

Test Report

Report Number:

F191350E4

Equipment under Test (EUT):

CTP2019 Mercedes

Applicant:

Daimler Truck AG

Manufacturer:

Bosch Car Multimedia Portugal, S.A.



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

Test Result

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.

Tested and written by:	Mohamed Yassine KHALEK Name	 Signature	19.12.2019 Date
Reviewed and approved by:	Bernd STEINER Name	 Signature	19.12.2019 Date

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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.

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1 Identification

1.1 Applicant

Name:	Daimler Truck AG
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Name for contact purposes:	Mr. Wolfgang SCHNITKER
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eMail address:	wolfgang.schnitker@daimler.com
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	Bosch Car Multimedia Portugal, S.A.
Address:	Rua Max Grundig, 35 – Lomar 4705-820 Braga
Country:	Portugal
Name for contact purposes:	Mr. Eliseu VIEIRA
Phone:	+351(253)30-6307
eMail address:	eliseu.vieira@pt.bosch.com
Manufacturer represented during the test by the following person:	None

1.3 Test Laboratory

The tests were carried out by: **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-17186-01-02 and D-PL-17186-01-05, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISD# 3469A.

1.4 EUT (Equipment under Test)

Type of equipment: *	Common Telematic Platform
Order number: *	A 000 446 9160
Serial number:*	3790006027
FCC ID: *	2AMIOCTP4465960
PCB identifier: *	0344H04-L1
Hardware version: *	A 000 446 9160
Software version: *	18.02.S.026

* Declared by the applicant

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

1.5 Technical Data of Equipment

General:

Power supply EUT: *	DC					
Supply voltage EUT: *	U _{nom} =	24 V DC	U _{min} =	19.2 V DC	U _{max} =	28.8 V DC
Temperature range: *	Max. 75 °C					
Lowest / highest internal clock frequency: *	32.768 kHz / 37.4 MHz					

Cellular module:

Manufacturer:	uBlox					
Model name: *	TOBY-L210-03S					
Power supply module: *	DC via DC/DC converter					
Supply voltage module: *	U _{nom} =	4.0 V DC	U _{min} =	3.2 V DC	U _{max} =	4.5 V DC
Serial Number: *	N/A					
IMEI: *	352255061994772					
Supported bands: *	GSM/GPRS/EDGE: 850/900/1800/1900 MHz WCDMA/HSPA+: Band I, II, V, VIII LTE FDD: Band 1, 3, 5, 7, 8, 20					
Max. output power: *	GSM/GPRS/EDGE: Class 4 (33 dBm) @ 850 / 900 MHz Class 1 (30 dBm) @ 1800 / 1900 MHz WCDMA/HSPA+: Class 3 (24 dBm) LTE FDD: Class 3 (23 dBm)					
Antenna type: *	Rod antenna					
Antenna name: *	Hirschmann (MB Sach-Nr.: A002 827 2201)					
Antenna connector: *	FAKRA					
Antenna gain: *	-1.4 dBi					

GNSS module:

Manufacturer: *	u-blox																																		
Model name: *	NEO-M8																																		
Power supply module: *	DC via host																																		
Supply voltage module: *	U _{nom} =	3.0 V DC	U _{min} =	2.7 V DC	U _{max} = 3.6 V DC																														
Supported GNSS: *	<table border="1"> <thead> <tr> <th>GNSS</th> <th colspan="4">GNSS Signals</th> </tr> </thead> <tbody> <tr> <td>BDS</td> <td>☒ B1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Galileo</td> <td>☒ E1</td> <td>☐ E5a</td> <td>☐ E5b</td> <td>☐ E6</td> </tr> <tr> <td>GLONASS</td> <td>☒ G1</td> <td>☐ G2</td> <td></td> <td></td> </tr> <tr> <td>GPS</td> <td>☒ L1</td> <td>☐ L2</td> <td>☐ L5</td> <td></td> </tr> <tr> <td>SBAS</td> <td>☒ L1</td> <td></td> <td>☐ L5</td> <td></td> </tr> </tbody> </table>					GNSS	GNSS Signals				BDS	☒ B1				Galileo	☒ E1	☐ E5a	☐ E5b	☐ E6	GLONASS	☒ G1	☐ G2			GPS	☒ L1	☐ L2	☐ L5		SBAS	☒ L1		☐ L5	
	GNSS	GNSS Signals																																	
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	GPS	☒ L1	☐ L2	☐ L5																															
SBAS	☒ L1		☐ L5																																
Antenna type: *	Shark fin antenna																																		
Antenna name: *	Hirschmann (MB Sach-Nr.: A 005 820 30 75)																																		
Antenna connector: *	FAKRA																																		
Antenna gain: *	Max. 2 dBi (zenith)																																		

Bluetooth / WLAN module:

Manufacturer: *	ALPS				
Model name: *	UGKZ7A1001A				
Power supply module: *	DC via host				
Supply voltage module: *	U _{nom} =	3.3 V DC	U _{min} =	3.0 V DC	U _{max} = 3.6 V DC
Fullfils BT / WLAN specification: *	IEEE 802.11a/b/g/n/ac; Bluetooth 4.2				
Antenna type: *	Patch antenna				
Antenna name: *	Hirschmann (MB Sach-Nr.: A117 905 29 02 / 002)				
Antenna connector: *	FAKRA				
Antenna gain: *	2 dBi @ 2.4 GHz; 5 dBi @ 5 GHz				

* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
DC/Data Harness	Customized port	DC Laboratory plug used for power supply/ Other wires left open	3.60 m	No
USB	Micro USB port, type B	USB plug, type A	3.00 m	Yes
WLAN antenna port	FAKRA plug	WLAN antenna	30 cm	Yes
Cellular antenna port	FAKRA plug	Cellular antenna	3.60 m	Yes
GPS antenna port	FAKRA plug	GPS antenna	3.60 m	Yes
SIM plug	SIM plug	-	-	-

Ancillary Equipment	
Laptop: *1	Fujitsu Lifebook S26391-K321-V100, S.No.: DSCC039741

1.6 Dates

Date of receipt of test sample:	29.08.2019
Start of test:	30.08.2019
End of test:	11.12.2019

2 Operational States

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

GSM 850 GPRS data connection

- Downlink channel 189 (881.4 MHz),
- Uplink channel 189 (836.4 MHz),
- BS-Power -70 dBm; Mobile-Power 33 dBm; Packet switched, GPRS.

PCS1900 GPRS data connection

- Downlink channel 661 (1960.0 MHz),
- Uplink channel 661 (1880.0 MHz),
- BS-Power -70 dBm; Mobile-Power 30 dBm; Packet switched, GPRS.

UMTS band 2

- Downlink channel UARFCN 9800 (1960.0 MHz),
- Uplink channel UARFCN 9400 (1880.0 MHz),
- BS-Power -75 dBm; Mobile-Power 24 dBm; Mode PRBS9.

UMTS band 5

- Downlink channel UARFCN 4407 (881.4 MHz),
- Uplink channel UARFCN 4182 (836.4 MHz),
- BS-Power -75 dBm; Mobile-Power 24 dBm; Mode PRBS9.

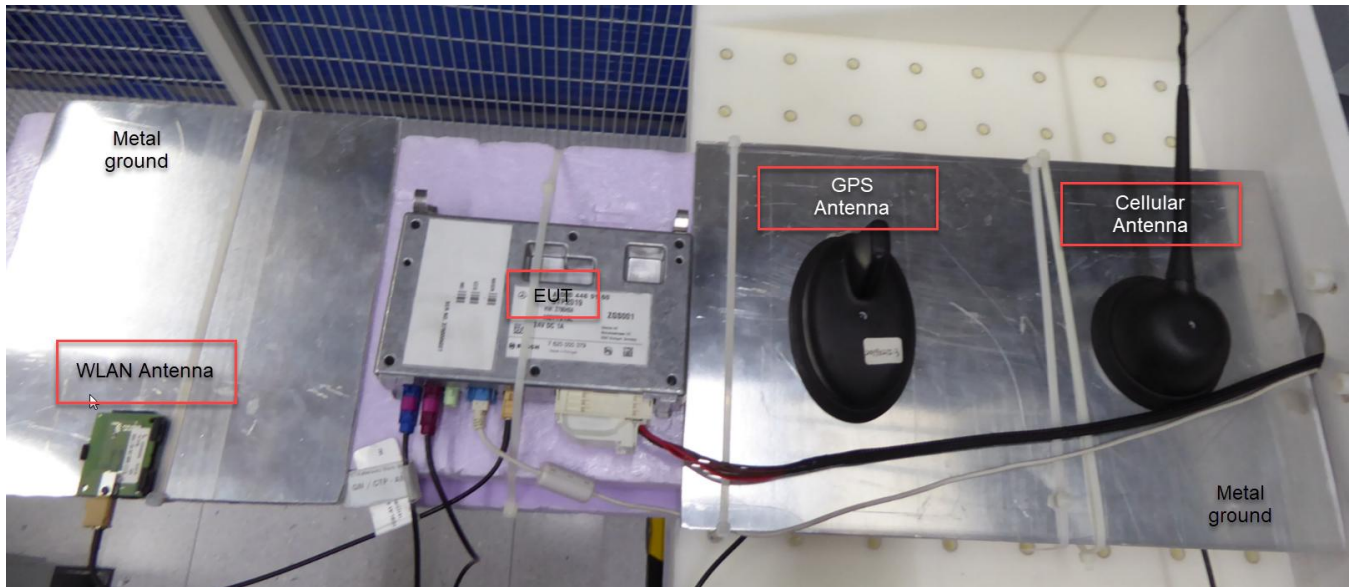
LTE band 5

- Downlink channel UARFCN 2524 (881.6 MHz),
- Uplink channel UARFCN 20524 (836.6 MHz),
- BS-Power -85 dBm; Mobile-Power 23 dBm; Mode PRBS9.

