 26): -3.0 dBd @ 814 MHz -3.0 dBd @ 838 MHz -2.2 dBd @ 862 MHz
	ANT-ROD-90 (Band 12, 13, 17, 28): -2.2 dBd @ 699 MHz -2.4 dBd @ 743 MHz -3.3 dBd @ 787 MHz
Antenna type: *	External monopole antenna
Gain: * (max) (mounted direct to EUT)	ANT-ZS-NBIOT-30 (Band 1, 2, 3, 4, 25, 66): -3.1 dBi @ 1710 MHz -4.5 dBi @ 1845 MHz -4.5 dBi @ 1980 MHz
	ANT-ZS-NBIOT-76 (Band 5, 18, 19, 20, 26): -5.3 dBd @ 814 MHz -5.8 dBd @ 838 MHz -4.8 dBd @ 862 MHz
	ANT-ZS-NBIOT-90 (Band 12, 13, 17, 28): -3.6 dBd @ 699 MHz -6.3 dBd @ 743 MHz -5.8 dBd @ 787 MHz

* Declared by the applicant

1.6 Dates

Date of receipt of test sample:	14.09.2022
Start of test:	15.09.2022
End of test:	27.09.2022

2 Operational States

The operation mode of the equipment under test during the emission tests was defined as follows:

An NB-IoT-connection was established using a Wideband Radio Communication Tester CMW 500. The EUT was connected to the tester via suitable antennas and set to communicate with maximum throughput. The following parameters were adjusted:

NB-IoT in E-UTRA band 2

- Downlink channel UARFCN 900 (1960.0 MHz),
- Uplink channel UARFCN 18900 (1880.0 MHz),
- BS-Power -75 dBm; Mobile-Power 23 dBm; Mode PRBS9.

NB-IoT in E-UTRA band 5

- Downlink channel UARFCN 2525 (881.5 MHz),
- Uplink channel UARFCN 20525 (836.5 MHz),
- BS-Power -75 dBm; Mobile-Power 23 dBm; Mode PRBS9.

NB-IoT in E-UTRA band 13

- Downlink channel UARFCN 5230 (751.0 MHz),
- Uplink channel UARFCN 23230 (782.0 MHz),
- BS-Power -75 dBm; Mobile-Power 23 dBm; Mode PRBS9.

NB-IoT in E-UTRA band 66

- Downlink channel UARFCN 66786 (2145.0 MHz),
- Uplink channel UARFCN 132322 (1745.0 MHz),
- BS-Power -75 dBm; Mobile-Power 23 dBm; Mode PRBS9.

3 Additional Information

The LTE-bands used during the measurements were defined by the manufacturer.
During all radiated spurious emission tests, the EUT was positioned on a non-conducting support with a height of 80 cm or 1.5 m (below or above 1 GHz). The measurement was carried out in three orthogonal positions. The worst-case plots are shown in this report. The radio module is already certified, therefore only the radiated emissions were measured in the final application. The lowest internal clock frequency is higher than 30 MHz. Therefore, no spurious emissions below 30 MHz were carried out. Two types of antennas were used during testing:
Setup #1: Monopole antenna mounted separately to a rod and connected via a coaxial cable to the EUT.
Setup #2: Monopole antenna connected directly to the EUTs antenna port.
For both antennas antenna measurements were carried out. The patterns and maximum gains can be found in Annex D of this test report.
The EUT was not labeled as required by FCC / ISED.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 22 [3], 24 [4], 27 [5]	Status	Refer page
Radiated spurious emissions	30 – 20,000	22.917 (a) (b), 24.238 (a) (b), 27.53	Passed	13 et seq.

Application	Frequency range [MHz]	RSS-130 [6], RSS-132 [7], RSS-133 [8], RSS-139 [9]	Status	Refer page
Radiated spurious emissions	30 – 20,000	4.7.1 [6], 5.5 (i) & (ii) [7], 6.5.1 (i) & (ii) [8], 6.6 (i) & (ii) [9]	Passed	13 et seq.

5 Spurious emissions (radiated)

5.1 Test arrangements for tabletop EUTs

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25 cm.

Figure 4 shows a typical EUT configuration with a wireless device placed on a tabletop on an appropriate radiated test site. The measurement antenna shall be placed at the specified distance from the closest point of the EUT. Tabletop devices shall be placed on a RF transparent platform with nominal top surface dimensions of 1 m by 1.5 m. Any necessary support equipment shall be placed far enough away from the EUT, such that changes in relative position of the EUT and support equipment do not influence the measured values. If the EUT requires a connection to a server or computer, via control/data cable(s), to exercise the product, then the controlling server or computer may be placed outside of the test area.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The height scan of the measurement antenna shall be varied from 1 m to 4 m in a search for the relative positioning that produces the maximum radiated signal level (i.e., field strength or received power). When using the direct field strength method and the EUT is manipulated through three different orientations, then the scan height range of the measurement antenna is limited to 2.5 m or 0.5 m above the top of the EUT, whichever is higher.

NOTE—The use of waveguide and/or flexible waveguide may be necessary when performing measurements at frequencies above 10 GHz to achieve usable signal-to-noise ratios at acceptable measurement distances. If so, it may be necessary to restrict the height search of the antenna, or conversely to raise or lower the EUT relative to the elevation of the measurement antenna, including its relative angle with respect to the ground plane. In any case, special care should be exercised to ensure that the maximum emissions are identified and measured.

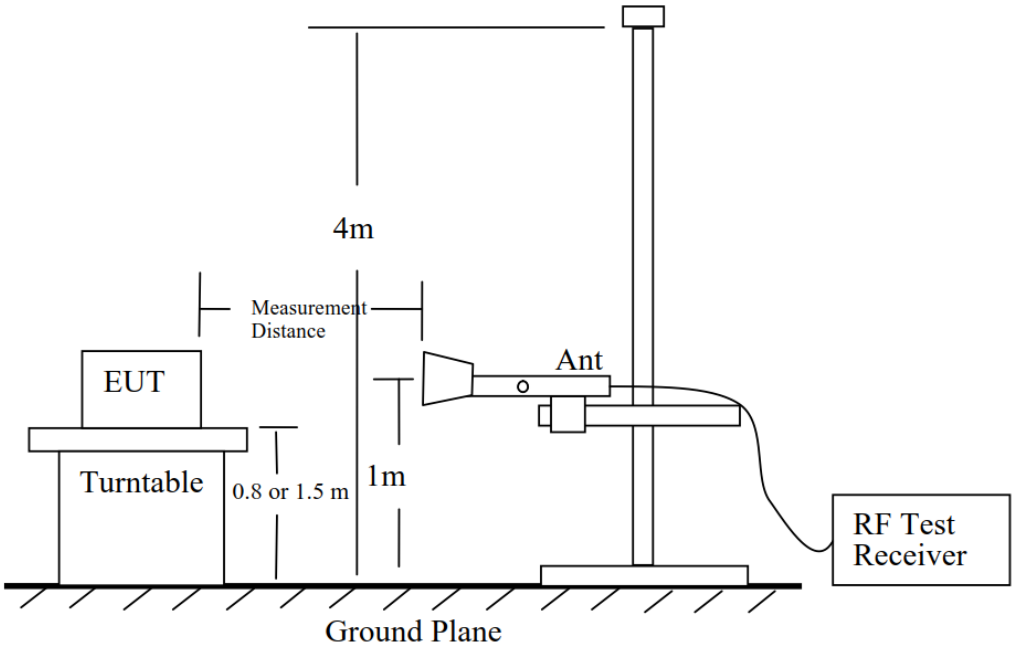


Figure 4—Test set-up for radiated spurious measurements

Radiated unwanted emissions measurements shall be made over the frequency range specified in 5.1, dependent upon the relevant operational frequency band. These radiated measurements shall be made around the EUT (or alternatively, with the EUT rotated on a turntable), while varying the measurement antenna height and examining both horizontal and vertical polarization of the measurement antenna, as described above. Ordinarily, this will require the use of a turntable and an antenna positioner.

The EUT shall be set up in its typical configuration and arrangement and operated in its various modes of operation. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels. EUTs with integral antennas shall be evaluated in their normal orientation. Where EUTs are designed to be installed in one of two distinct orientations, they shall be tested in both of their possible orientations. EUTs that can be operated in one of multiple orientations (e.g., handheld, portable, or modular devices) shall be tested in a minimum of three orientations. See Figure 5. When large antennas (e.g., high gain) or antennas not structurally supported by the EUT are utilized, a RF transparent supporting structure shall be used to facilitate the compliance testing. In all cases, the EUT, including the transmit antenna, shall be orientated such that the measurement of the emission is maximized.

