

Test Report

Report Number:

F211717E1

Equipment under Test (EUT):

**Communication Module
EK 042**

Applicant:

Miele & Cie. KG

Manufacturer:

Miele & Cie. KG



Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

- [1] **ANSI C63.10-2013**, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **558074 D01 15.247 Meas Guidance v05r02 (April 2019)**, GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
- [4] **RSS-247, Issue 2 (2017-02)** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- [5] **RSS-Gen, Issue 5 (2021-02)** General Requirements for Compliance of Radio Apparatus

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.
“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:

Signature

Reviewed and
approved by:

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.

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1 Identification

1.1 Applicant

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Address:	Carl-Miele-Str. 29, 33332 Gütersloh
Country:	Germany
Name for contact purposes:	Mr. Gunnar BORGELT
Phone:	+49 5241 89-4289
eMail Address:	gunnar.borgelt@miele.com
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	Miele & Cie. KG
Address:	Carl-Miele-Str. 29, 33332 Gütersloh
Country:	Germany
Name for contact purposes:	Mr. Gunnar BORGELT
Phone:	+49 5241 89-4289
eMail Address:	gunnar.borgelt@miele.com
Applicant 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-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Accreditation designation number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

EUT	
Test object: *	Communication Module
PMN / Model name: *	EK042
FCC ID: *	2ACUWEK042
IC: * ISED Certification number: *	5669C-EK042

* Declared by the applicant

	EUT number		
	1 (antenna port conducted)	2 (radiated)	3
Serial number: *	R9243924	R9243937	-
PCB identifier: *	EK042 240118	EK042 240118	-
Hardware version: * HVIN:*	EK042	EK042	-
Software version: * FVIN:*	NA	NA	-

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

1.5 Technical Data of Equipment

General EUT data			
Power supply EUT: *	DC		
Supply voltage EUT: *	U _{Nom} = 13.0 V _{DC}	U _{Min} = 7.0 V _{DC}	U _{Max} = 20.0 V _{DC}
Temperature range: *	0 °C to +50 °C		
Lowest / highest internal clock frequency: *	32.768 kHz / 2.462 GHz		

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
Power	Soldering pads	NA*	NA*	NA*
Device Bus	Soldering pads	NA*	NA*	NA*
-	-	-	-	-

Remark:* The EUT will be implemented into various host devices. Therefore, the ancillary devices and cable properties cannot be known in advance.

IEEE 802.11 radio mode		
Fulfils radio specification: *	IEEE 802.11 b/g/n20	
Radio chip: *	CC3200, Texas Instruments	
Antenna type: *	PIFA	
Antenna name: *	NA	
Antenna gain: *	0.7 dBi	
Antenna connector: *	None*	
Type of modulation: *	IEEE 802.11 b	BPSK, DQPSK, CCK (1/2/5.5/11 Mbit/s)
	IEEE 802.11 g	BPSK, QPSK, 16-QAM, 64-QAM (6/9/12/18/24/36/48/54 Mbit/s)
	IEEE 802.11 n20	BPSK, QPSK, 16-QAM, 64-QAM (up to 72.2 Mbit/s)

* Temporary antenna connector was provided by the applicant.

IEEE 802.11 radio mode		
Operating frequency range: *	IEEE 802.11 b	2412 – 2462 MHz
	IEEE 802.11 g	2412 – 2462 MHz
	IEEE 802.11 n20	2412 – 2462 MHz
Number of channels: *	IEEE 802.11 b	11 (5 MHz channel spacing)
	IEEE 802.11 g	11 (5 MHz channel spacing)
	IEEE 802.11 n20	11 (5 MHz channel spacing)

IEEE 802.11 b/g/n20 frequencies				
Channel 01	RX	2412 MHz	TX	2412 MHz
Channel 02	RX	2417 MHz	TX	2417 MHz
Channel 03	RX	2422 MHz	TX	2422 MHz
Channel 04	RX	2427 MHz	TX	2427 MHz
Channel 05	RX	2432 MHz	TX	2432 MHz
Channel 06	RX	2437 MHz	TX	2437 MHz
Channel 07	RX	2442 MHz	TX	2442 MHz
Channel 08	RX	2447 MHz	TX	2447 MHz
Channel 09	RX	2452 MHz	TX	2452 MHz
Channel 10	RX	2457 MHz	TX	2457 MHz
Channel 11	RX	2462 MHz	TX	2462 MHz

1.5.1 Ancillary Equipment / Equipment used for testing

Equipment used for testing	
Laptop PC:*1	Fujitsu Lifebook S751 (PM-Nr. 201036)
USB to UART-TTL converter: *2	TTL-232R-3V3 by FTDI Limited
AC/DC adaptor*1	Enercell AC Adapter CAT. NO. 273-316 100-120 V / 60 Hz AC → 12 V DC

*1 Provided by the laboratory

*2 Provided by the applicant

Ancillary equipment	
-	-

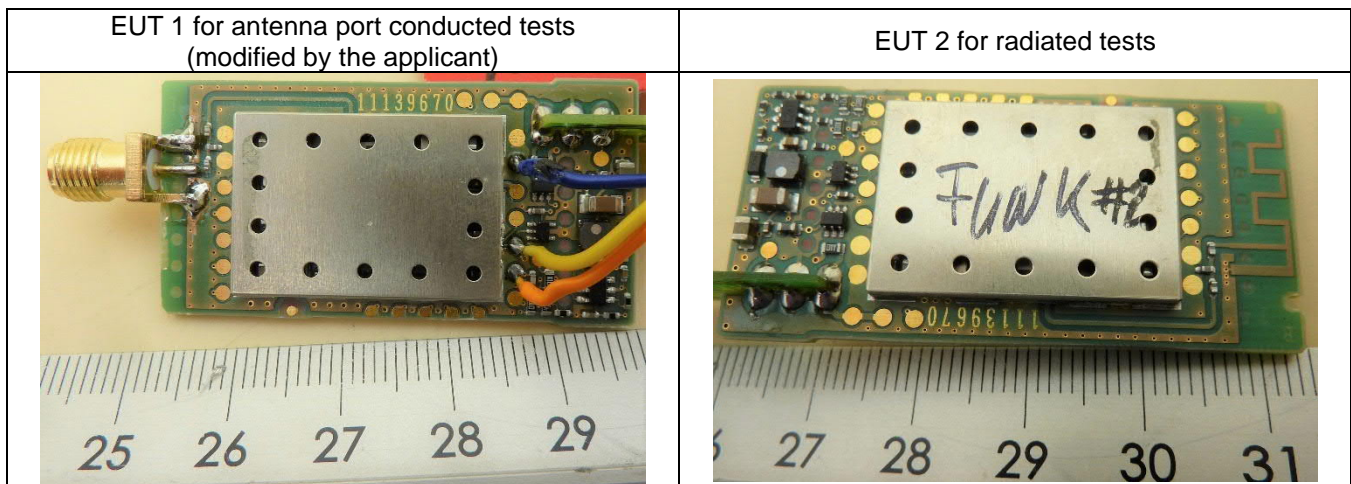
1.6 Dates

Date of receipt of test sample:	22.09.2021
Start of test:	24.09.2021
End of test:	25.10.2021

2 Operational States

2.1 Description of function of the EUT

The EUT is a WLAN communication component that is intended to be used in household appliances, especially in cooling appliances. The power supply and communication are realized via a 4 pin connection, of which one is not used.