LTE band 7

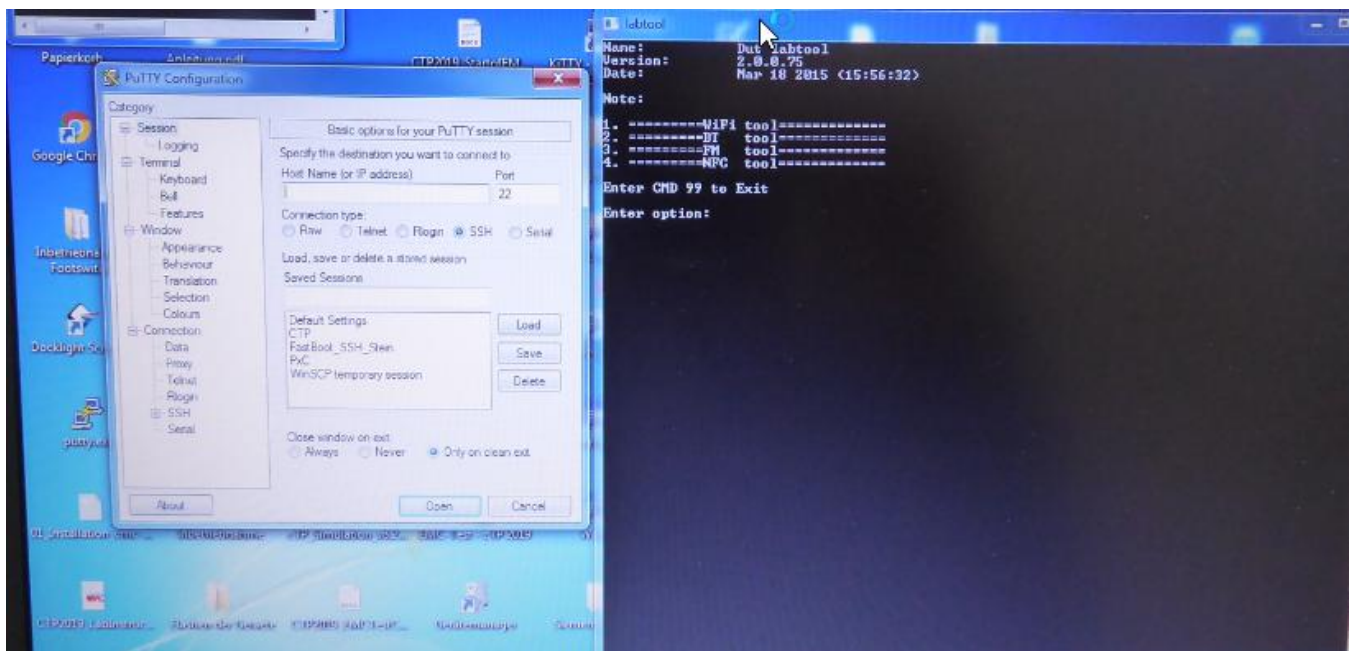
- Downlink channel UARFCN 3100 (2655.0 MHz),
- Uplink channel UARFCN 21100 (2535.0 MHz),
- BS-Power -80 dBm; Mobile-Power 23 dBm; Mode PRBS9.

The system was set up as follows:



A GSM/WCDMA/LTE connection to the EUT was established by using a Wideband Communication Tester (CMW500). The EUT was connected wireless to the tester via a narrowband antenna.

Additionally, the WLAN module of the EUT was set to transmit in b-mode 11 Mbps on channel 1 with maximum output power to reflect a simultaneous transmission scenario. This has been done by means of a software called "Putty" (Release 0.65) and Labtool (Version 2.0.0.75), provided by the applicant.



The GPS reception was also active during the measurement.

3 Additional Information

The applicant has applied modifications to the device and therefore requested retesting of the radiated spurious emissions. The test report includes only worst-case test results for radiated emissions as ordered by the applicant.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 22 [3], 24 [4], 27 [5]	Status	Refer page
Radiated spurious emissions	30 – 26,500	22.917 (a) (b) 24.238 (a) (b) 27.53	Passed	13 et seq.

5 Results of radiated spurious emissions

5.1 Method of measurement

The EUT is measured in the frequency range from 30 MHz to 26.5 GHz in a semi anechoic chamber with a metal ground plane, which has been validated to the requirements of ANSI C63.4. It is placed on a 3D-positioner to allow different positions at a distance of 3 meters from the receiving antenna. Both polarizations (vertical and horizontal) have been evaluated and the turn table has been turned to 360° to maximize the emissions. The receiving antenna is raised from 1 to 2.5m.

Procedure preliminary measurement:

The following procedure is used:

1. Set the measurement antenna to 1 m height.
2. Monitor the frequency range at vertical polarisation and a EUT azimuth of 0 °.
3. Rotate the EUT by 360° to maximize the detected signals.
4. Repeat 1) to 2) with the horizontal polarisation of the measuring antenna.
5. Increase the height of the antenna for 0.5 m and repeat steps 2 – 4 until the final height of 2.5 m is reached.
6. The highest values for each frequency will be saved by the software, including the antenna height, measurement antenna polarization and turntable azimuth for that value.

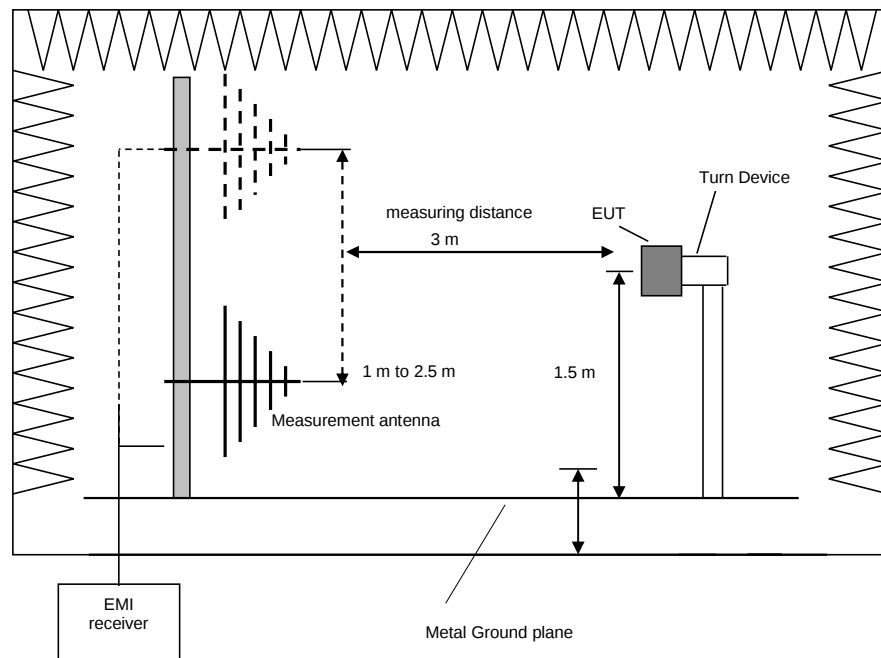
Procedure final measurement:

The following procedure is used:

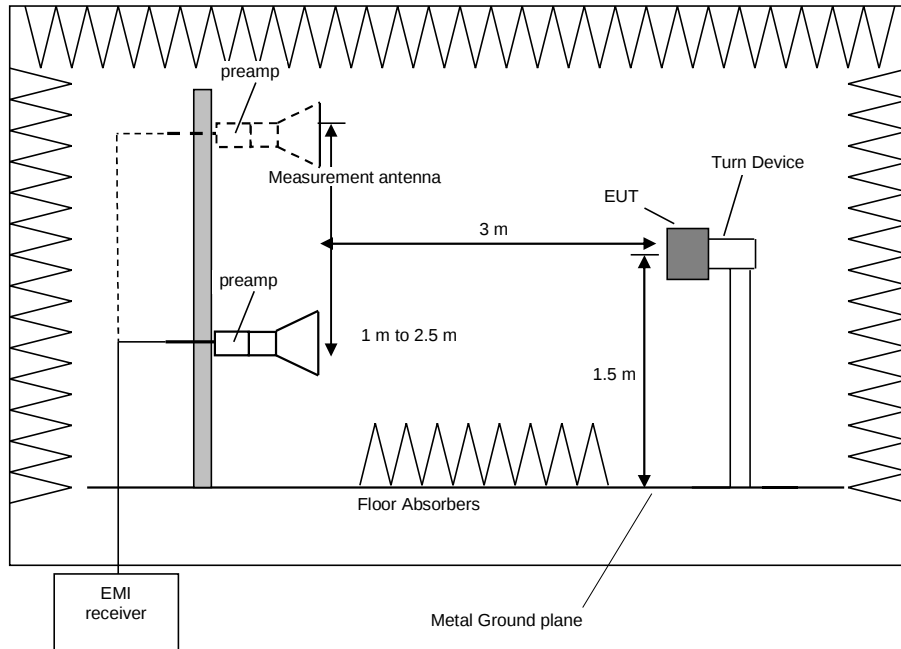
1. Select the highest frequency peaks to the limit for the final measurement.
2. The software will determine the exact peak frequencies by doing a partial scan with reduced RBW with +/- 10 times the RBW of the pre-scan of the selected peaks.
3. If the EUT is portable or ceiling mounted, find the worst case EUT position (x,y,z) for the final test.
4. The worst measurement antenna height is found by the measurement software by varying the measurement antenna height by +/- 0.5 m from the value obtained in the preliminary measurement, and to monitor the emission level.
5. The worst azimuth turntable position is found by varying the turntable azimuth by +/- 25° from the value obtained in the preliminary measurement, and to monitor the emission level.
6. The final measurement is performed at the worst-case antenna height and the worst case turntable azimuth
7. Steps 2 – 6 will be repeated for each frequency peak selected in step 1.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	100 kHz
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 25 / 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz



Test setup for measurements below 1 GHz



Test setup for measurements above 1 GHz

5.2 Radiated spurious emissions results:

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 [3][4][5].