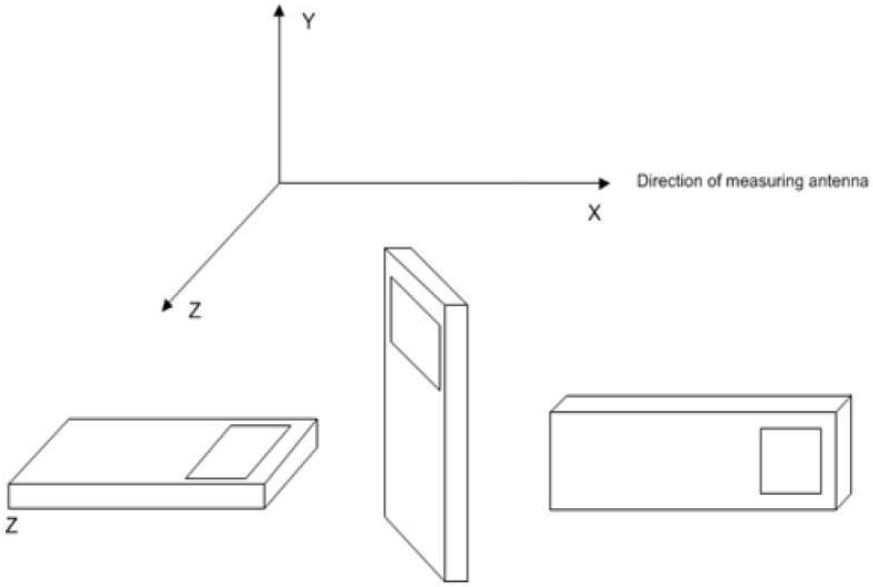


Figure 5—EUT configuration positions

Cables or wires inclusive to the EUT shall be configured so as to maximize the measured emission levels. The EUT controls shall also be adjusted to maximize the emission according to the manufacturer's specifications. The modulation applied shall be based on the guidance provided in the manufacturer's specifications. When necessary, field strength measurements shall be converted to ERP or EIRP for comparison to the applicable regulatory limits. See 5.2.7 for additional guidance.

5.2 Results

5.2.1 Radiated emissions (UE) in traffic mode (NB-IoT in E-UTRA band 2)

Ambient temperature:	22 °C
Relative humidity:	41 %

Date:	27.09.2022
Tested by:	M. Bastert

Measurement at uplink channel 18900:

Setup #1:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1880.0	Uplink channel, no spurious							
1960.0	Downlink channel, no spurious							

Setup #2:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1880.0	Uplink channel, no spurious							
1960.0	Downlink channel, no spurious							

Limit: 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 [1].

This results into a limit of -13 dBm for all power levels of the UE.

No significant frequencies were found during the spurious emission measurement.

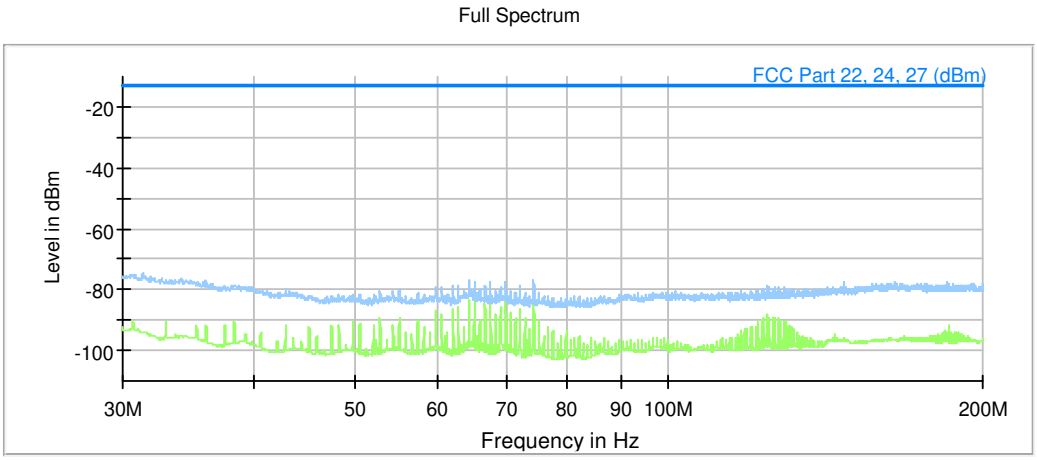
Test equipment used (see chapter 7 for details):

1 – 10, 12, 13, 15, 19, 20, 23, 24

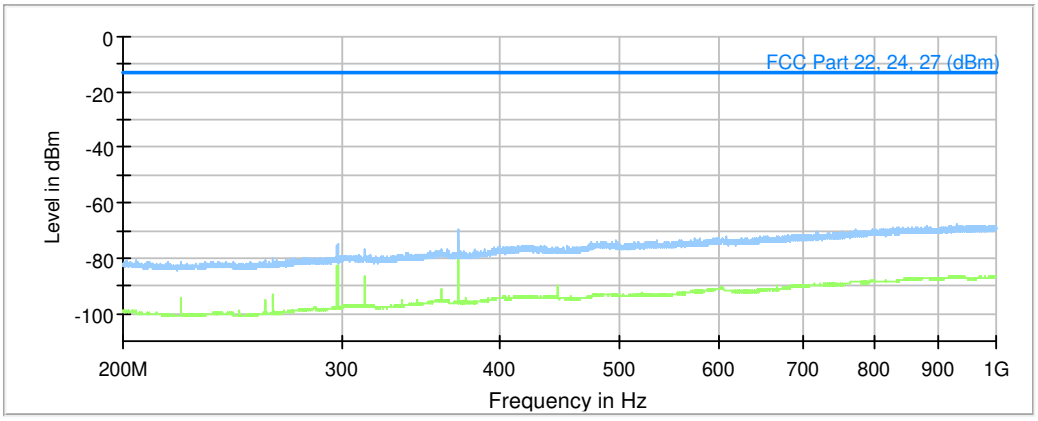
The measurement plots are shown in the following:

Setup #1:

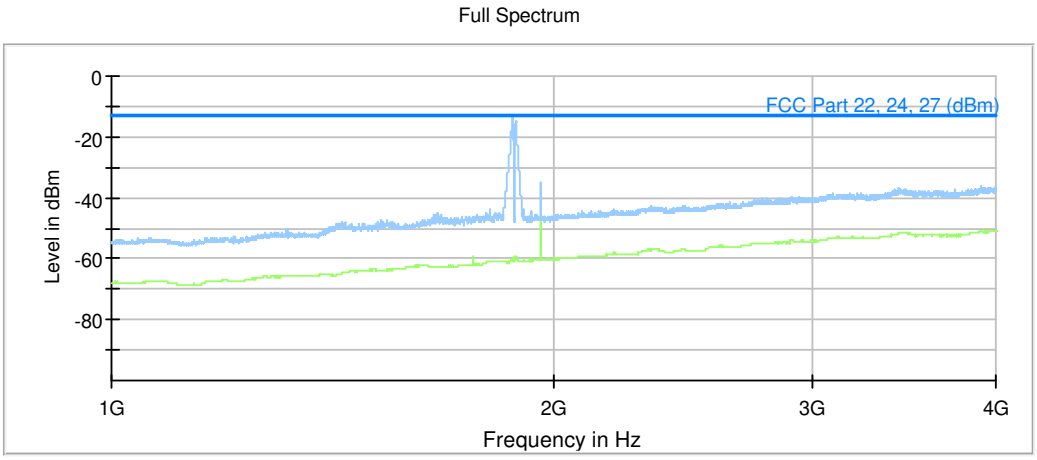
Radiated emissions from 30 MHz to 200 MHz:



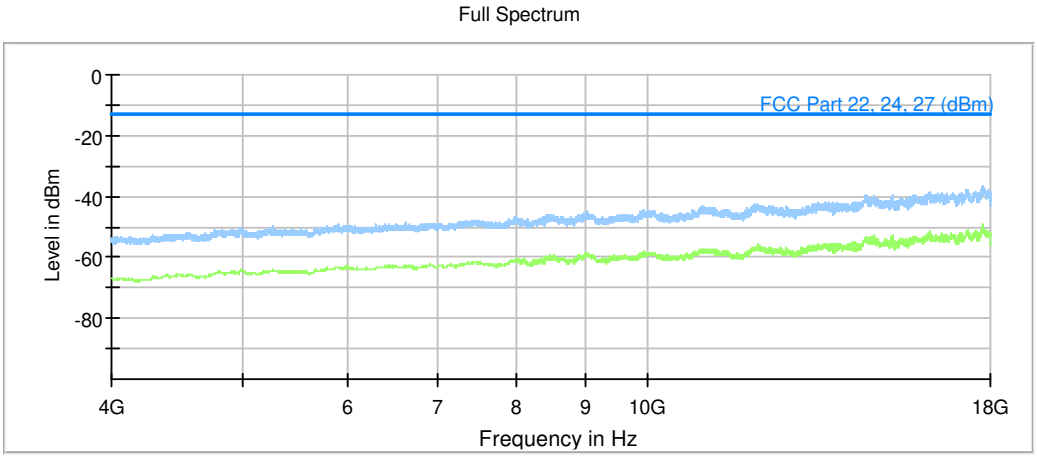
Radiated emissions from 200 MHz to 1GHz:



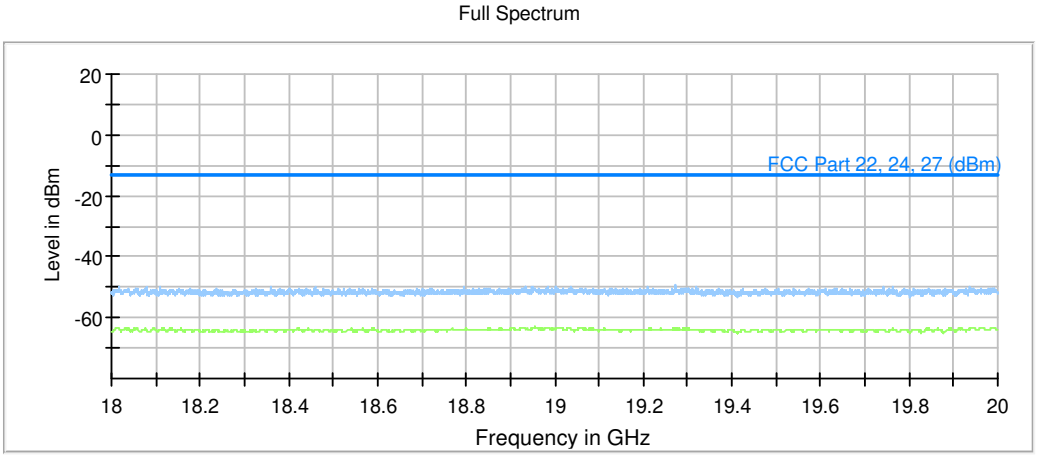
Radiated emissions from 1GHz to 4 GHz:



Radiated emissions from 4 GHz to 18 GHz:

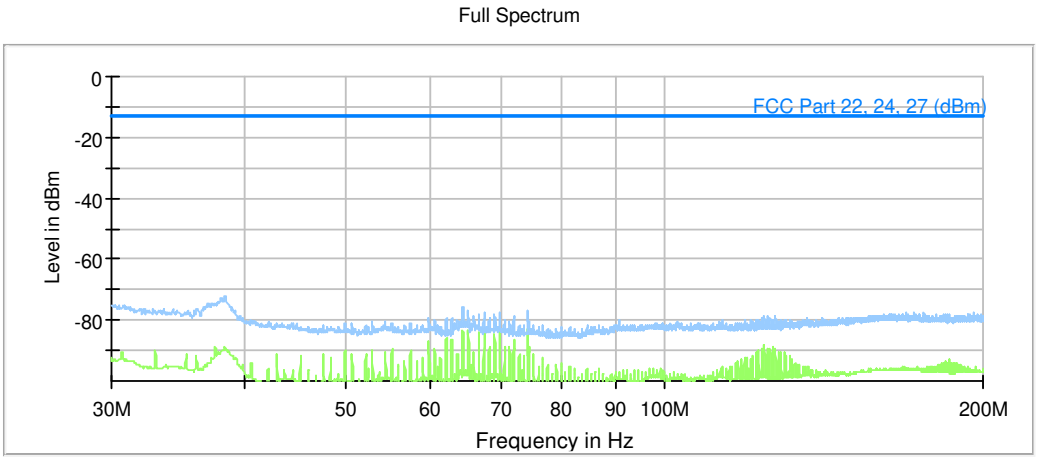


Radiated emissions from 18 GHz to 20 GHz:

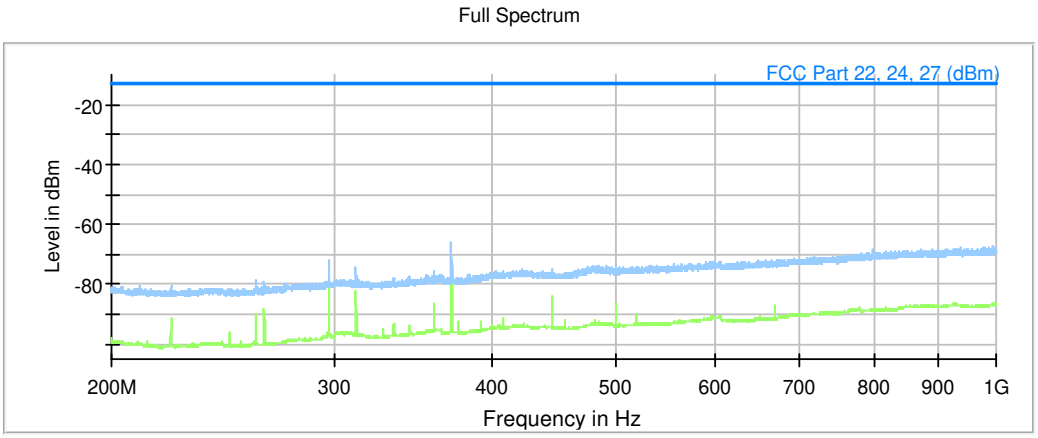


Setup #2:

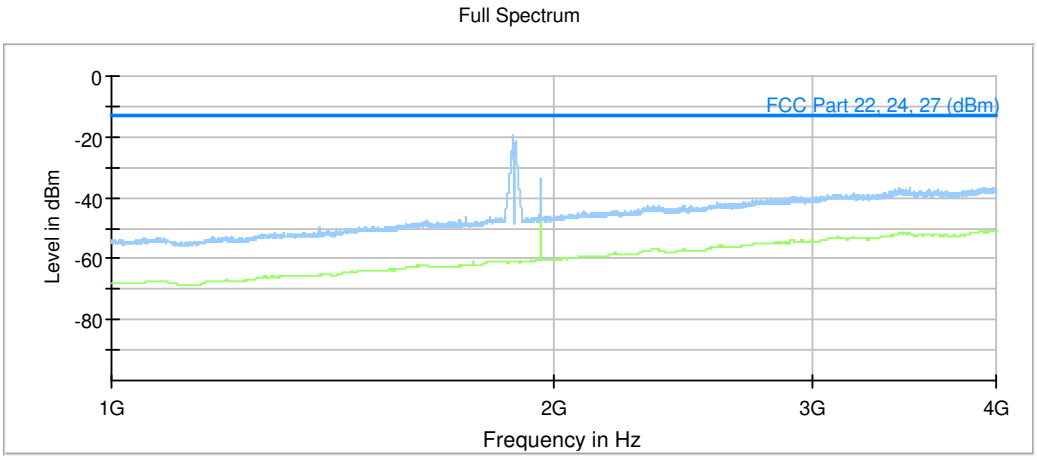
Radiated emissions from 30 MHz to 200 MHz:



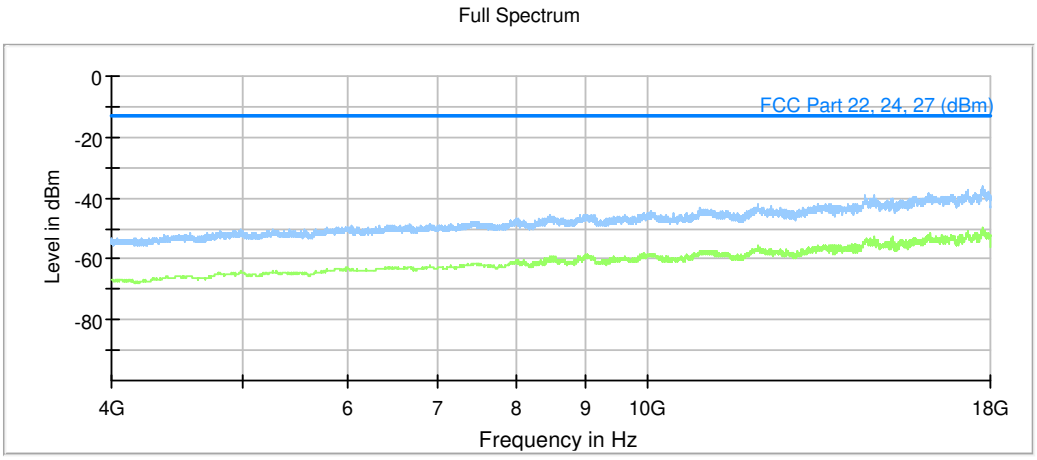
Radiated emissions from 200 MHz to 1GHz:



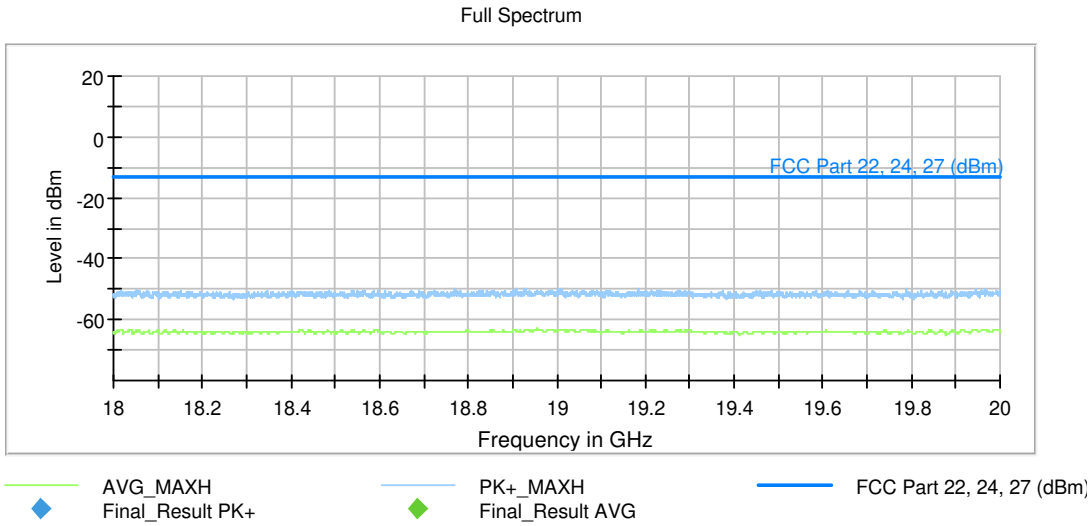
Radiated emissions from 1GHz to 4 GHz:



Radiated emissions from 4 GHz to 18 GHz:



Radiated emissions from 18 GHz to 20 GHz:



5.2.2 Radiated emissions (UE) in traffic mode (NB-IoT in E-UTRA band 5)

Ambient temperature:	23 °C
Relative humidity:	46 %

Date:	15.09.2022
Tested by:	M. Bastert

Measurement at uplink channel 20525:

Setup #1:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
836.5	Uplink channel, no spurious							
881.5	Downlink channel, no spurious							

Setup #2:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
836.5	Uplink channel, no spurious							
881.5	Downlink channel, no spurious							

Limit: 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 [1].