2.2 The following states were defined as the operating conditions

For the antenna port conducted tests, a connection was established using a terminal program on a laptop computer and an UART-TTL to USB cable to connect the EUT to the test laptop computer. Using commands, which were provided by the applicant, the test modes were started

For the radiated tests in the anechoic chamber the EUT was configured to start up as a WLAN access point. After connecting to the EUT with a laptop computer acting as a WLAN client, the test command could be sent via a program called "RadioToolTestConfig". Test commands and radio tool were provided by the applicant.

Modulation	Power setting ch. 1 - 11
All modes	0 dB power reduction
802.11 g mode, channel 1	1 dB power reduction

2.2.1 Operation modes

Operation mode	Description of the operation mode	EUT	mode	channel	Modulation	Data rate / Mbps
1	Continuous transmitting on 2412 MHz	1, 2	802.11 b-mode	1	CCK	11 Mbps
2	Continuous transmitting on 2437 MHz	1, 2	802.11 b-mode	6	CCK	11 Mbps
3	Continuous transmitting on 2462 MHz	1, 2	802.11 b-mode	11	CCK	11 Mbps
4	Continuous transmitting on 2412 MHz	1, 2	802.11 g-mode	1	BPSK	6 Mbps
5	Continuous transmitting on 2437 MHz	1, 2	802.11 g-mode	6	BPSK	6 Mbps
6	Continuous transmitting on 2462 MHz	1, 2	802.11 g-mode	11	BPSK	6 Mbps
7	Continuous transmitting on 2412 MHz	1, 2	802.11 n20-mode	1	BPSK	MCS0
8	Continuous transmitting on 2437 MHz	1, 2	802.11 n20-mode	6	BPSK	MCS0
9	Continuous transmitting on 2462 MHz	1, 2	802.11 n20-mode	11	BPSK	MCS0

3 Additional Information

The EUT was not labeled as required by FCC / IC.

The EUT for the antenna port conducted measurements was modified by the applicant with a temporary antenna connector as seen in the photographs above. All other tests were performed using unmodified samples.

Since the electronic filters in the anechoic chamber prevented rapid current changes, the EUT had to be buffered with a 100 μ F capacitor, to stabilize the EUT DC power supply.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-247 [4] RSS-Gen [5]	Status	EUT
Maximum conducted output power	2400.0 - 2483.5	15.247 (b) (3), (4)	5.4 (d) [4]	Passed	1
DTS Bandwidth / 99% Bandwidth	2400.0 - 2483.5	15.247 (a) (2)	5.2 (a) [4]	Passed	1
Average Power Spectral Density	2400.0 - 2483.5	15.247 (e)	5.2 (b) [4]	Passed	1
Band edge compliance	2400.0 - 2483.5	15.247 (d) 15.205 (a) 15.209 (a)	5.5 [4]	Passed	1, 2
Maximum unwanted emissions	0.009 – 26,500	15.247 (d) 15.205 (a) 15.209 (a)	8.9 [5]	Passed	2
Antenna Requirement	-	15.203 15.247 (b)	5.4 (f) (ii) [4]	Passed*1	-
Conducted emissions on supply line	0.15 – 30	15.207 (a)	8.8 [4]	Passed	2

*1 Fixed Antenna, gain below 6 dBi, no power reduction necessary.

5 Results

5.1 Test setup

5.1.1 Test Setup (radiated)

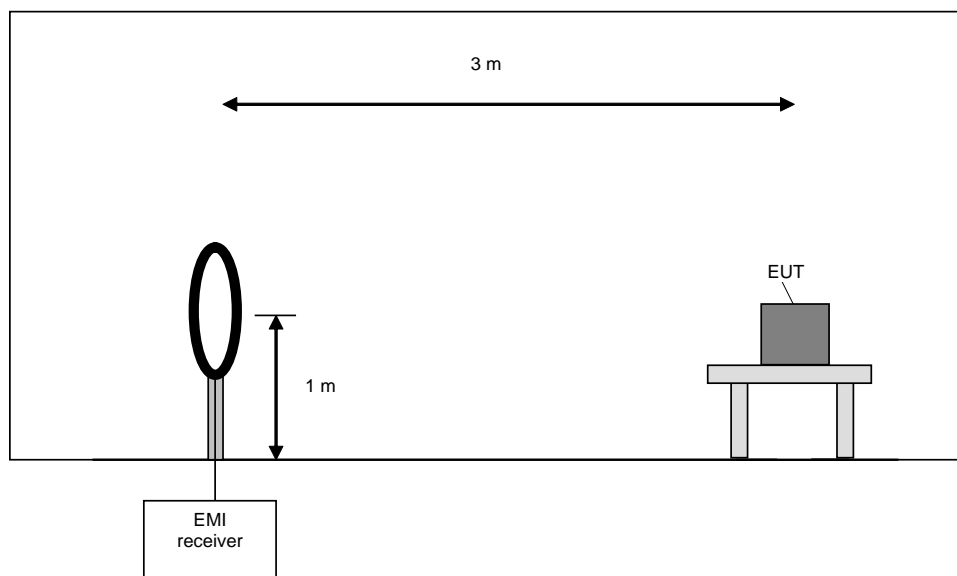
5.1.1.1 Preliminary measurement 9 kHz to 30 MHz

In the first stage a preliminary measurement is performed in an anechoic chamber with a measuring distance of 3 meters. Table-top and portable devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane. The setup of the equipment under test is in accordance to [1].

The frequency range 9 kHz to 30 MHz is monitored with an EMI receiver while the system and its cables are manipulated to find out the configuration with the maximum emission levels if applicable. The EMI receiver is set to MAX hold mode. The EUT and the measuring antenna are rotated around their vertical axis to find the maximum emission levels.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



Procedure preliminary measurement:

Pre-scans are performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure is used:

- 1) Monitor the frequency range with the measuring antenna facing the EUT and an EUT / turntable azimuth of 0 °.
- 2) Manipulate the system cables to produce the maximum levels of emissions.
- 3) Rotate the EUT by 360 ° to maximize the detected signals.
- 4) Measure the frequencies of the highest detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency values.
- 5) If the EUT is portable or ceiling mounted, repeat steps 1 to 4 with other orientations (x,y,z) of the EUT.
- 6) Rotate the measuring antenna and repeat steps 1 to 5.

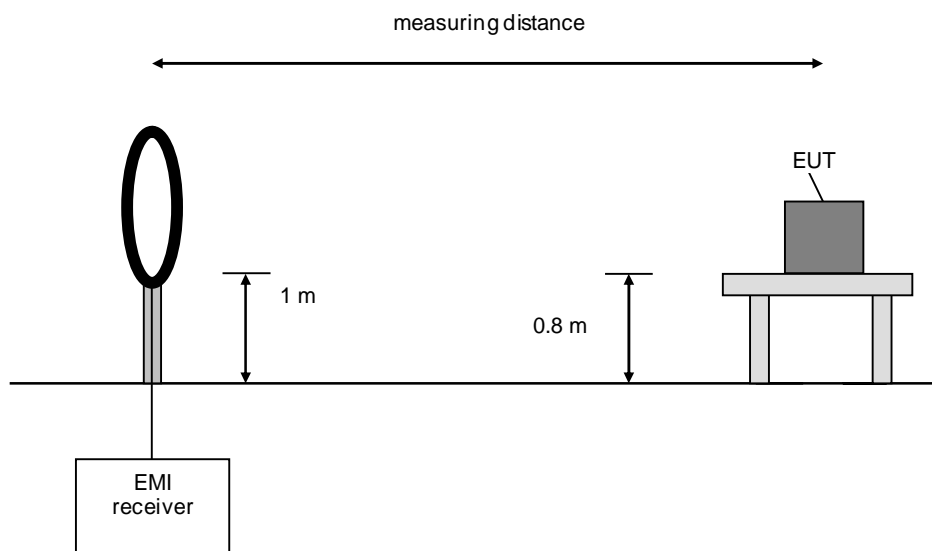
5.1.1.2 Final measurement 9 kHz to 30 MHz

In the second stage a final measurement is performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m or 30 m. In the case where larger measuring distances are required the results are extrapolated based on the values measured on the closer distances according to section 15.31 (f) (2) [2]. The final measurement is performed with an EMI receiver set to Quasi-Peak detector, except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an Average detector is used according section 15.209 (d) [2].