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

A field strength was measured and converted to an ERP or EIRP [dBm] using the formula:

$E \text{ [dB}\mu\text{V/m]} = \text{EIRP [dBm]} - 20\log(d) + 104.8$ according to chapter 5.2.7 [1].

è $\text{EIRP} = E - 95.25$ ($d = 3 \text{ m}$ measuring distance)

$\text{ERP [dBm]} = \text{EIRP} - 2.15 \text{ dB}$

Level (dBm) $\triangleq$ ERP (below 1GHz) or EIRP (above 1 GHz)

5.2.1 Radiated spurious emissions GSM 850

Ambient temperature: 21 °C

Relative humidity: 35 %

Measurement at uplink channel 189 (uplink channel notched):

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
836.4	Uplink channel, no spurious		4824.0	54.5	-40.7 (EIRP)
881.4	Downlink channel, no spurious		3989.25	65.6	-29.7 (EIRP Noise level)
2412.0	WLAN Signal, no spurious		-	-	-
2509.2	73.2	-22.0 (EIRP)	-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

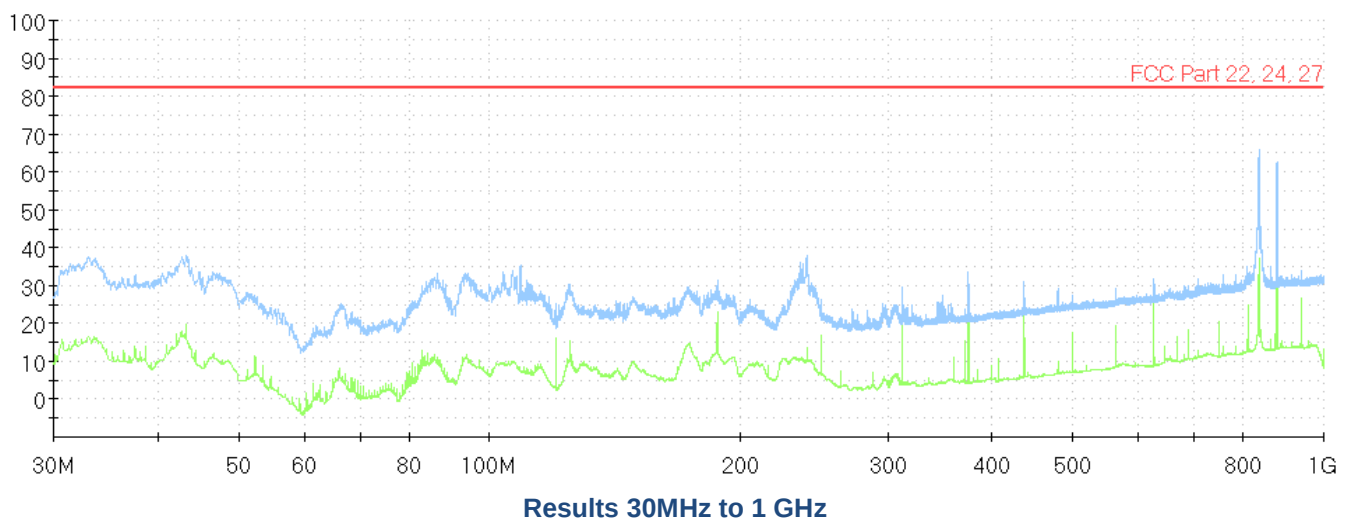
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

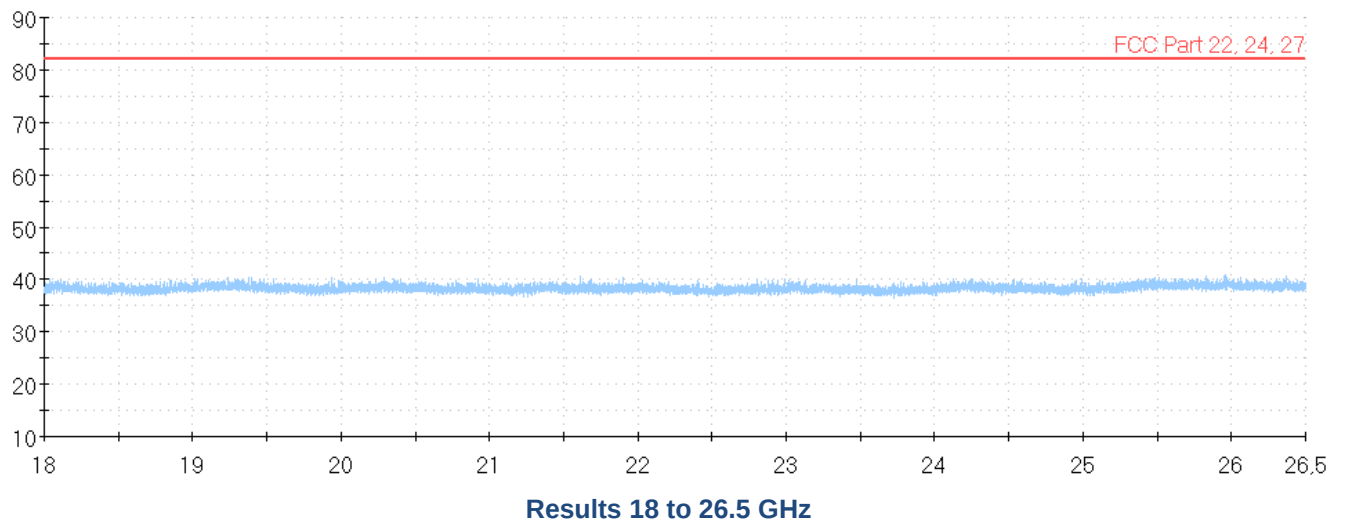
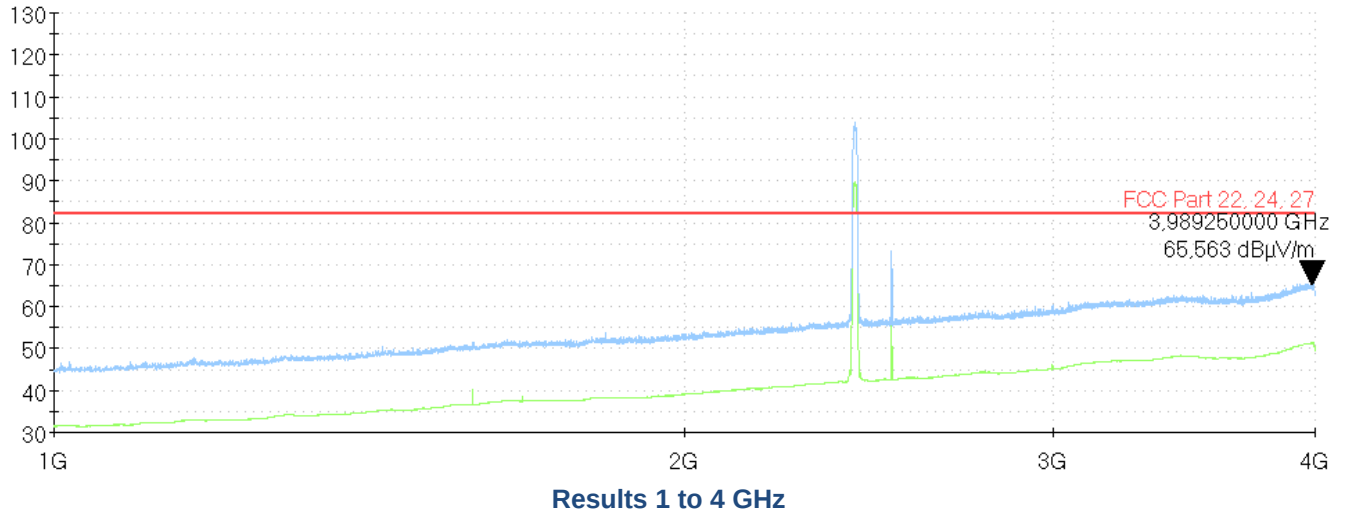
This results into a limit of -13 dBm for all power levels of the UE.