This results into a limit of -13 dBm for all power levels of the UE.

No significant frequencies were found during the spurious emission measurement.

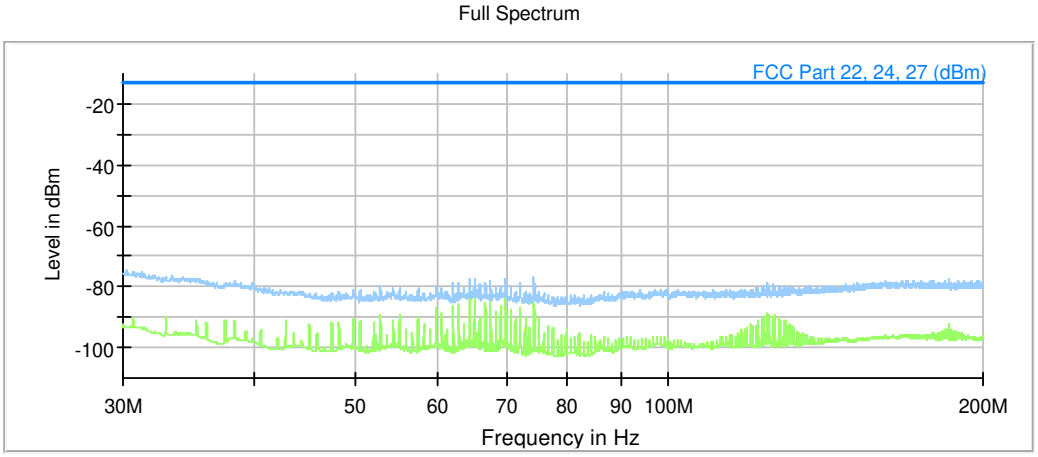
Test equipment used (see chapter 7 for details):

1 - 10, 13, 19, 22, 23

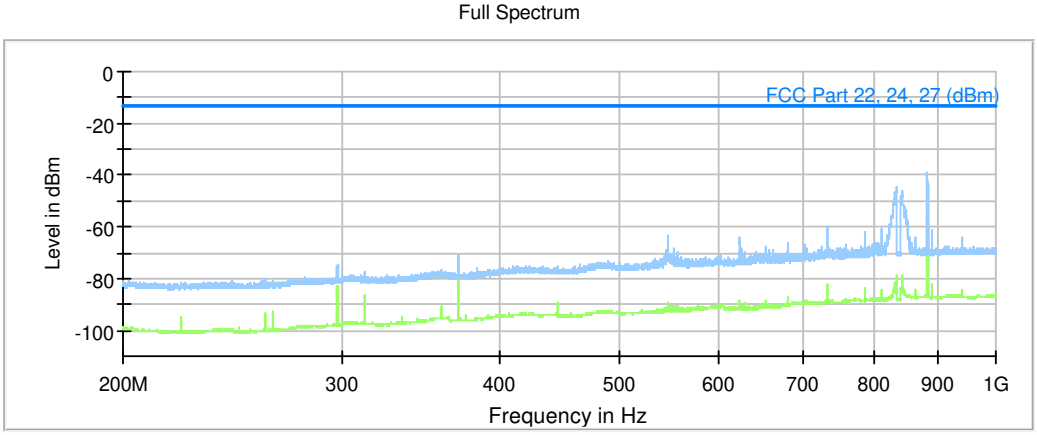
The measurement plots are shown in the following:

Setup #1

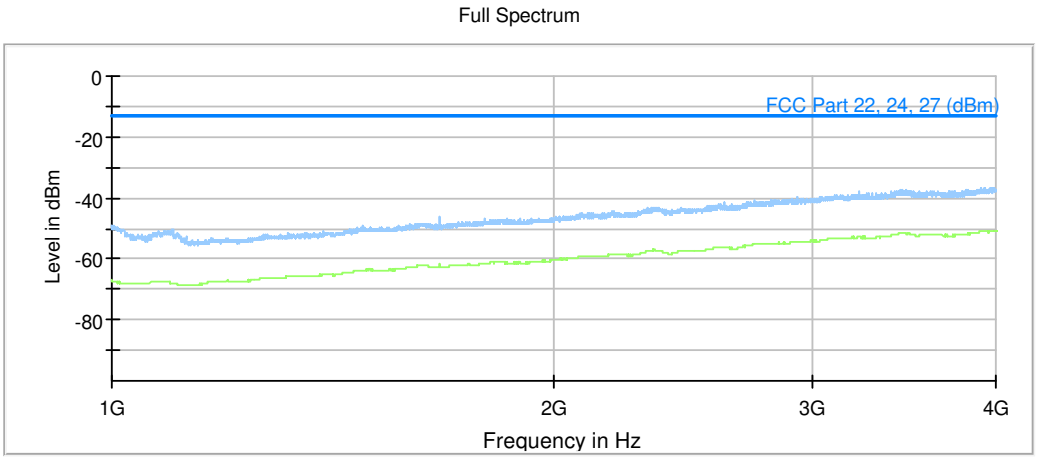
Radiated emissions from 30 MHz to 200 MHz:



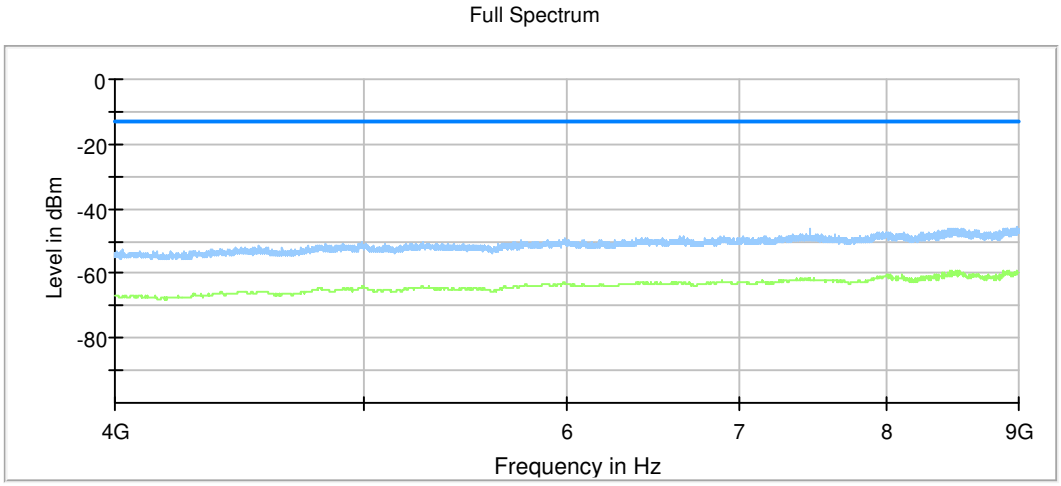
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1 GHz to 4 GHz:

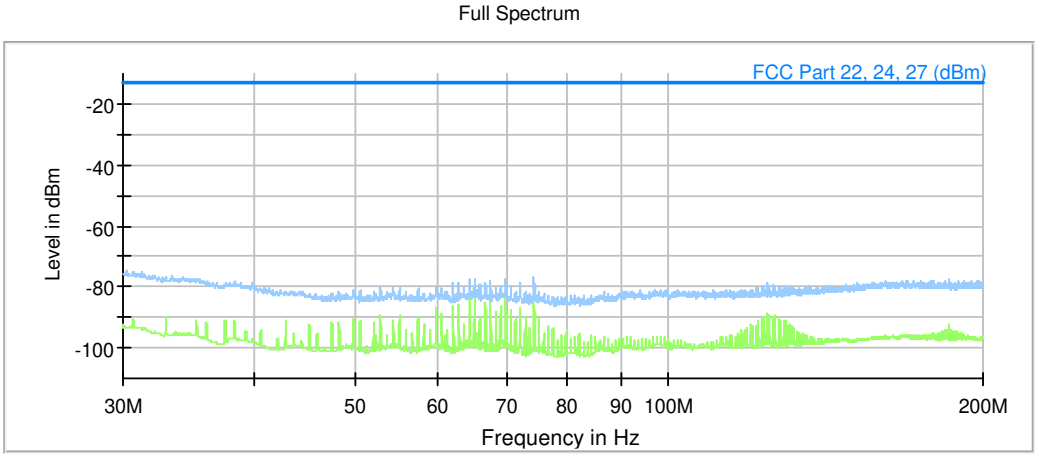


Radiated emissions from 4 GHz to 9 GHz:

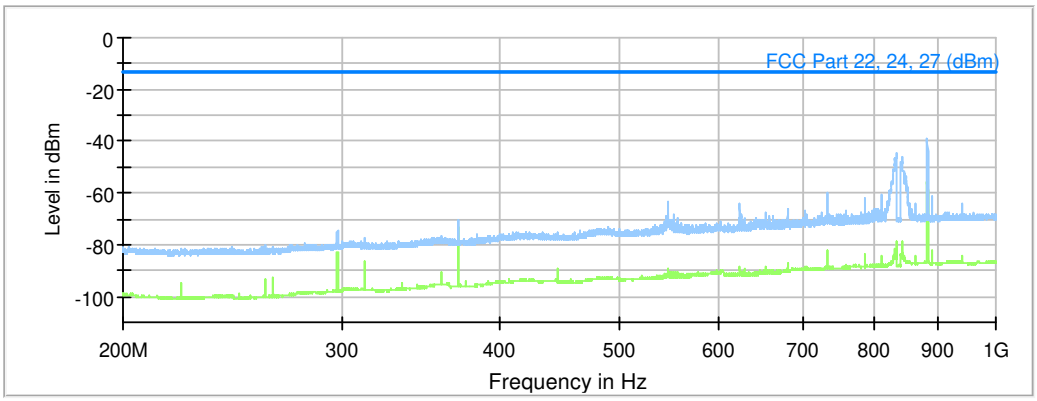


Setup #2

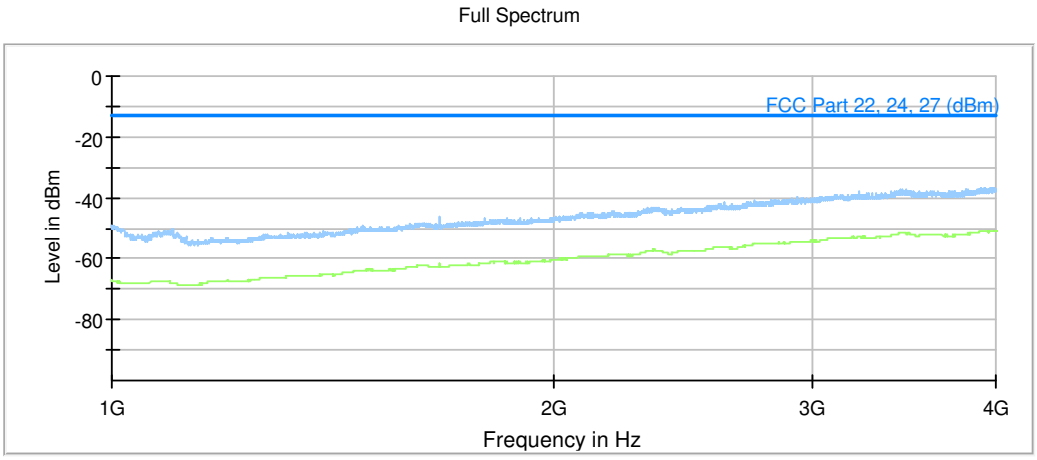
Radiated emissions from 30 MHz to 200 MHz:



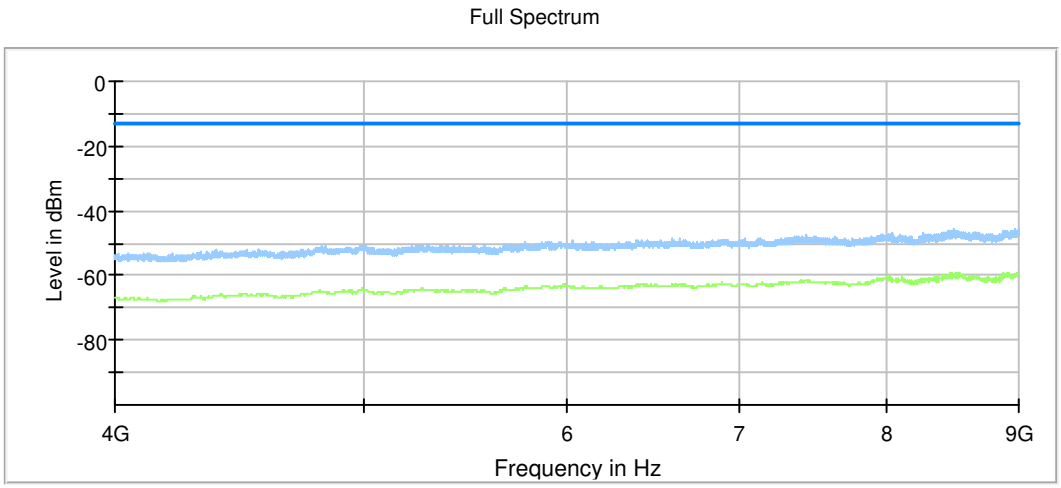
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1 GHz to 4 GHz:



Radiated emissions from 4 GHz to 9 GHz:



5.2.3 Radiated emissions (UE) in traffic mode (NB-IoT in E-UTRA band 13)

Ambient temperature:	22 °C
Relative humidity:	34 %

Date:	23.09.2022
Tested by:	M. Bastert

Measurement at uplink channel 23230:

Setup #1:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
782.000	Uplink channel, no spurious							
751.000	Downlink channel, no spurious							

Setup #2:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
782.000	Uplink channel, no spurious							
751.000	Downlink channel, no spurious							

Limit: 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 [1].

This results into a limit of -13 dBm for all power levels of the UE.

No significant frequencies were found during the spurious emission measurement.

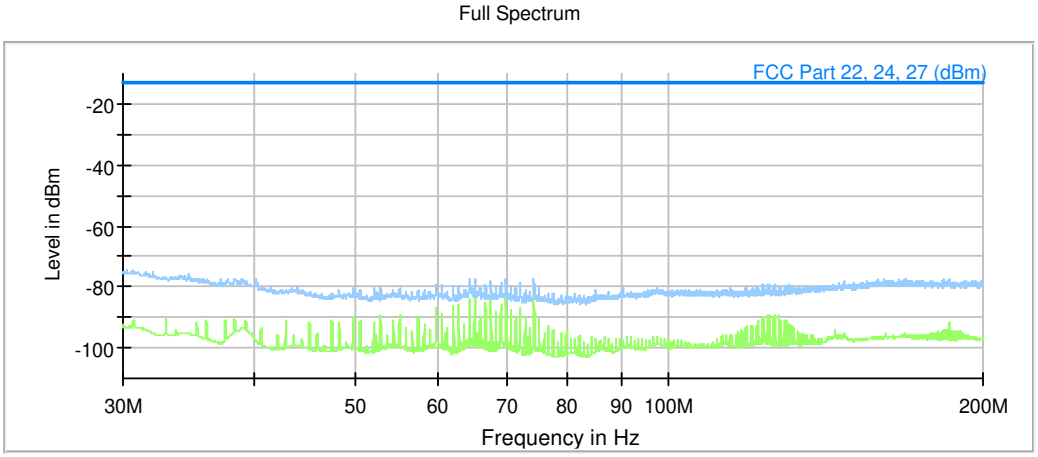
Test equipment used (see chapter 7 for details):

1 - 10, 13, 17, 19, 22, 23, 26

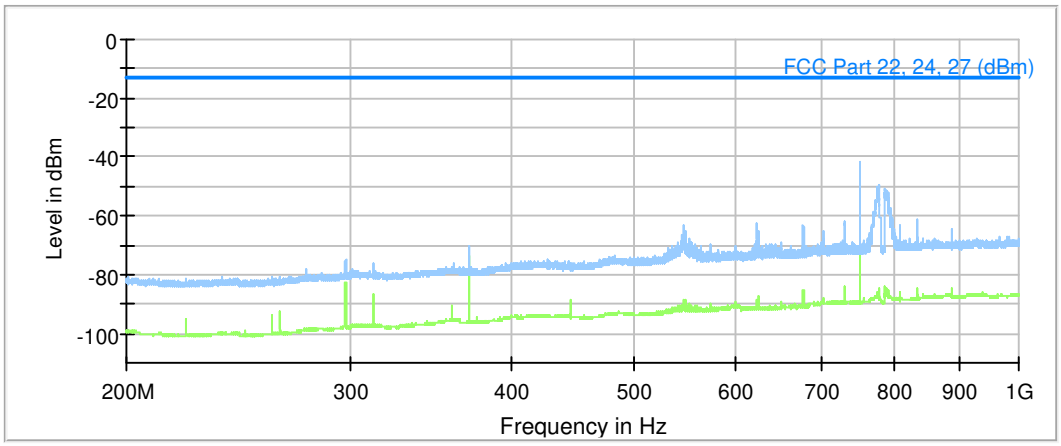
The measurement plots are shown in the following:

Setup #1

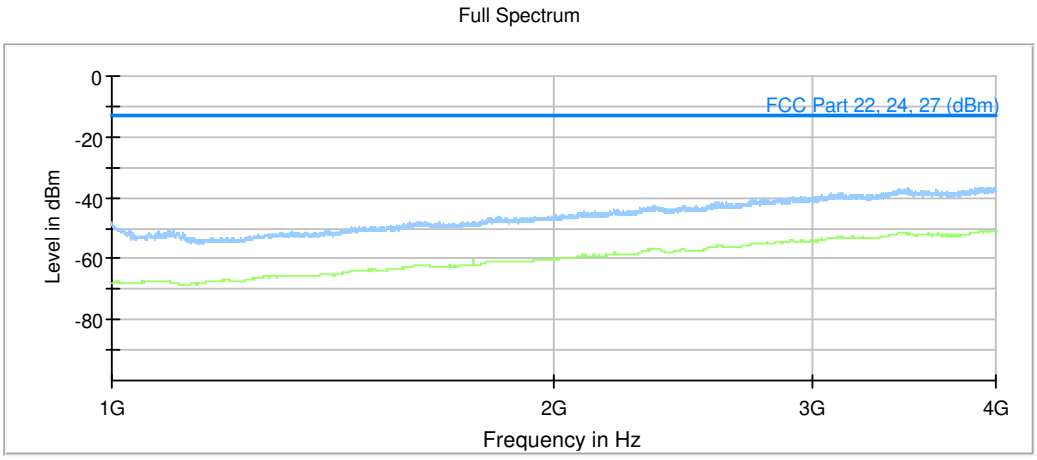
Radiated emissions from 30 MHz to 200 MHz:



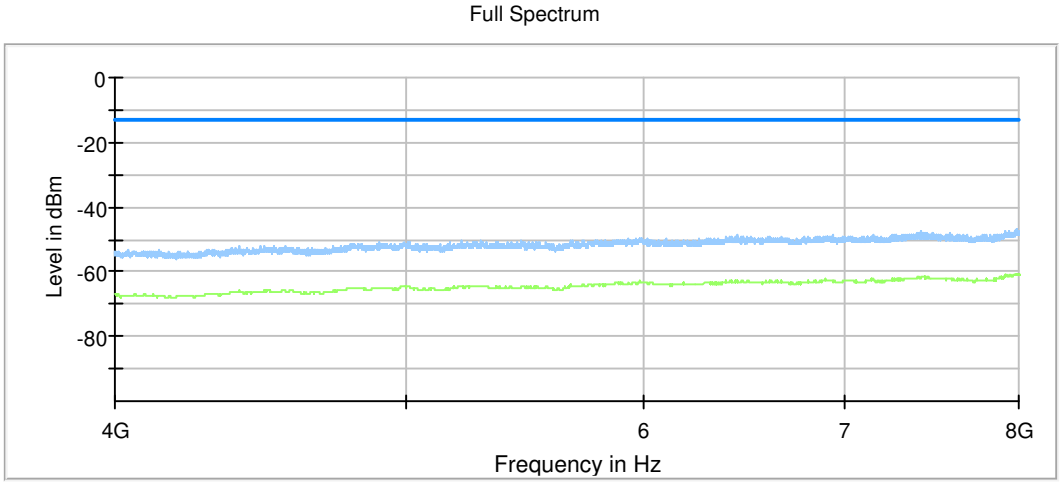
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1 GHz to 4 GHz:

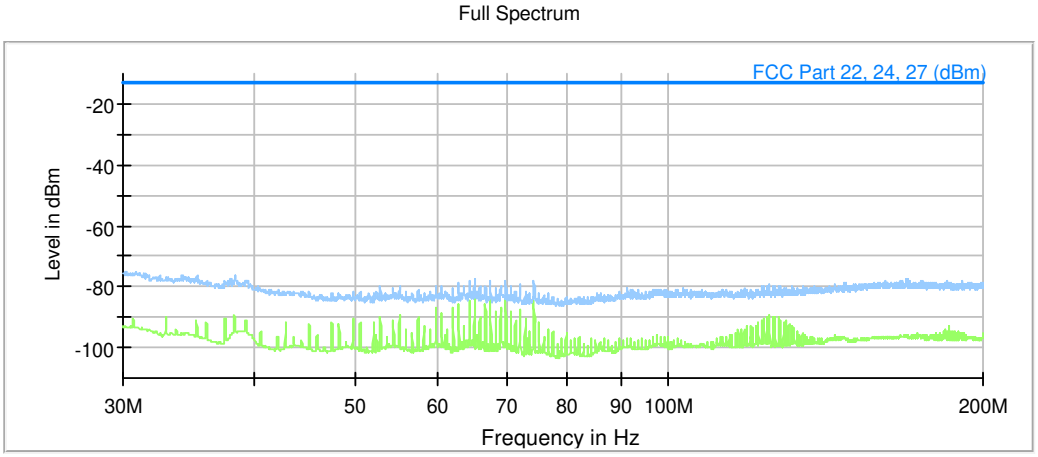


Radiated emissions from 4 GHz to 8 GHz:

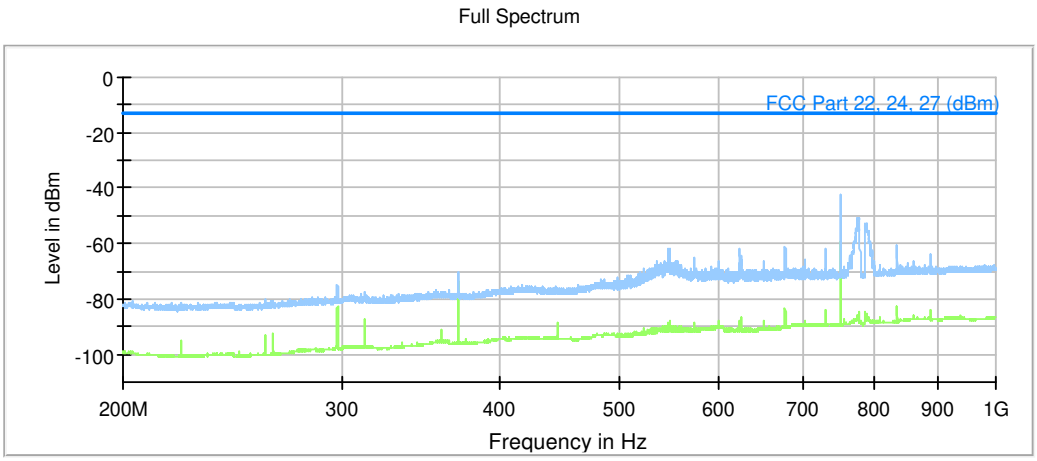


Setup #2

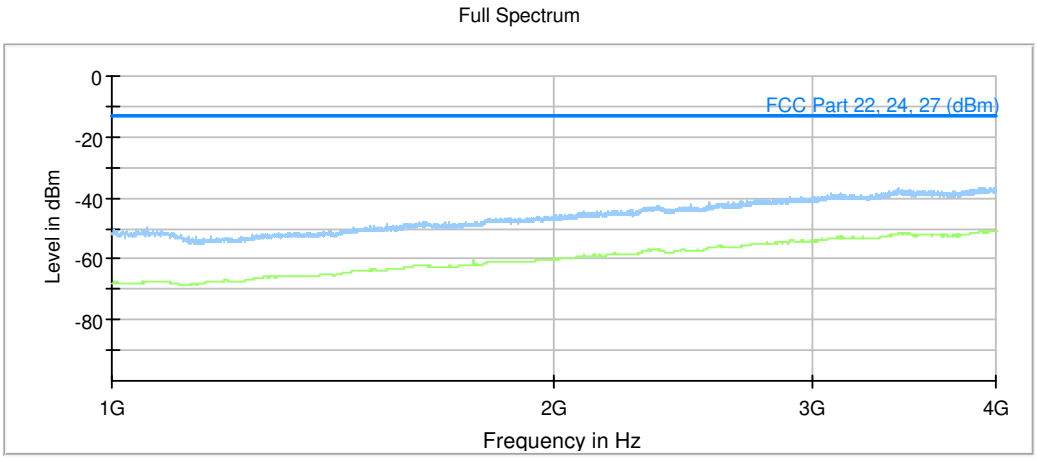
Radiated emissions from 30 MHz to 200 MHz:



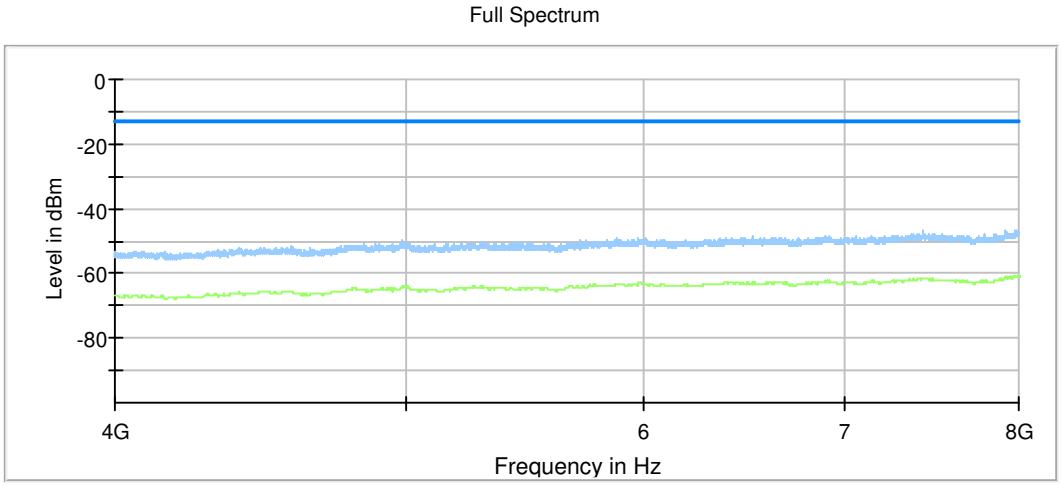
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1 GHz to 4 GHz:



Radiated emissions from 4 GHz to 8 GHz:



5.2.4 Radiated emissions (UE) in traffic mode (NB-IoT in E-UTRA band 66)

Ambient temperature:	22 °C
Relative humidity:	40 %

Date:	26.09.2022
Tested by:	M. Bastert

Measurement at uplink channel 132322:

Setup #1:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1745.0	Uplink channel, no spurious							
2145.0	Downlink channel, no spurious							

Setup #2:

Spurious emissions level								
Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1745.0	Uplink channel, no spurious							
2145.0	Downlink channel, no spurious							

Limit: 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 [1].