At the frequencies, which were detected during the preliminary measurements, the final measurement is performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum level value is found.

The resolution bandwidth of the EMI receiver is set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



Procedure final measurement:

The following procedure is used:

- 1) Monitor the selected frequencies from the preliminary measurement with the measuring antenna facing the EUT and an EUT azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals.
- 3) Rotate the measuring antenna and repeat steps 1 to 2 until the maximum value is found and note it.
- 4) If the EUT is portable or ceiling mounted, repeat steps 1 to 3 with other orientations (x,y,z) of the EUT.

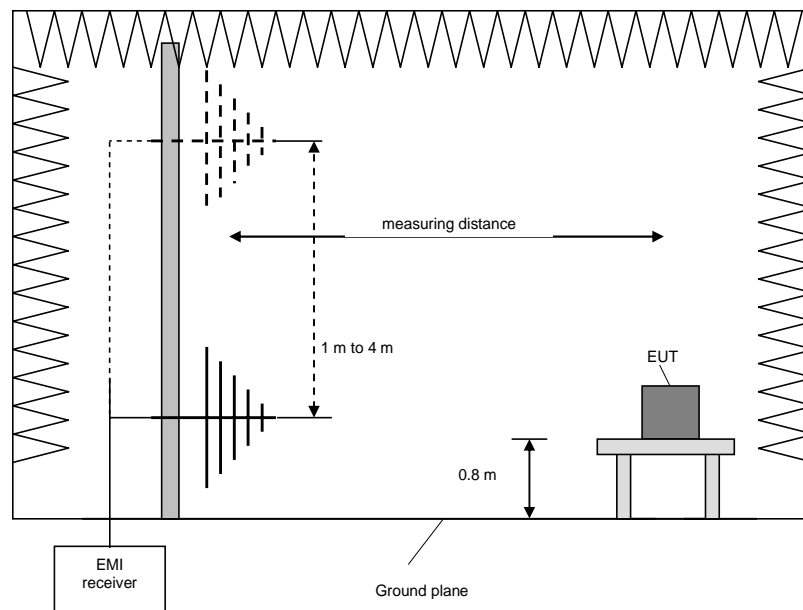
5.1.1.3 Preliminary and final measurement 30 MHz to 1 GHz

The preliminary and final measurements are performed in a semi-anechoic chamber with a metal ground plane in a 3 m distance. Table-top and portable devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices are placed directly on the turntable / ground plane.

During the tests the EUT is rotated in the range of 0 ° to 360 °, the measuring antenna is set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

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

Test	Frequency range	Step-size	Resolution bandwidth	Detector
Preliminary measurement	30 MHz to 1 GHz	30 kHz	120 kHz	Peak Average
Frequency peak search	± 120 kHz	10 kHz	120 kHz	Peak
Final measurement	30 MHz to 1 GHz	-	120 kHz	QuasiPeak



Procedure preliminary measurement:

The following procedure is used:

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

Procedure final measurement:

The following procedure is used:

- 1) Select the highest frequency peaks (lowest margin to the limit) for the final measurement.
- 2) The software determines the exact peak frequencies by doing a partial scan with reduced step size of the pre-scan of the selected peaks.
- 3) If the EUT is portable or ceiling mounted, find the worst-case EUT orientation (x,y,z) for the final test.
- 4) The worst-case measuring antenna height is found via varying the height by +/- 0.5 m from the value obtained in the preliminary measurement while monitoring the emission level.
- 5) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 6) The final measurement is performed at the worst-case measuring antenna height and the worst-case turntable azimuth.
- 7) Steps 2 to 6 are repeated for each frequency peak selected in step 1.

5.1.1.4 Preliminary and final measurement > 1 GHz

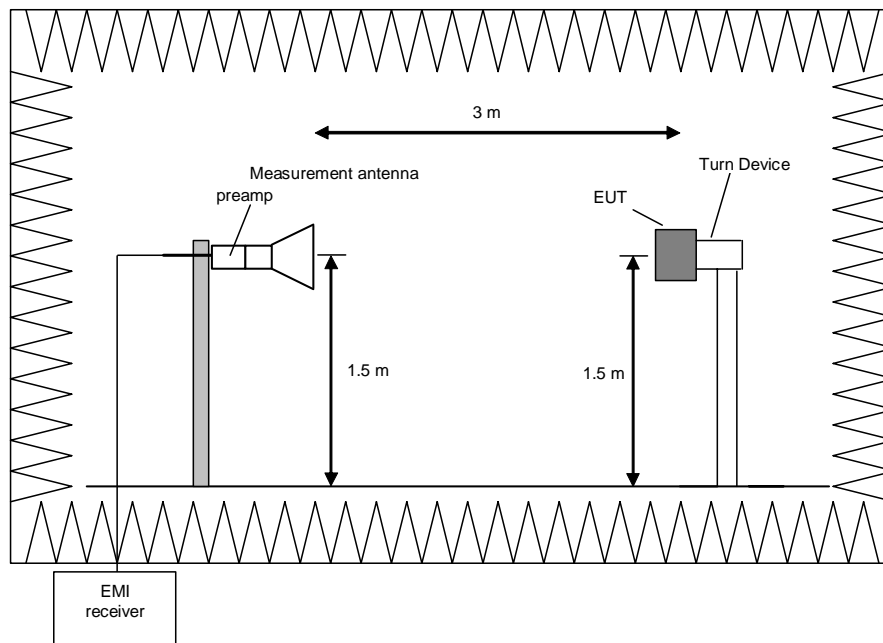
This measurement will be performed in a fully anechoic chamber. Tabletop and portable devices will set up on a non-conducting turn device on the height of 1.5m. The set-up of the Equipment under test will be in accordance to [1].

Preliminary measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending on the frequency range of the used antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according to 6.6.5.4 in [1].

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

Frequency range	Resolution bandwidth
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



Procedure preliminary measurement:

Pre-scans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

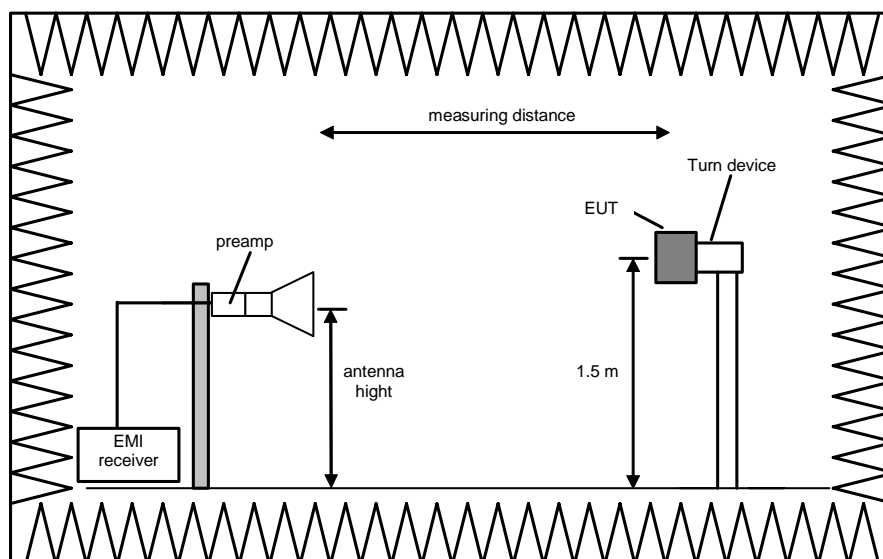
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarisation, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