All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

Test equipment (please refer to chapter 6 for details)

1 - 24





5.2.2 Radiated spurious emissions PCS1900

Ambient temperature: 21 °C

Relative humidity: 35%

Measurement at uplink channel 661 (uplink channel notched):

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
2412.0	WLAN Signal, no spurious		3995.0	65.6	29.7 (Noise level)
4824.0	54.5	-40.7 (EIRP)	-	-	-
5640.1	61.6	-33.65 (EIRP)	-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

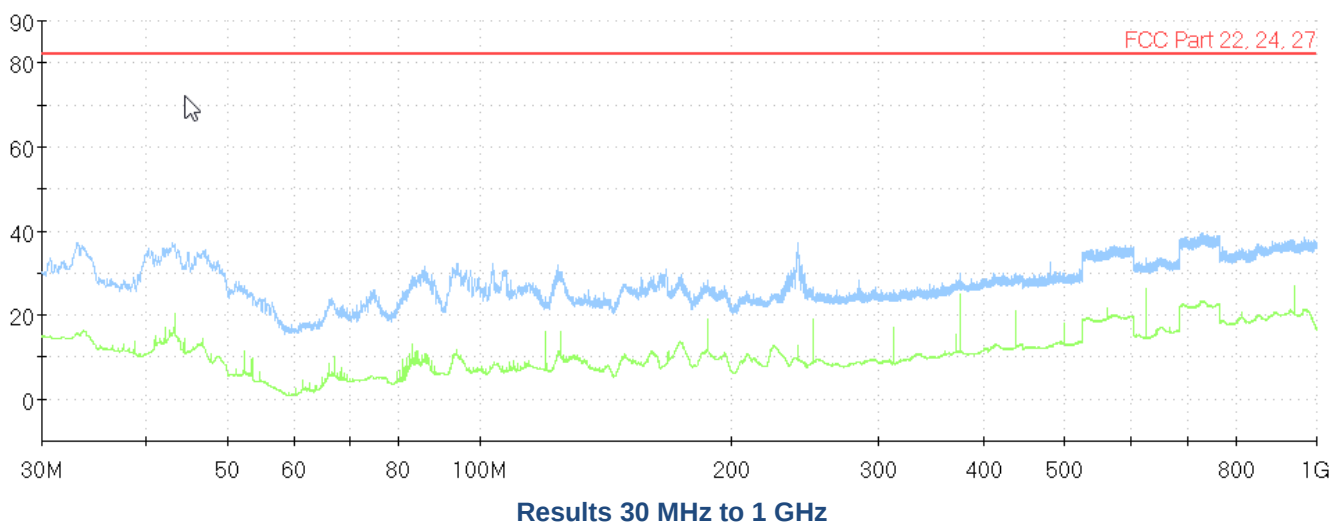
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

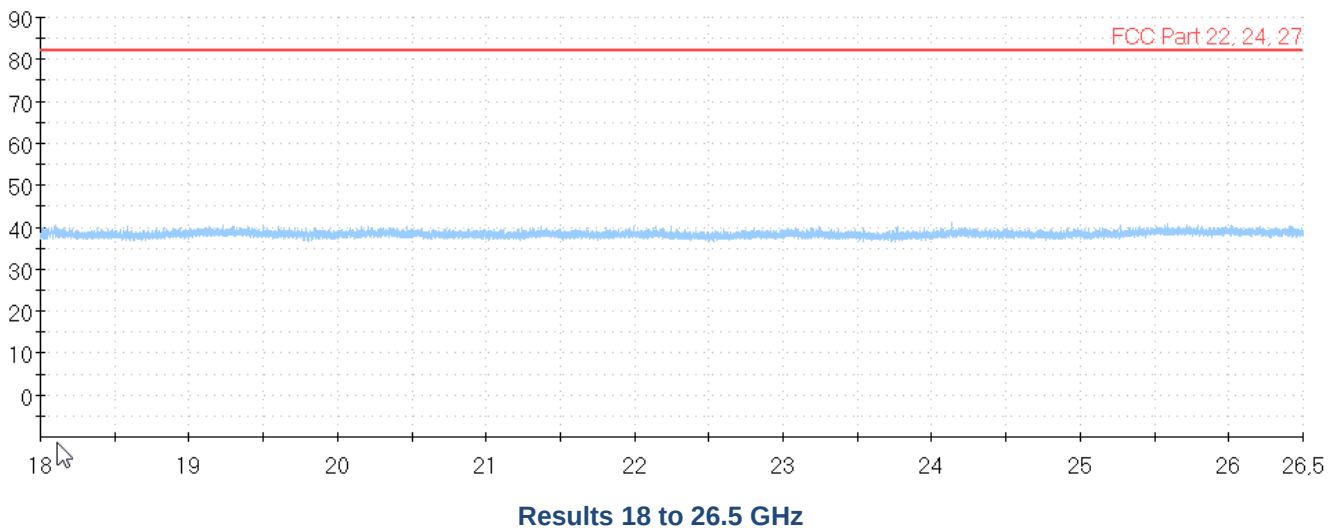
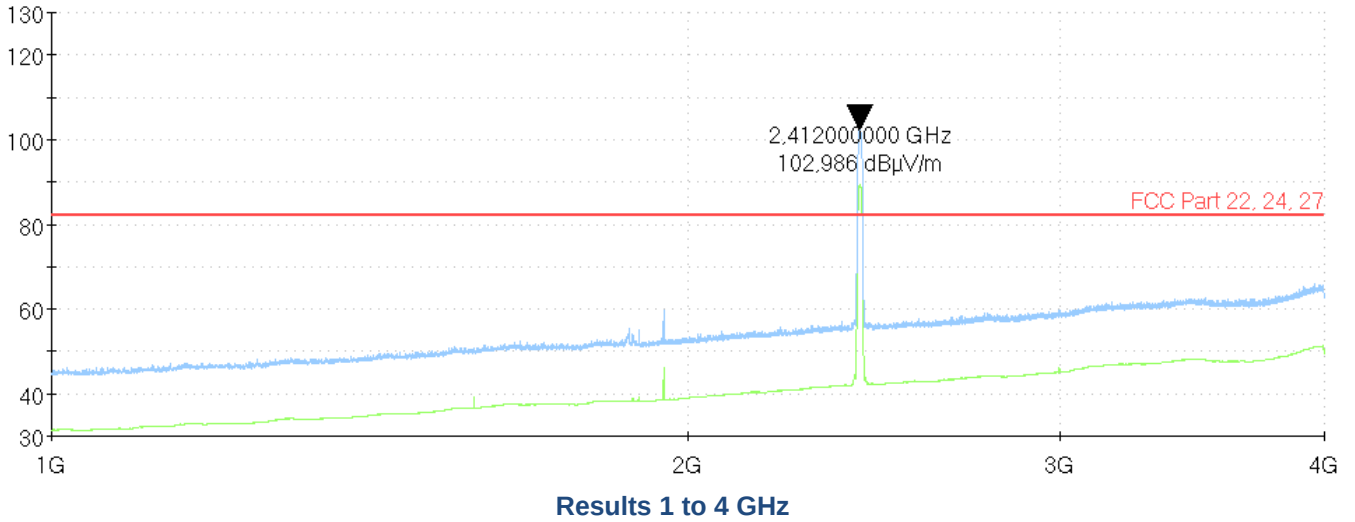
This results into a limit of -13 dBm for all power levels of the UE.

All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

Test equipment (please refer to chapter 6 for details)

1 - 24





5.2.3 Radiated spurious emissions UMTS Band 2

Ambient temperature	21 °C	Relative humidity	35 %
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Measurement at uplink channel 9400 (uplink channel notched):

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
1880.0	Uplink channel, no spurious	-	-	-	-
1960.0	Downlink channel, no spurious	-	-	-	-
2412.0	WLAN Signal, no spurious	-	-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

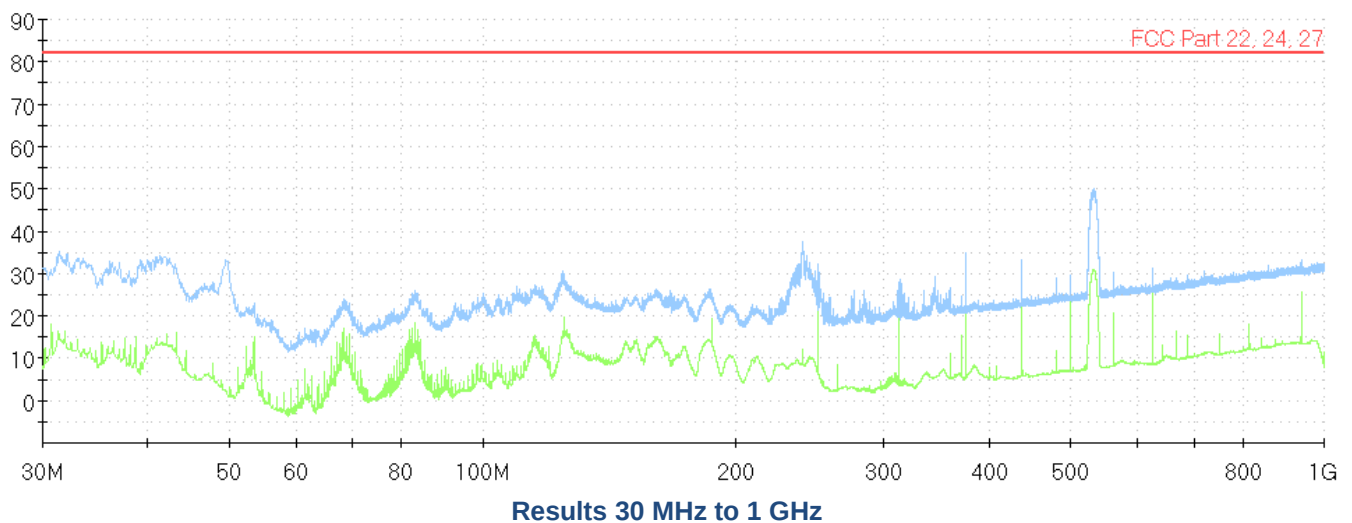
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