This results into a limit of -13 dBm for all power levels of the UE.

No significant frequencies were found during the spurious emission measurement.

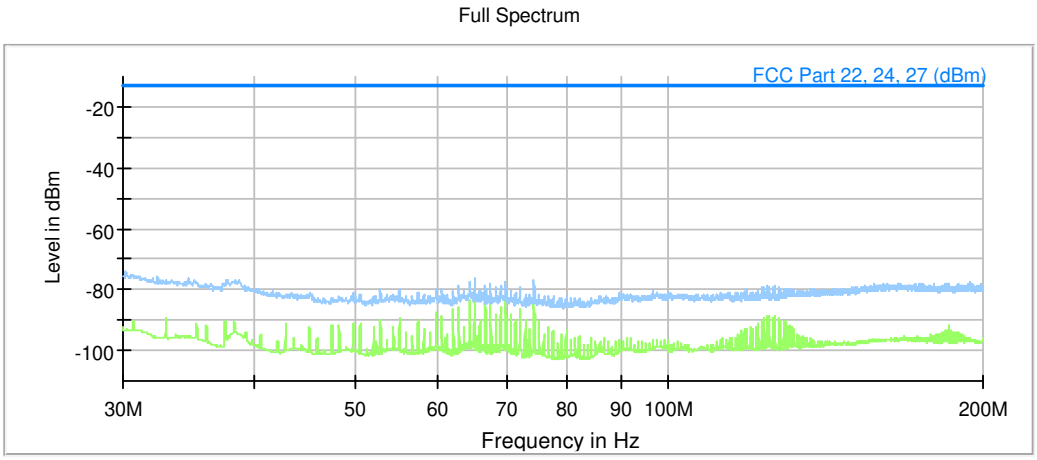
Test equipment used (see chapter 7 for details):

1 – 10, 13, 19, 21, 23, 24

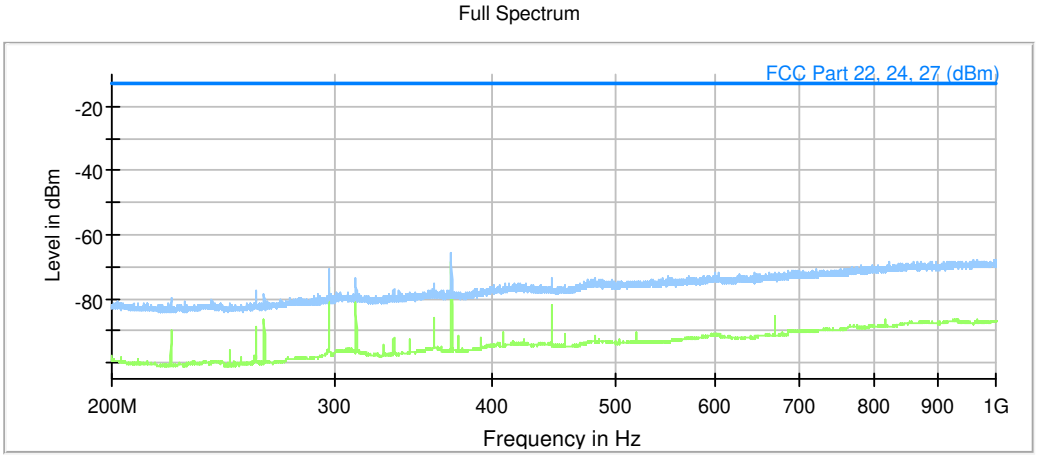
The measurement plots are shown in the following:

Setup #1:

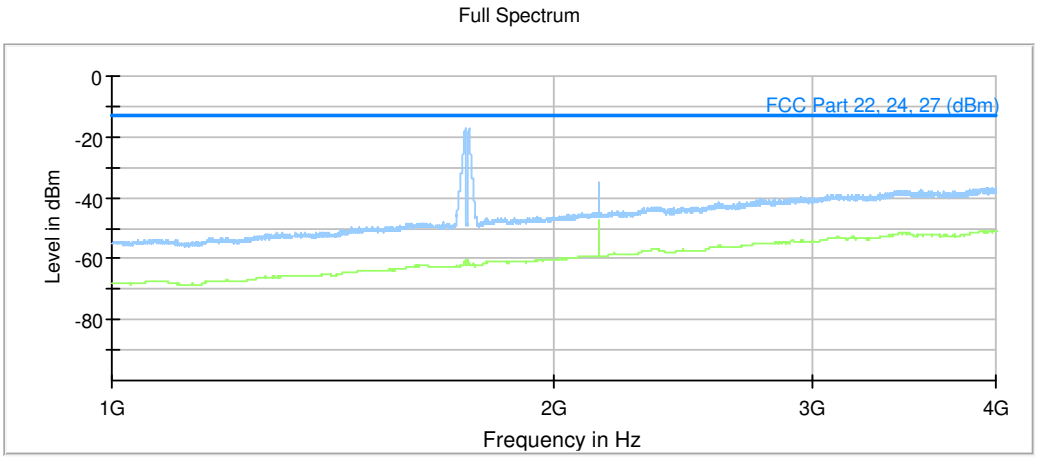
Radiated emissions from 30 MHz to 200 MHz:



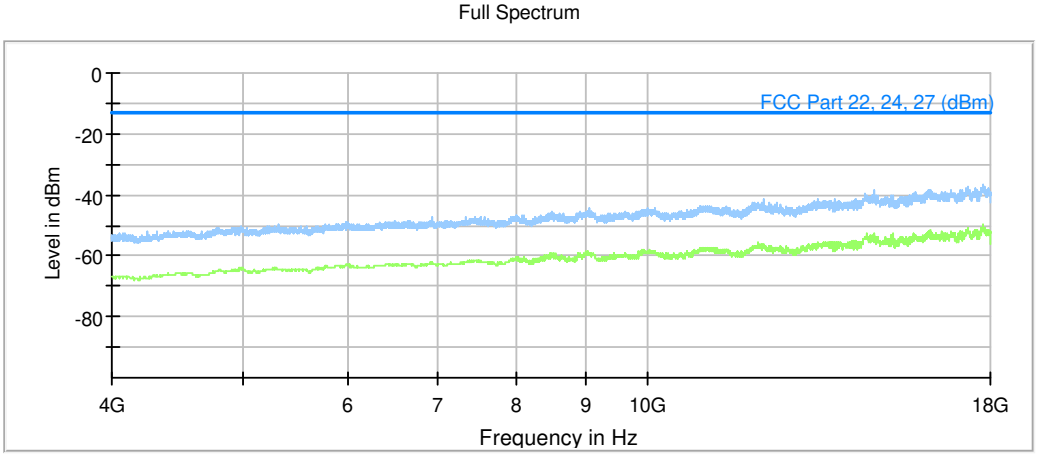
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1GHz to 4 GHz:

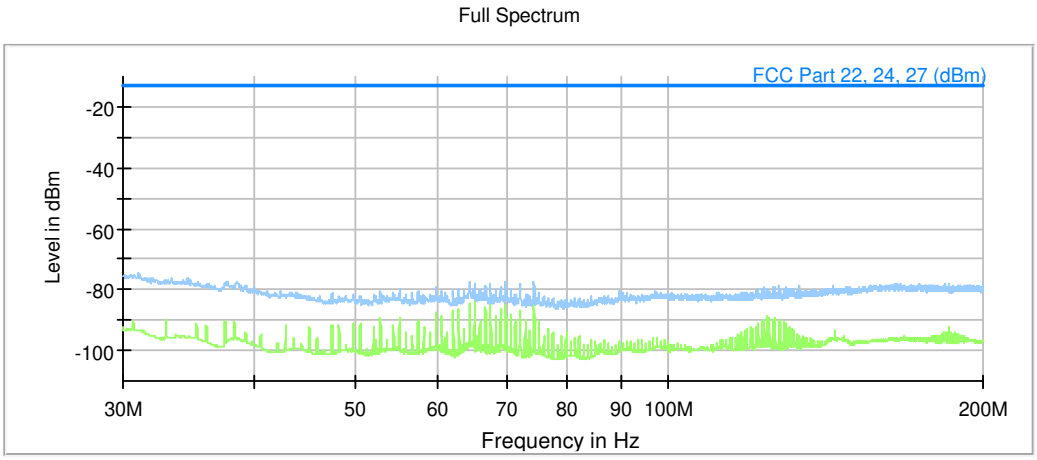


Radiated emissions from 4 GHz to 18 GHz:

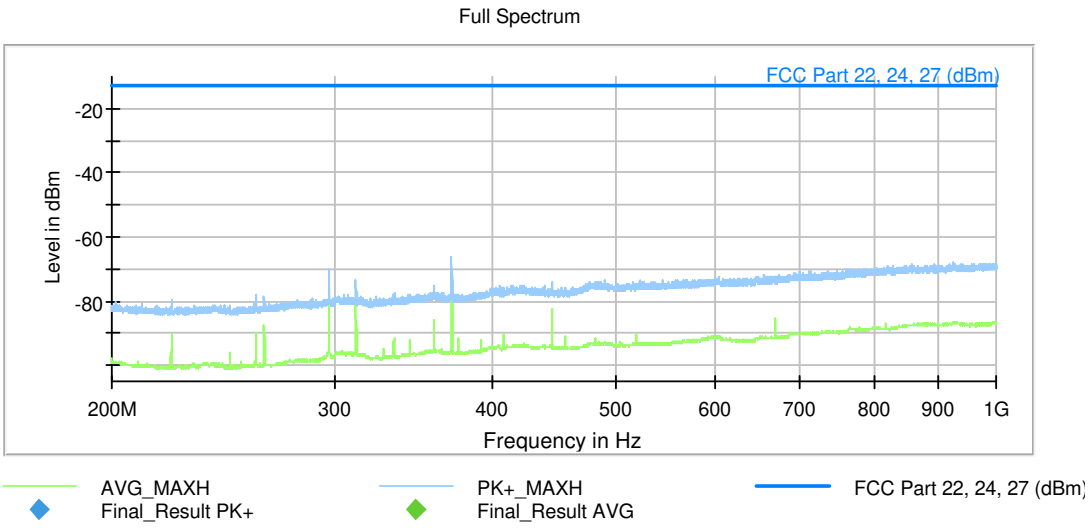


Setup #2:

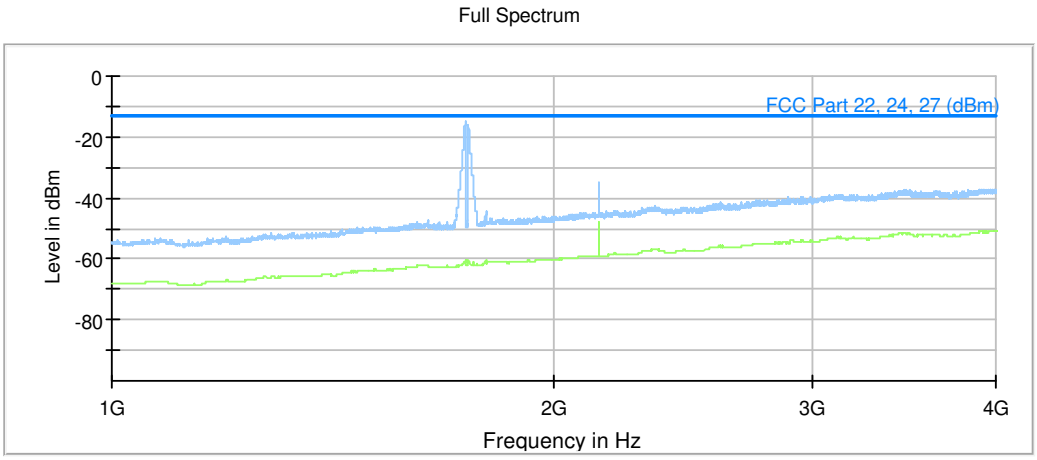
Radiated emissions from 30 MHz to 200 MHz:



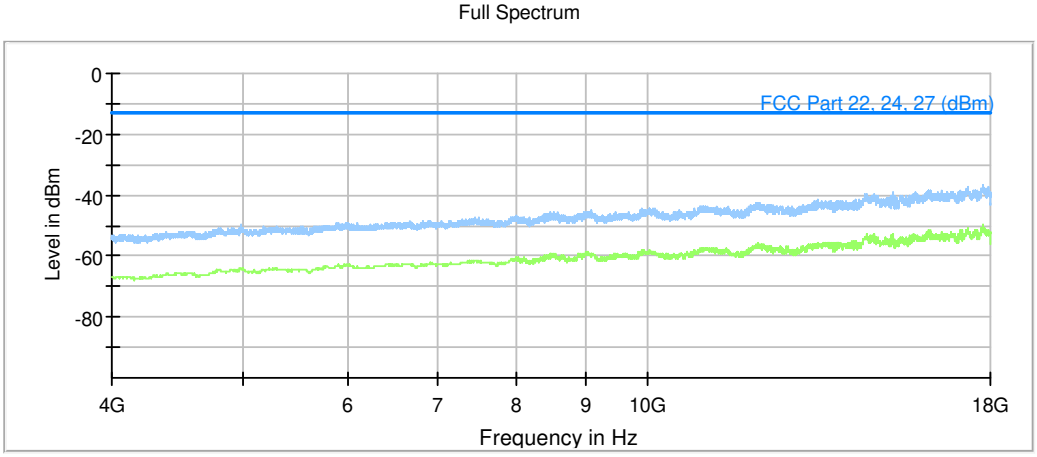
Radiated emissions from 200 MHz to 1GHz:



Radiated emissions from 1GHz to 4 GHz:



Radiated emissions from 4 GHz to 18 GHz:



6 Measurement Uncertainties

Radiated measurements		
Frequency error		
(Semi-) Anechoic chamber	ETSI TR 100 028	4.5×10^{-8}
OATS	ETSI TR 100 028	4.5×10^{-8}
Test fixture	ETSI TR 100 028	4.5×10^{-8}
Bandwidth measurements		
(Semi-) Anechoic chamber	-	9.0×10^{-8}
OATS	-	9.0×10^{-8}
Test fixture	-	9.1×10^{-8}
Radiated field strength M20		
CBL6112B @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	5.3 dB
R&S HL050 @ 3 m		
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB
Radiated field strength M276		
R&S HL562E @ 3 m 30 MHz – 1 GHz	CISPR 16-4-2	4.8 dB
R&S HL050 @ 3 m	-	
1 – 6 GHz	CISPR 16-4-2	5.1 dB
6 – 18 GHz	CISPR 16-4-2	5.4 dB
Flann Standard Gain Horns 18 – 40 GHz	-	5.9 dB
OATS		
Field strength measurements below 30 MHz on OATS without ground plane	-	4.4 dB

7 Test equipment used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Log.-Per Antenna	VUSLP 9111B	Schwarzbeck	464	483279	Calibration not necessary	
2	Bikonical Antenna	VHA 9103B + VHBB 9124	Schwarzbeck	768	483278	Calibration not necessary	
3	Software	EMC32 V11.30	Rohde & Schwarz	100970	482972	Calibration not necessary	
4	RF Switch Matrix	OSP220	Rohde & Schwarz		482976	Calibration not necessary	
5	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
6	Antenna support	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
7	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
8	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
9	EMI Test receiver	ESW44	Rohde & Schwarz	101828	482979	08.12.2021	12.2023
10	Low Noise Amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2022	02.2024
11	Low Noise Amplifier 12 - 18 GHz	LNA-30-12001800-13-10P	Narda-Miteq	2089798	482968	Calibration not necessary	
12	Low Noise Amplifier 18 - 26.5 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	482969	18.02.2022	02.2024
13	Log.-Per. antenna	HL050	Rohde & Schwarz	100908	482977	22.09.2022	09.2025
14	Low Noise Amplifier 26 MHz - 40 GHz	LNA-30-26004000-27-10P	Narda-Miteq	2110293	482970	18.02.2022	02.2024
15	Standard Gain Horn 20 dB, 18 - 26 GHz	20240-20	Flann	266399	483026	Calibration not necessary	
16	Precision Dipole	HZ-12	Rohde & Schwarz	831781/02	480061	Calibration not necessary	
17	Precision Dipole	HZ-13	Rohde & Schwarz	831782/02	480062	Calibration not necessary	
18	Horn Antenna	3115	EMCO Elektronik	9609-4918	480183	23.02.2021	02.2024
19	Wideband Radio Communication Tester	CMW500	Rohde & Schwarz	167339	483023	04.03.2021	03.2023
20	Tunable Band Reject Filter	WRCT1850/2170-5/40-10EESD	Wainwright Instruments	1	480715	Calibration not necessary	
21	Tuneable Band Reject Filter	WTRCD10-1700-1900-5-13-60EEK	Wainwright Instruments	1	482011	Calibration not necessary	
22	Tuneable Band Reject Filter	WTRCD8-800-960EEK	Wainwright Instruments	2	482012	Calibration not necessary	
23	Vector Network Analyzer	ZVA 40	Rohde & Schwarz	100298	481538	17.02.2022	02.2024

8 Test site Verification

Test equipment	PM. No.	Frequency range	Type of validation	According to	Ver. Date	Ver. Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2014	03.03.2021	03.2023
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 Amd. 1	25.02.2021	02.2023

9 Report History

Report Number	Date	Comment
F221265E1	15.02.2023	Initial Test Report
-	-	-
-	-	-

10 List of Annexes

Annex A	Test Setup Photos	6 pages
Annex B	External Photos	7 pages
Annex C	Internal Photos	5 pages
Annex D	Antenna measurements	18 pages