Final measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending on the frequency range of the used antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

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

Frequency range	Resolution bandwidth
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



Procedure of measurement:

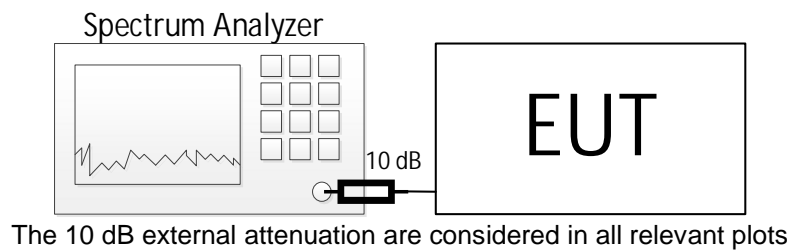
The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 25 /26.5 GHz and 26.5 GHz to 40 GHz.

The following procedure will be used:

- 1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
- 2) The worst-case turntable position is found via varying the turntable azimuth by +/- 30° from the value obtained in the preliminary measurement while monitoring the emission level.
- 3) Set the measurement antenna polarisation to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
- 4) Set the spectrum analyser to EMI mode with peak and average detector activated.
- 5) Rotate the turntable from 0° to 360° to find the TT Pos. that produces the highest emissions.
- 6) Note the highest displayed peak and average values
- 7) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

5.1.2 Test setup (conducted)

Test setup (conducted)		
Used	Antenna connector	Comment
<input checked="" type="checkbox"/>	Temporary antenna connector	As provided by the applicant
<input type="checkbox"/>	Normal antenna connector	



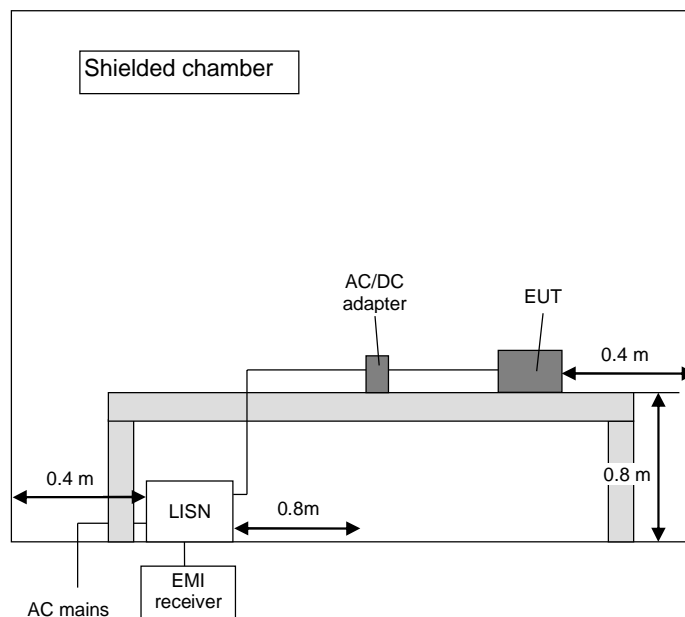
5.1.3 Test setup (AC powerline)

The test is carried out in a shielded chamber. Table-top and portable devices are set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices are placed directly on the ground plane. In case of DC powered equipment, which is not exclusively powered by a battery, it is connected to the LISN via a suitable AC/DC adaptor. The setup of the equipment under test is in accordance to [1].

The frequency range 150 kHz to 30 MHz is measured with an EMI receiver set to MAX hold mode with Peak and Average detectors and a resolution bandwidth of 9 kHz. A scan is carried out on the phase and neutral line of the AC mains network. If emissions less than 10 dB below the appropriate limit are detected, these emissions are measured with an Average and Quasi-Peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz

5.1.3.1 Test setup (AC powerline) with AC/DC adapter



5.2 Duty cycle

5.2.1 Test setup (Duty cycle)

Test setup (Duty cycle)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.2.2 Test method (Duty cycle)

Test method (Duty cycle)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.6. a)	Diode detector	No limitation	
<input checked="" type="checkbox"/>	11.6. b)	Zero span	No limitation	

5.2.3 Test results (Duty cycle)

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD

Since the duty cycle variation is greater than $\pm 2\%$, no duty cycle correction for the following tests is permitted and the applicable alternative procedures for non-constant duty cycle were used in the following test cases.

Test equipment (please refer to chapter 6 for details)
1 - 2

5.3 Transmit Antenna Performance considerations

Test result (Transmit antenna requirements)			
Integral antenna	Antenna gain $\leq 6\text{dBi}$	Result	Comment
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Passed	No output power reduction necessary

5.4 DTS bandwidth

5.4.1 Test setup (DTS bandwidth)

Test setup (Duty cycle)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.4.2 Test method (DTS bandwidth)

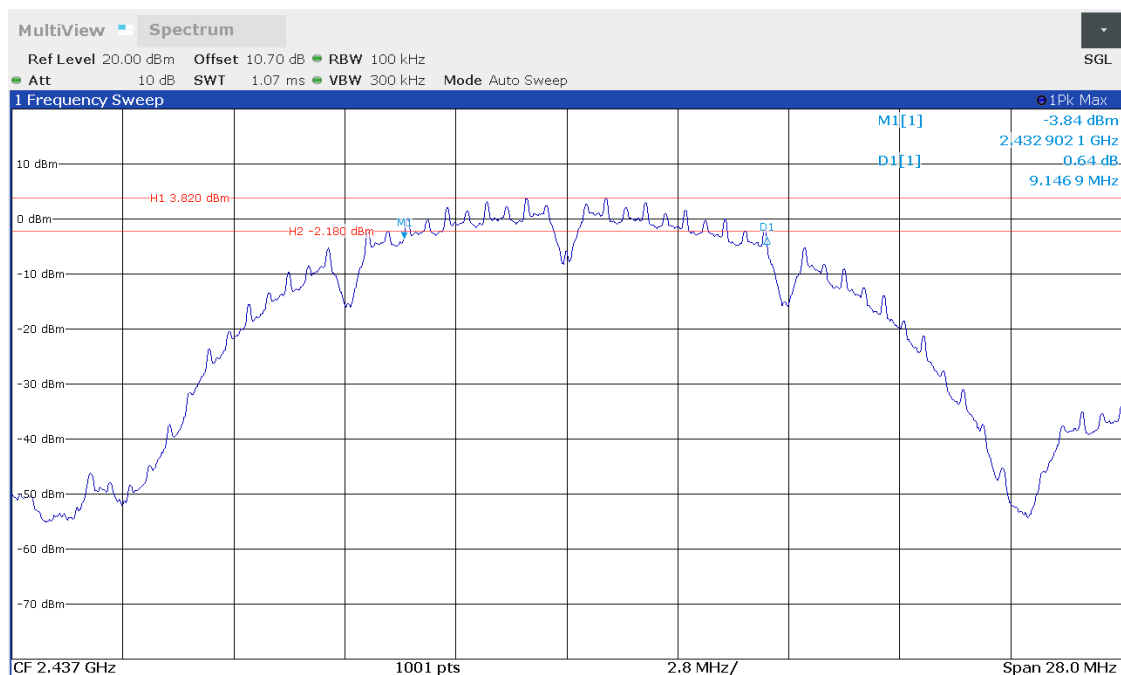
Test method (Maximum peak conducted output power)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input checked="" type="checkbox"/>	11.8.1	Option 1	No limitations	
<input type="checkbox"/>	11.8.2	Option 2	No limitations	6 dB down function