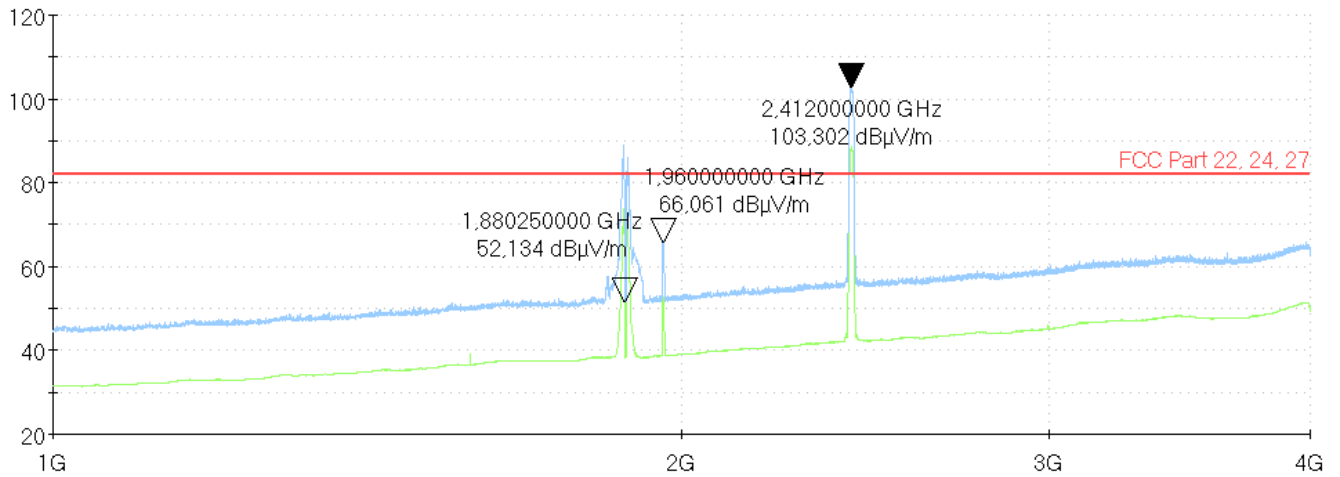
This results into a limit of -13 dBm for all power levels of the UE.

All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

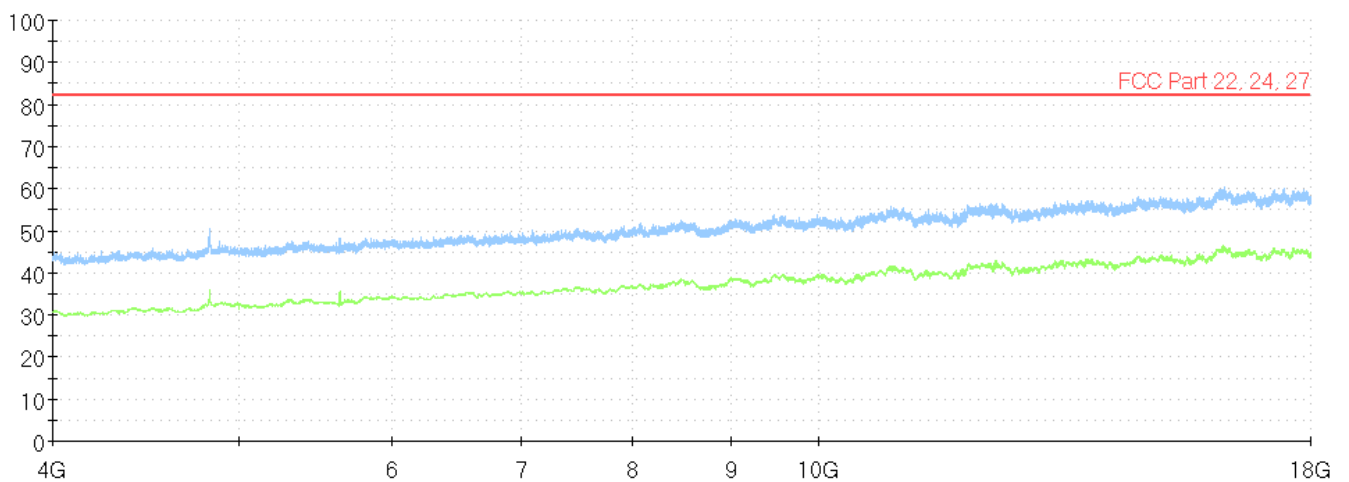
Test equipment (please refer to chapter 6 for details)

1 - 24

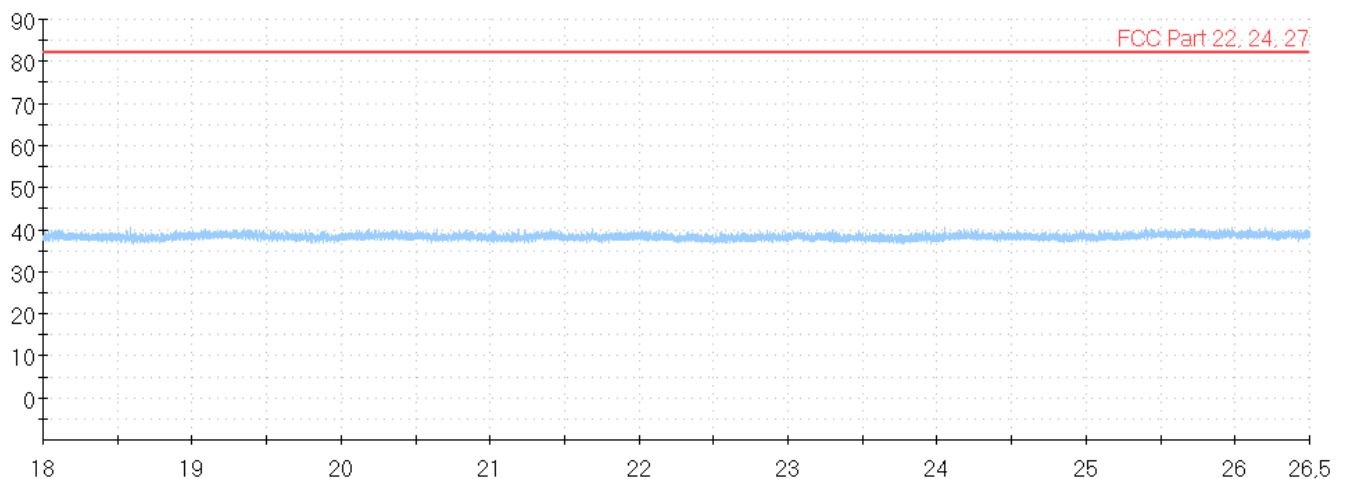




Results 1 to 4 GHz



Results 4 to 18 GHz



Results 18 GHz to 26.5 GHz

5.2.4 Radiated spurious emissions UMTS Band 5

Ambient temperature	21 °C	Relative humidity	35 %
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Measurement at uplink channel 4182 (uplink channel notched):

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
836.4	Uplink channel, no spurious		4824.0	54.1	-41.15 (EIRP)
881.4	Downlink channel, no spurious		-	-	-
3975.25	65.45	- 29.8 (EIRP Noise level)	-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

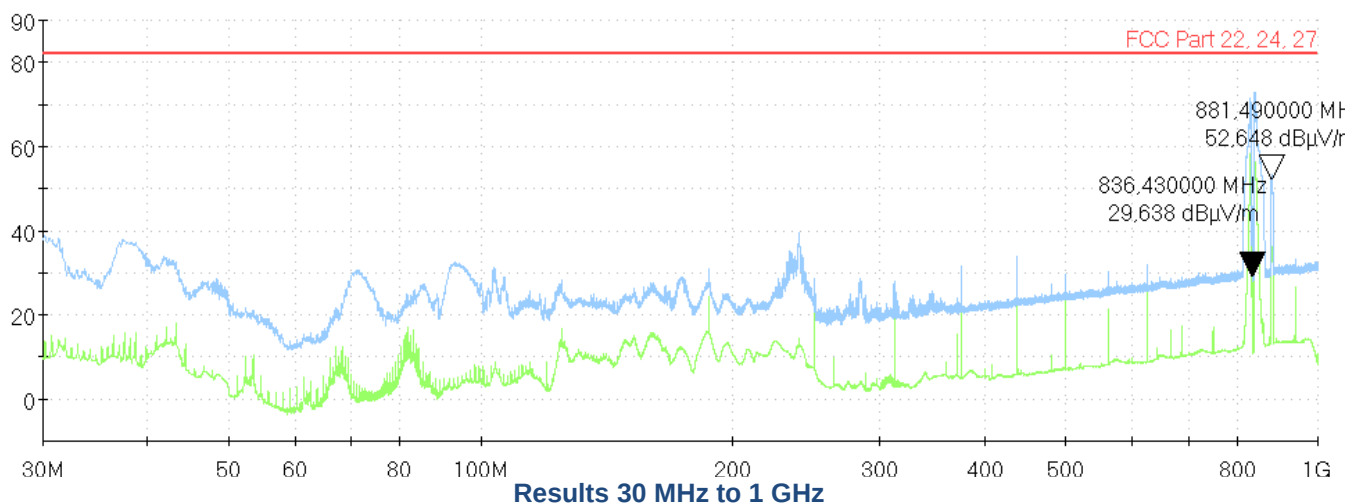
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