5.4.3 Test results (DTS bandwidth)

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD

Worst case plot (operation mode 2)



Operation mode #	DTS bandwidth [MHz]	Minimum DTS bandwidth Limit [MHz]	Result
1	9.622378	0.5	Passed
2	9.146853	0.5	Passed
3	9.594406	0.5	Passed
4	15.140859	0.5	Passed
5	15.140859	0.5	Passed
6	15.140859	0.5	Passed
7	15.140859	0.5	Passed
8	15.140859	0.5	Passed
9	15.140859	0.5	Passed
Measurement uncertainty: 9.0×10^{-8}			

Test equipment (please refer to chapter 6 for details)

1 - 2

5.5 Occupied bandwidth – power bandwidth (99%)

5.5.1 Test Setup (Occupied bandwidth – power bandwidth (99%))

Test setup (Occupied bandwidth – power bandwidth (99%))			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.5.2 Test method (Occupied bandwidth – power bandwidth (99%))

Test method (Maximum peak conducted output power)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	6.9.2	relative measurement procedure		n-dB down
<input checked="" type="checkbox"/>	6.9.3	power bandwidth (99%)	*1	99% power function

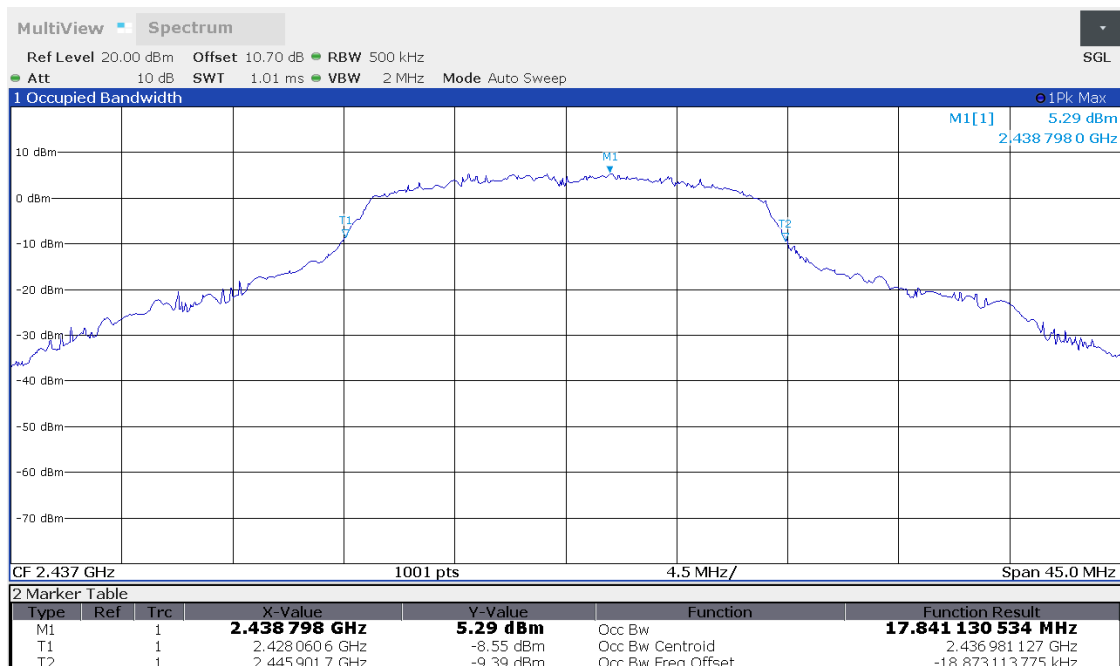
*1 See RSS-GEN Issue 5 (2018-05) sub-clause 6.7 for details.

5.5.3 Test results (Occupied bandwidth – power bandwidth (99%))

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD

Worst case plot (operation mode 5):



Operation mode #	99% bandwidth [MHz]
1	14.070180
2	14.107453
3	14.167100
4	17.405307
5	17.841131
6	17.450514
7	17.378382
8	18.509705
9	18.228415
Measurement uncertainty: 9.0×10^{-8}	

Test equipment (please refer to chapter 6 for details)
1 - 2

5.6 DTS fundamental emission output power

5.6.1 Test setup (DTS fundamental emission output power)

Test setup (DTS fundamental emission output power)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.6.2 Test method (DTS fundamental emission output power)

Test method (Maximum peak conducted output power)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.9.1.1	RBW \geq DTS bandwidth		
<input type="checkbox"/>	11.9.1.2	Integrated band power method	Not for DTS	
<input type="checkbox"/>	11.9.1.3	PKPM1 Peak power meter method*2		

*2 VBW of the peak power meter has to be $>$ OBW of the fundamental.

Test method (Maximum conducted (average) output power)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.9.2.2.2	Method AVGSA-1	$D \geq 98\%$	
<input type="checkbox"/>	11.9.2.2.3	Method AVGSA-1A (alternative)	$D \geq 98\%$	
<input type="checkbox"/>	11.9.2.2.4	Method AVGSA-2	Constant D ($\pm 2\%$)	
<input type="checkbox"/>	11.9.2.2.5	Method AVGSA-2A (alternative)	Constant D ($\pm 2\%$)	
<input checked="" type="checkbox"/>	11.9.2.2.6	Method AVGSA-3A		
<input type="checkbox"/>	11.9.2.2.7	Method AVGSA-3A (alternative)		
<input type="checkbox"/>	11.9.2.3.1	Method AVGPM	Constant D ($\pm 2\%$)	
<input type="checkbox"/>	11.9.2.3.2	Method AVGPM-G		

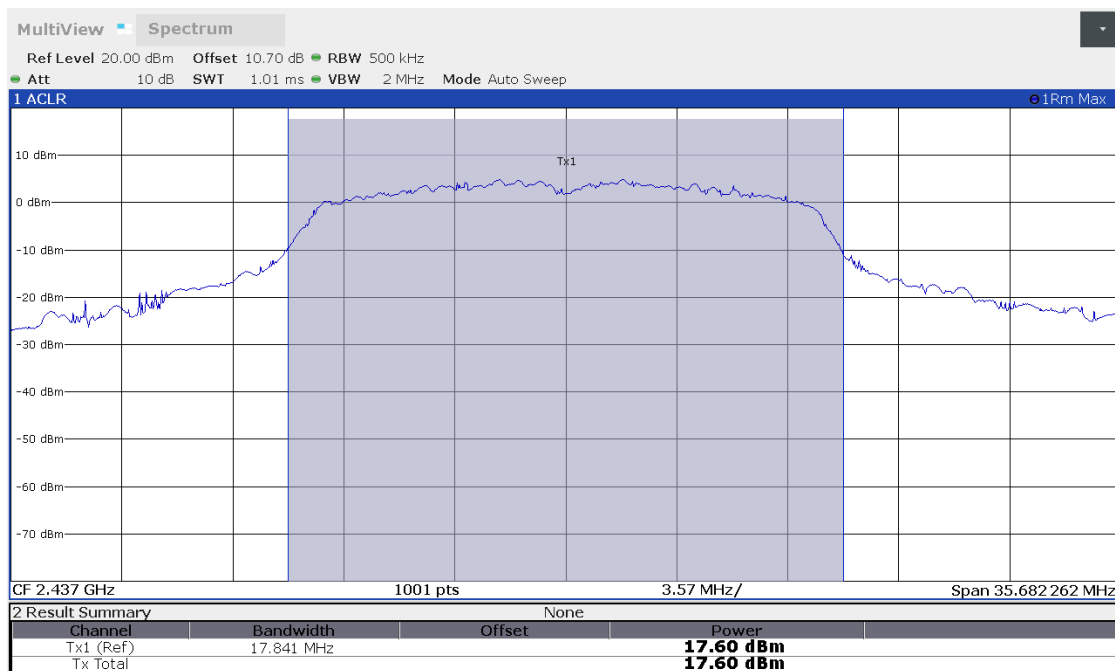
5.6.3 Test results (DTS fundamental emission output power)

Maximum conducted (average) output power

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD

Worst case plot (operation mode 5):



Operation mode	Reading [dBm]	Corr. Fact.* [dB]	DCCF [dB]	Result [dBm]	Limit [dBm]
1	14.8	0.0	0.0	14.8	30
2	16.2	0.0	0.0	16.2	30
3	16.3	0.0	0.0	16.3	30
4	14.5	0.0	0.0	14.5	30
5	17.6	0.0	0.0	17.6	30
7	15.8	0.0	0.0	15.8	30
8	14.3	0.0	0.0	14.3	30
9	16.7	0.0	0.0	16.7	30
11	14.8	0.0	0.0	14.8	30

Measurement uncertainty: +/- 2.3 dB

* The 10.7 dB correction for external attenuator and measurement cable is set as offset in the measurement / plot.

Test equipment (please refer to chapter 6 for details)
1 - 2

5.7 DTS maximum PSD level in the fundamental emission

5.7.1 Test setup (DTS maximum PSD level in the fundamental emission)

Test setup (DTS fundamental emission output power)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.7.2 Test method (DTS maximum PSD level in the fundamental emission)

Test method (Maximum <i>peak</i> power spectral density level in the fundamental emission)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.10.2	Method PKPSD (peak PSD)	No limitations	

Test method (Maximum <i>peak</i> power spectral density level in the fundamental emission)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.10.3	Method AVGPSD-1	$D \geq 98\%$	
<input type="checkbox"/>	11.10.4	Method AVGPSD-1A (alternative)	$D \geq 98\%$	
<input type="checkbox"/>	11.10.5	Method AVGPSD-2	Constant D ($\pm 2\%$)	
<input type="checkbox"/>	11.10.6	Method AVGPSD-2A (alternative)	Constant D ($\pm 2\%$)	
<input checked="" type="checkbox"/>	11.10.7	Method AVGPSD-3	No limitations	
<input type="checkbox"/>	11.10.8	Method AVGPSD-3A (alternative)	No limitations	

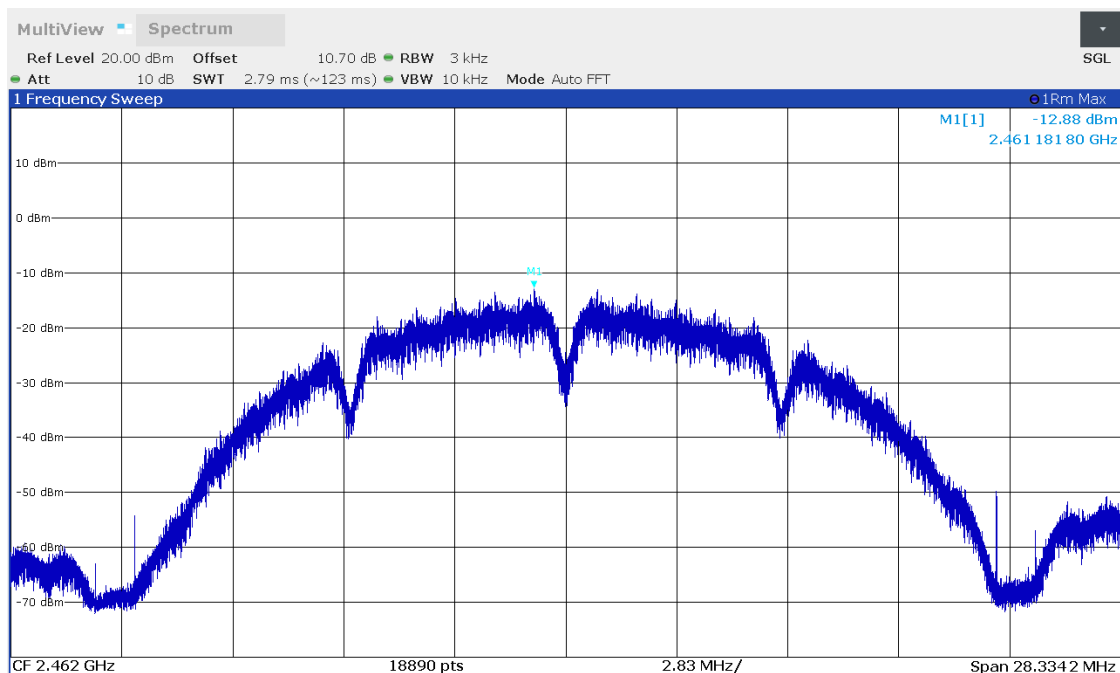
5.7.3 Test results (DTS maximum PSD level in the fundamental emission)

Maximum average PSD

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD

Worst case plot (operation mode 3):



Operation mode	Reading [dBm/3 kHz]	Corr. Fact. [dB]	DCCF [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]
1	-14.4	0.0	0.0	-14.4	8.0
2	-13.1	0.0	0.0	-13.1	8.0
3	-12.9	0.0	0.0	-12.9	8.0
4	-18.3	0.0	0.0	-18.3	8.0
5	-15.2	0.0	0.0	-15.2	8.0
6	-17.2	0.0	0.0	-17.2	8.0
7	-18.8	0.0	0.0	-18.8	8.0
8	-15.7	0.0	0.0	-15.7	8.0
9	-17.0	0.0	0.0	-17.0	8.0

Measurement uncertainty: +/- 2.3 dB

* The 10.7 dB correction for external attenuator and measurement cable is set as offset in the measurement / plot.

Test equipment (please refer to chapter 6 for details)
1 - 2

5.1 Band edge

5.1.1 Test setup (Band edge – unrestricted bands)

Test setup (Band edge – unrestricted bands)			
Used	Setup	See sub-clause	Comment
<input type="checkbox"/>	Test setup (radiated)	5.1.1	
<input checked="" type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.1.2 Test method (Band edge – unrestricted bands)

Test method (Band edge – unrestricted bands)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input type="checkbox"/>	11.11.	20 dBc (Peak)	Peak power	*1
<input checked="" type="checkbox"/>	11.11.	30 dBc (Average)	RMS power	*2

*1 As declared in “47 CFR 15.247(d)” In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits