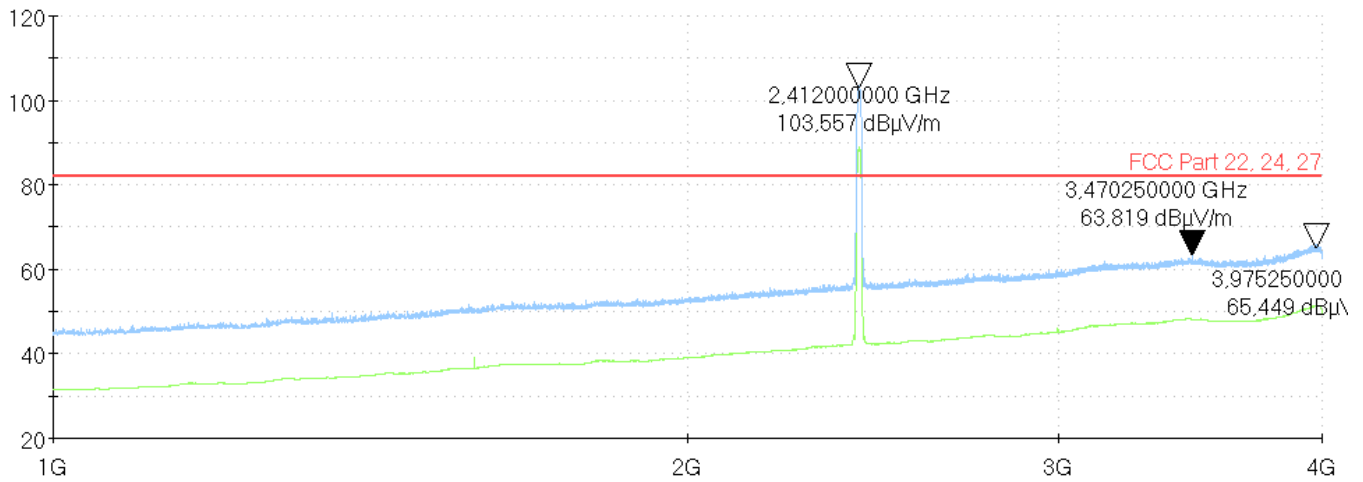
This results into a limit of -13 dBm for all power levels of the UE.

All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

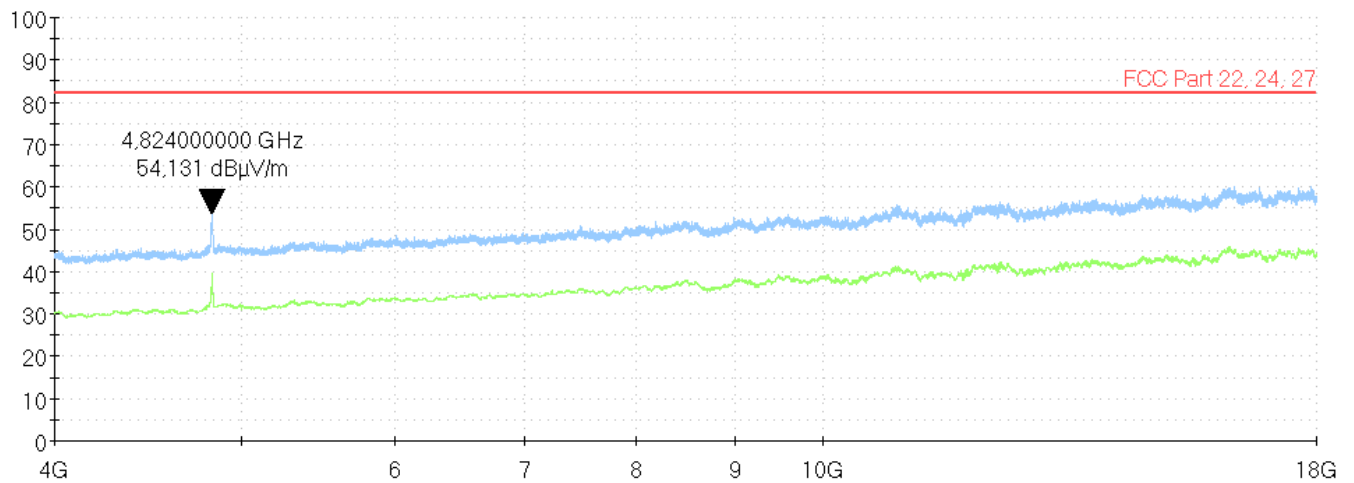
Test equipment (please refer to chapter 6 for details)

1 - 24

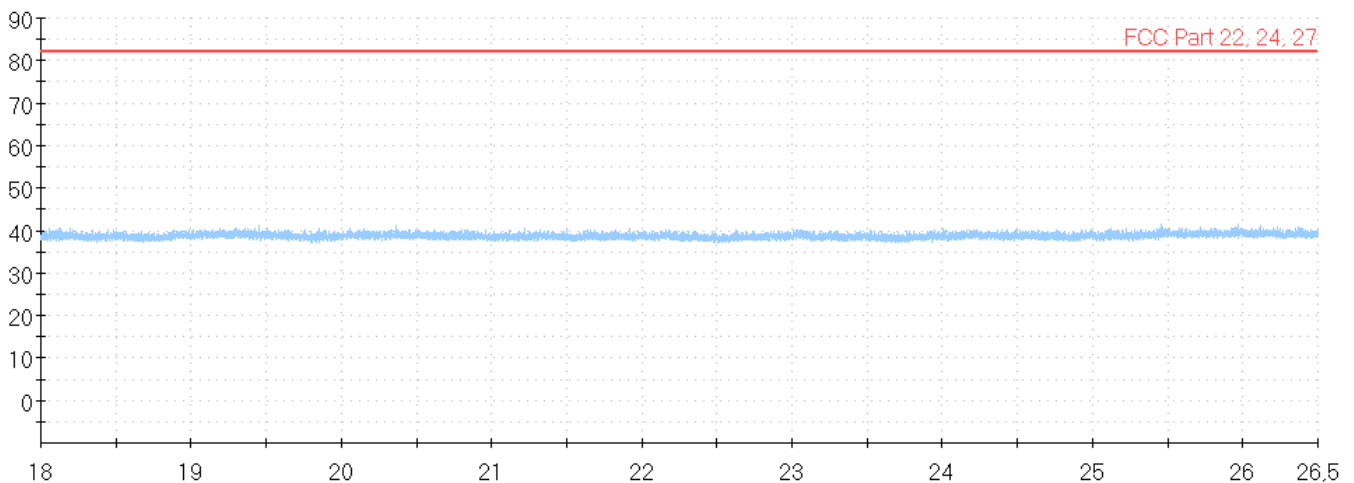




Results 1 to 4 GHz



Results 4 to 18 GHz



Results 18 GHz to 26.5 GHz

5.2.5 Radiated spurious emissions LTE Band 5

Ambient temperature	21 °C	Relative humidity	35 %
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Measurement at uplink channel 20524 (uplink channel notched):

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
836.4	Uplink channel, no spurious		16212.75	60.7	-34.6 (EIRP Noise level)
881.4	Downlink channel, no spurious		-	-	-
4824.0	54.3	-40.95 (EIRP)	-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

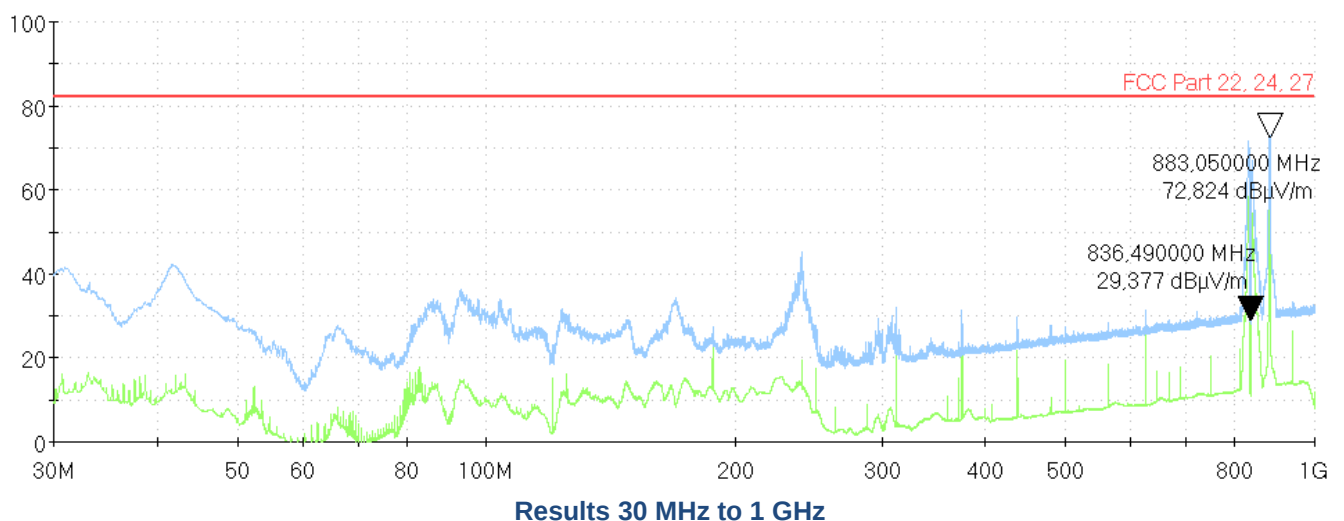
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