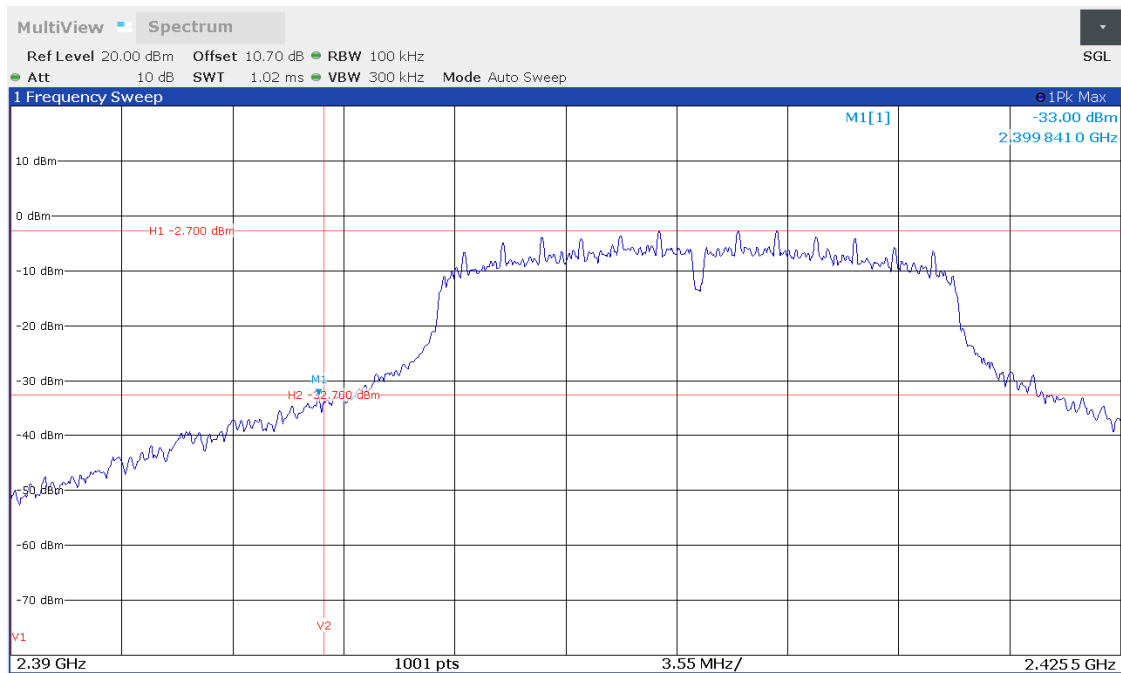
*2 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.1.3 Test results (Band edge – unrestricted bands)

Worst case plot Lower band edge (operation mode 4):

Ambient temperature:	22 °C
Relative humidity:	38 %

Date	01.10.2021
Tested by	P. NEUFELD



* The 10.7 dB correction for external attenuator and measurement cable is set as offset in the measurement / plot.

Lower band edge (operation mode 1):

Frequency [MHz]	Reference [dB μ V/m]	Limit [dB μ V/m]	Unrestricted band emission [dB μ V/m]	Margin [dB]	Result
2396.997	2.1	-27.9	-47.5	19.6	Passed
Measurement uncertainty +/- 5.1 dB					

Lower band edge (operation mode 4):

Frequency [MHz]	Reference [dB μ V/m]	Limit [dB μ V/m]	Unrestricted band emission [dB μ V/m]	Margin [dB]	Result
2399.841	-2.7	-32.7	-33.0	0.3	Passed
Measurement uncertainty +/- 5.1 dB					

Lower band edge (operation mode 8):

Frequency [MHz]	Reference [dB μ V/m]	Limit [dB μ V/m]	Unrestricted band emission [dB μ V/m]	Margin [dB]	Result
2399.841	-2.9	-32.9	-33.4	0.5	Passed
Measurement uncertainty +/- 5.1 dB					

Test equipment (please refer to chapter 6 for details)
1 - 2

5.1.4 Test setup (Band edge – restricted bands)

Test setup (Band edge – restricted bands)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Test setup (radiated)	5.1.1	
<input type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.1.5 Test method (Band edge – restricted bands)

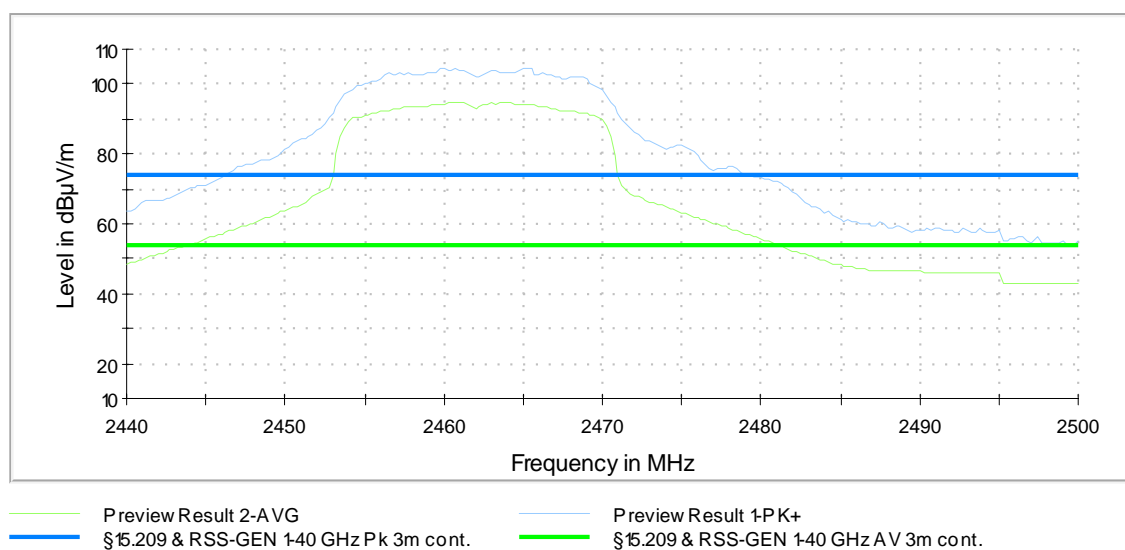
Test method (Band edge – restricted bands)				
Used	Sub-Clause [3]	Name of method	Applicability	Comment
<input checked="" type="checkbox"/>	11.13.1	Standard method	No limitations	
<input type="checkbox"/>	11.13.2	Marker-delta method		See 6.10.6 [3]
<input type="checkbox"/>	11.13.3.2	Peak detection	Not for DTS testing	2 MHz from band
<input type="checkbox"/>	11.13.3.3	Trace averaging with cont. EUT	D ≥ 98%	2 MHz from band
<input type="checkbox"/>	11.13.3.4	Trace averaging with cont. EUT & D	Constant D (±2%)	2 MHz from band
<input type="checkbox"/>	11.13.3.5	Reduced VBW		2 MHz from band

5.1.6 Test results (Band edge – restricted bands)

Ambient temperature:	22 °C
Relative humidity:	40 %

Date	04.10.2021
Tested by	P. NEUFELD

Worst case plot upper band edge (operation mode 6):



Only the worst-case emissions from the antenna port conducted pre-tests were repeated as radiated tests.