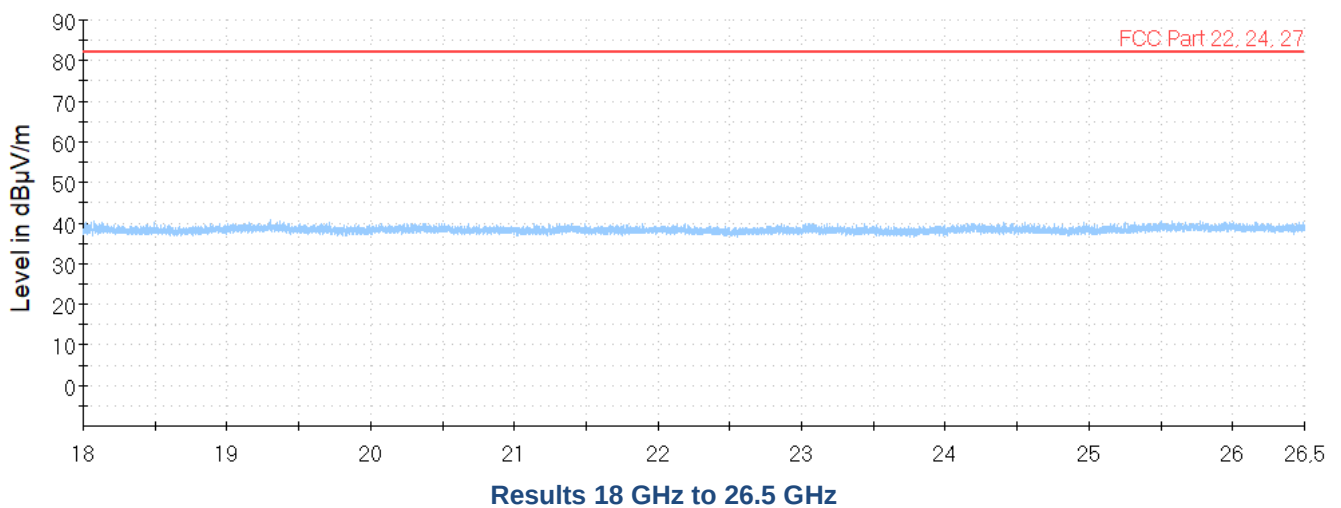
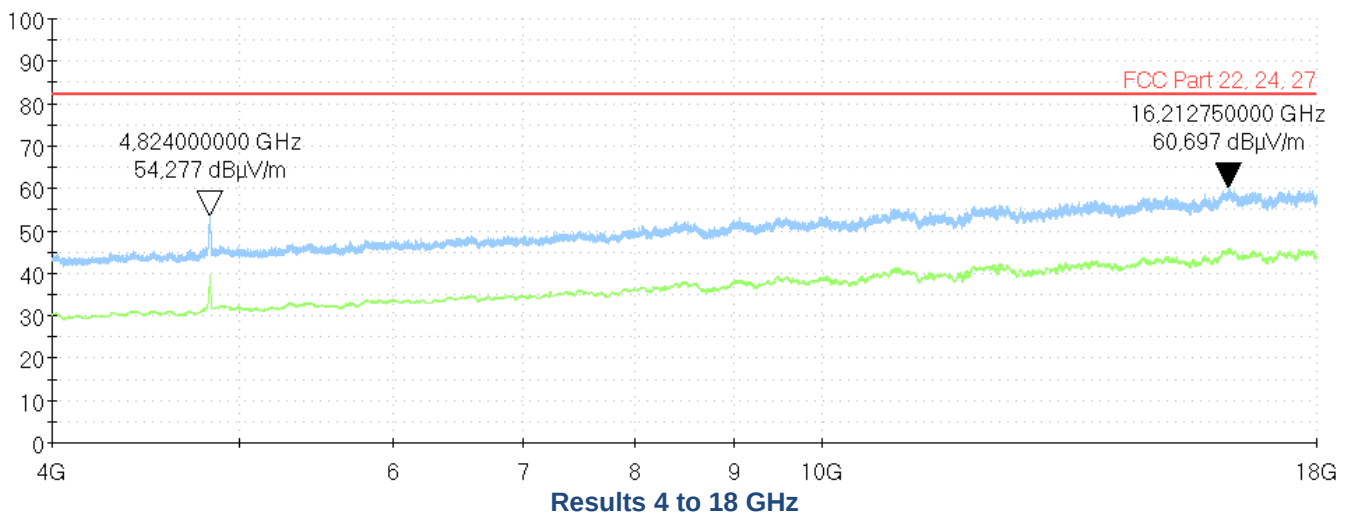
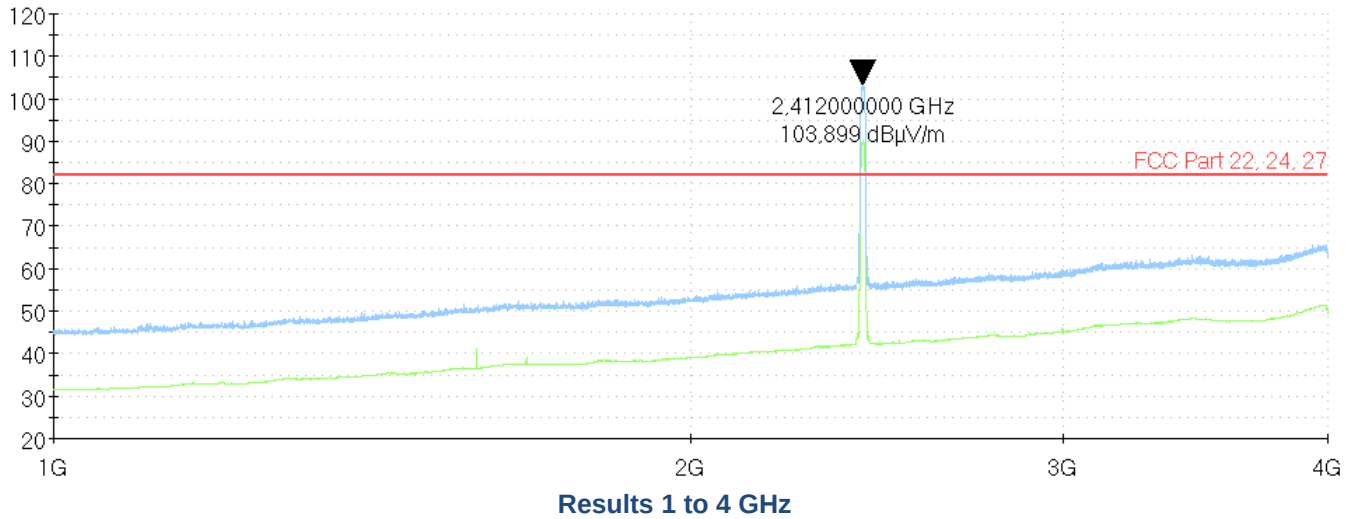
This results into a limit of -13 dBm for all power levels of the UE.

All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

Test equipment (please refer to chapter 6 for details)

1 - 24





5.2.6 Radiated spurious emissions LTE Band 7

Ambient temperature	21 °C	Relative humidity	35 %
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Measurement at uplink channel 21100:

Spurious emissions level					
f (MHz)	E (dBμV/m)/3m	Level (dBm)	f (MHz)	E (dBμV/m)/3m	Level (dBm)
2535.0	Uplink channel, no spurious		4824.0	59.44	-35.8 (EIRP)
2655.0	Downlink channel, no spurious		3968.5	65.7	-29.55 (Noise level)
2412.0	WLAN Signal, no spurious		-	-	-
Measurement uncertainty: +2.2 dB / -3.6 dB					

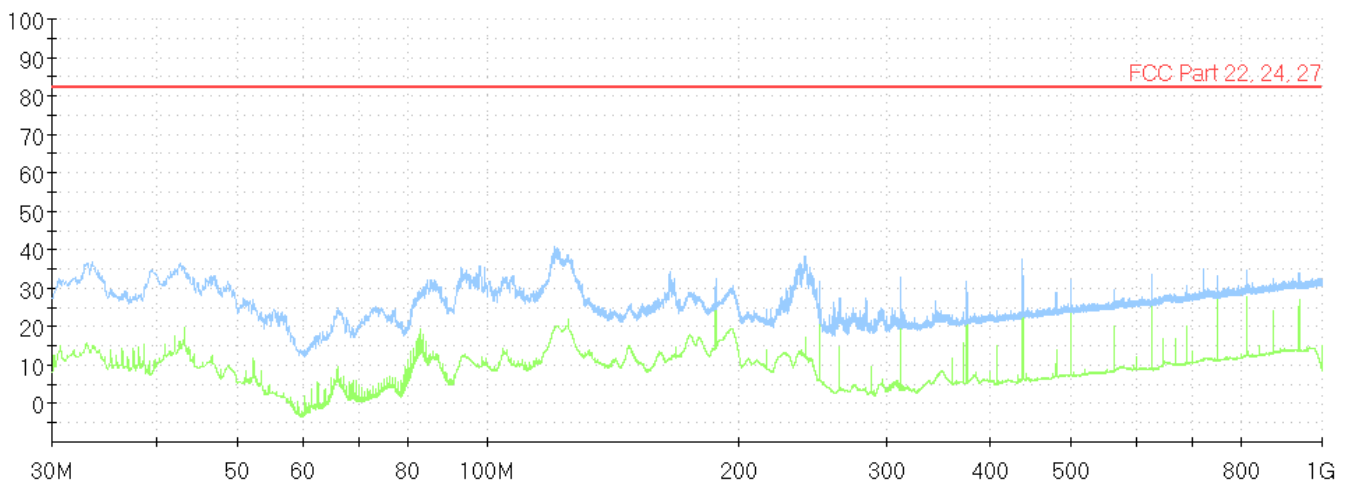
Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB [3][4][5].

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

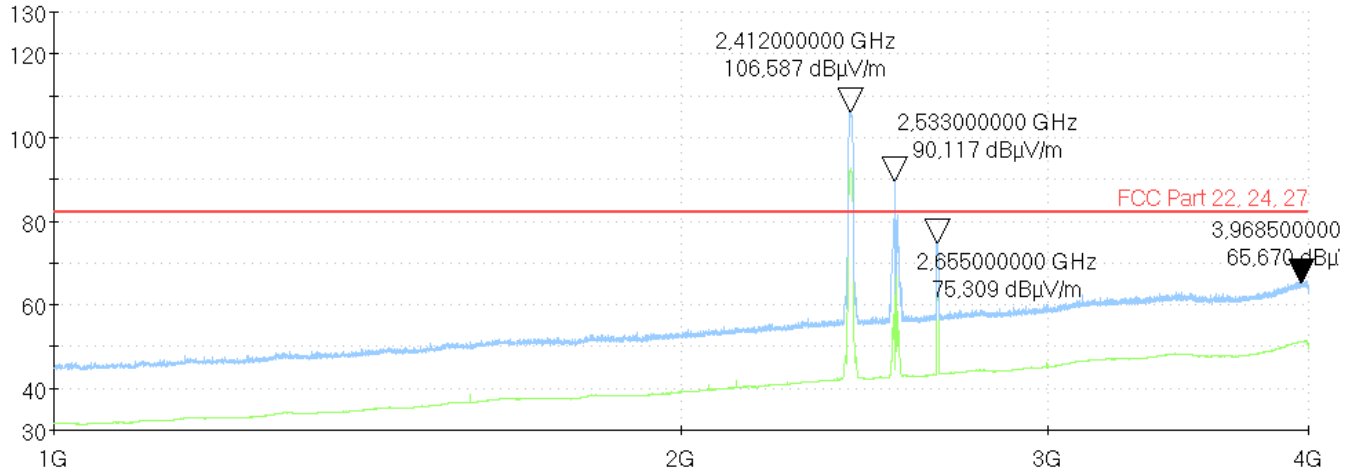
All emissions show more than 20 dB margin to the limit. Therefore, no final measurement has been performed.

Test equipment (please refer to chapter 6 for details)

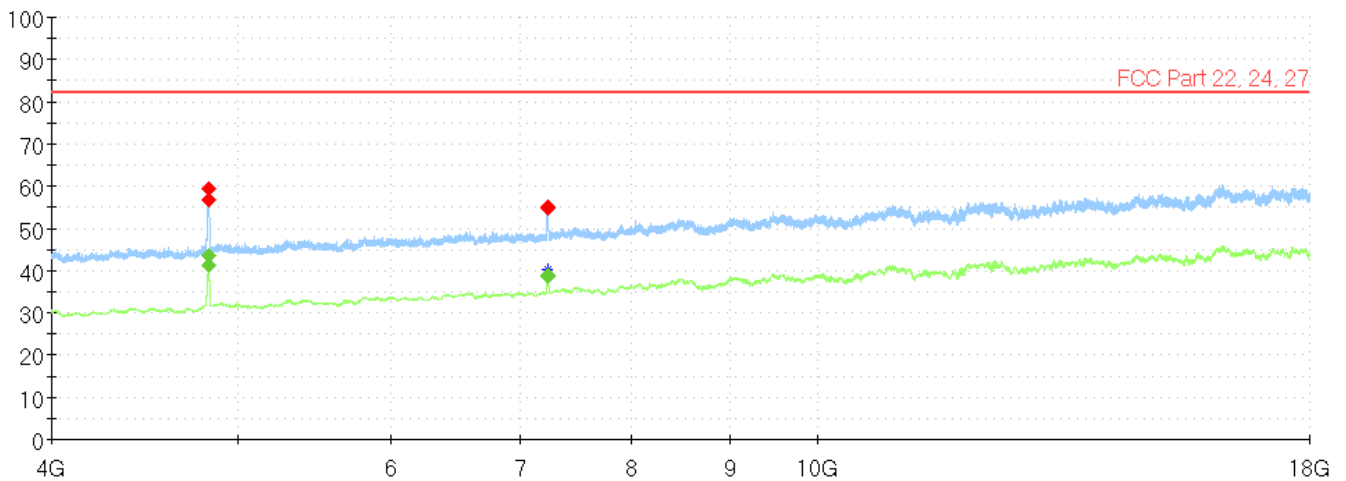
1 - 24



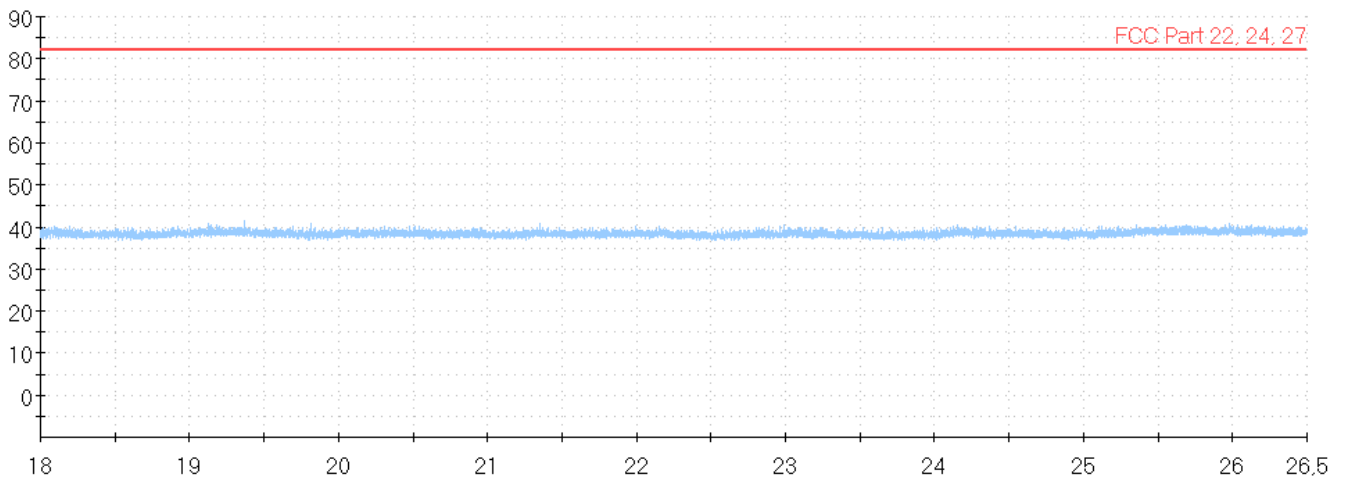
Results 30 MHz to 1 GHz



Results 1 to 4 GHz



Results 4 to 18 GHz



Results 18 GHz to 26.5 GHz

6 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Ultralog Antenna	HL562E	Rohde & Schwarz		482978	07.08.2019	08.2022
2	Systemsoftware EMC32 M276	EMC32	Rohde & Schwarz	100970	482972	Calibration not necessary	
3	RF Switch Matrix	OSP220	Rohde & Schwarz		482976	Calibration not necessary	
4	Drehscheibe/Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
5	Antennenmast / Antennasupport	BAM 4.5-P-10kg	Maturo	222/2612.01	483225	Calibration not necessary	
6	Controller	NCD	Maturo	474/2612.01	483226	Calibration not necessary	
7	Absorberhalle M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
8	EMI Test receiver ESW	ESW44	Rohde & Schwarz	101828	482979	12.04.2019	04.2021
9	Log Per Antenna	HL050	Rohde & Schwarz	4062.4063.02-100908	482977	13.08.2019	08.2022
10	Highpass Filter	WHKX4.0/18G-8SS	Wainwright Instruments GmbH	1	480587	Calibration not necessary	
11	Highpass Filter	WHKX12-935-1000-15000-40ST	Wainwright Instruments GmbH	1	482908	Calibration not necessary	
12	standard gain horn antenna	20240-20	Flann Microwave	411	480297	Calibration not necessary	
13	Preamplifier 18 GHz - 26 GHz	JS4-18002600-20-5A	MITEQ Hauppauge N.Y.	658697	480342	10.07.2018	07.2020
14	Wideband Radio Communication Tester	CMW500	Rohde & Schwarz	167339	483023	15.04.2019	04.2021
15	Tuneable Notch Filter	WRCA800/960-0.2/40-6EEK	Wainwright Instruments	15	480414	Calibration not necessary	
16	Tuneable Notch Filter	WRCD1700/2000-0.2/40-10EEK	Wainwright Instruments	14	480415	Calibration not necessary	
17	Tunable Band Reject Filter	WRCT2300/2650-5/40-10EEK	Wainwright Instruments GmbH	1	480446	Calibration not necessary	
18	Tuneable Band Reject Filter	WTRCD8-800-960EEK	Wainwright Instruments GmbH	2	482012	Calibration not necessary	
19	Tunable Band Reject Filter	WRCT1850/2170-5/40-10EESD		1	480715	Calibration not necessary	
20	Preamplifier	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	Calibration not necessary	
21	Cable	C417	H+S	-	-	Calibration not necessary	
22	Cable	C416	H+S	-	-	Calibration not necessary	
23	Cable	C416.1	H+S	-	-	Calibration not necessary	
24	Cable	C419	H+S	-	-	Calibration not necessary	

7 Test Site Validation

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4a-2017	19.09.2019	18.09.2021
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	01.10.2019	30.09.2021

8 Report History

Report Number	Date	Comment
F191350E4	19.12.2019	Initial Test Report

9 List of Annexes

Annex A	Test Setup Photos	6 pages
Annex B	EUT External Photos	4 pages
Annex C	EUT Internal Photos	2 pages