Lower band edge (operation mode 1):

Frequency [MHz]	Result Peak [dB μ V/m]	Result Average [dB μ V/m]	Limit [dB]	Margin [dB μ V]	Pol.	Azimuth [deg]	Elevation [deg]	Correction [dB/m]	Result
2390.000	---	39.48	54.0	14.5	H	114	30	35.2	Passed
2390.000	54.54	---	74.0	19.5	H	114	30	35.2	Passed
Measurement uncertainty				±4.8 dB					

Lower band edge (operation mode 4):

Frequency [MHz]	Result Peak [dB μ V/m]	Result Average [dB μ V/m]	Limit [dB]	Margin [dB μ V]	Pol.	Azimuth [deg]	Elevation [deg]	Correction [dB/m]	Result
2390.000	---	44.77	54.0	9.2	H	108	30	35.2	Passed
2390.000	63.05	---	74.0	11.0	H	108	30	35.2	Passed
Measurement uncertainty				±4.8 dB					

Upper band edge (operation mode 6):

Frequency [MHz]	Result Peak [dB μ V/m]	Result Average [dB μ V/m]	Limit [dB]	Margin [dB μ V]	Pol.	Azimuth [deg]	Elevation [deg]	Correction [dB/m]	Result
2483.5	---	50.24	54.0	4.8	H	124	30	35.4	Passed
2483.5	64.77	---	74.0	9.2	H	124	30	35.4	Passed
Measurement uncertainty				±4.8 dB					

Lower band edge (operation mode 7):

Frequency [MHz]	Result Peak [dB μ V/m]	Result Average [dB μ V/m]	Limit [dB]	Margin [dB μ V]	Pol.	Azimuth [deg]	Elevation [deg]	Correction [dB/m]	Result
2390.000	---	44.61	54.0	9.4	H	113	30	35.2	Passed
2390.000	63.35	---	74.0	10.6	H	113	30	35.2	Passed
Measurement uncertainty				±4.8 dB					

Test equipment (please refer to chapter 6 for details)
3 – 9, 11

5.2 Maximum unwanted emissions

5.2.1 Test setup (Maximum unwanted emissions)

Test setup (Maximum unwanted emissions)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Test setup (radiated)	5.1.1	
<input type="checkbox"/>	Test setup (antenna port conducted)	5.1.2	

5.2.2 Test method (Maximum unwanted emissions)

- Test method (radiated) see sub-clause 5.1.1 as described herein

5.2.3 Test results (Maximum unwanted emissions)

5.2.3.1 Test results (9 kHz – 30 MHz)

Ambient temperature:	22 °C
Relative humidity:	40 %

Date	14.10.2021
Tested by	P. NEUFELD

Position of EUT: For tests for f between 9 kHz to 30 MHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

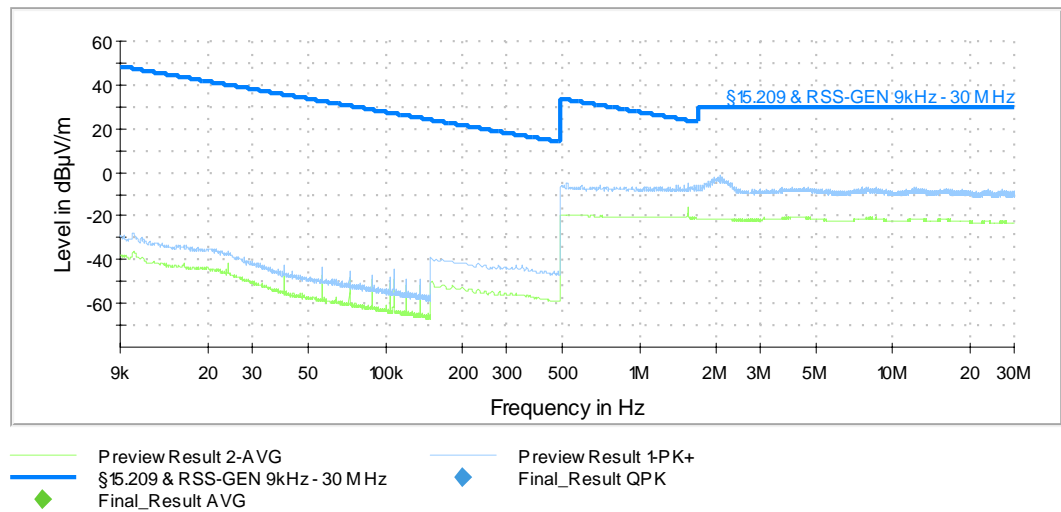
Test record: The measurement value was already corrected by 40 dB/decade as described in §15.31 (f) (2) regarding to the measurement distance as requested in §15.209

Remark: Result [dBµV/m] = Reading [dBµV] + Correction [dBµV/m]
 Correction [dBµV/m] = AF [dB/m] + Cable attenuation [dB] + distance correction factor [dB]
 Margin [dB] = Limit [dBµV/m] - Result [dBµV/m]
 All 3 orthogonal planes were tested separately

Since no differences occurred between the measurement results of all 3 orthogonal planes, radio channels and modulations, only one exemplary plot is submitted below.

5.2.3.1.1 Plots

5.2.3.1.1.1 (All operation modes):



5.2.3.1.2 Result tables

5.2.3.1.2.1 (All operation modes):

No final measurement done; no emission close than 20 dB to the limit.

Test equipment (please refer to chapter 6 for details)

3 - 9, 18

5.2.3.2 Test results (30 MHz – 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	40 %

Date	14.10.2021
Tested by	P. NEUFELD

Position of EUT: For tests for f between 30 MHz to 1 GHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

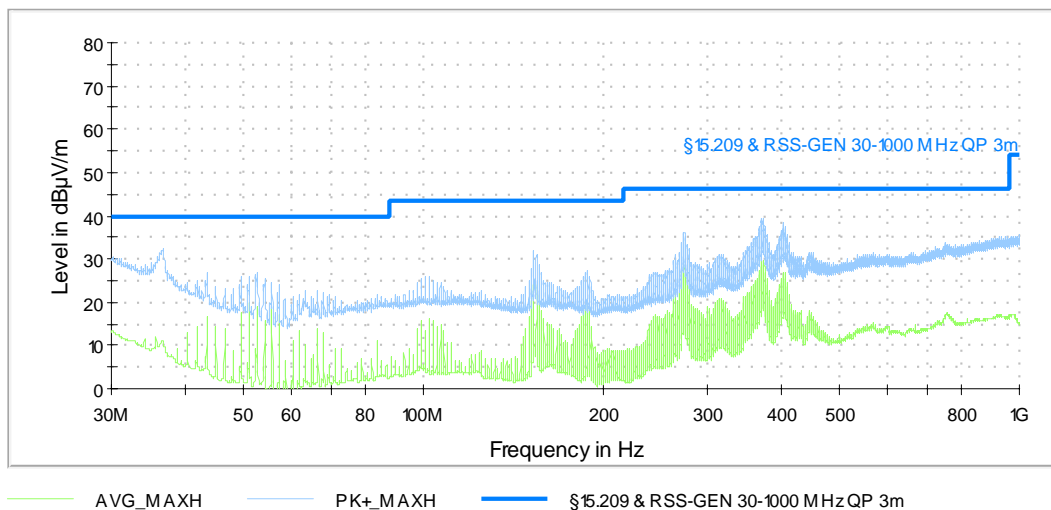
Test record: Plots for each frequency range are submitted below.

Remark: Result [dB μ V/m] = Reading [dB μ V] + Correction [dB μ V/m]
 Correction [dB μ V/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]
 Margin [dB] = Limit [dB μ V/m] - Result [dB μ V/m]
 All 3 orthogonal planes were tested separately

Since no differences occurred between the measurement results of all 3 orthogonal planes, radio channels and modulations, only one exemplary plot is submitted below.

5.2.3.2.1 Plots

5.2.3.2.1.1 (All operation modes):



5.2.3.2.2 Result tables

5.2.3.2.2.1 (All operation modes):

Frequency [MHz]	Result QP [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Pol.	Azimuth [deg]	Correction [dB/m]	Result
36.520	23.7	40.0	16.3	114.0	H	281	22.2	Passed
153.400	30.7	43.5	12.8	200.0	H	189	15.3	Passed
154.960	26.5	43.5	17.1	107.0	H	198	15.3	Passed
274.230	32.8	46.0	13.2	133.0	H	277	18.3	Passed
370.370	33.5	46.0	12.6	130.0	V	113	21.2	Passed
371.920	34.5	46.0	11.5	131.0	V	128	21.2	Passed
Measurement uncertainty				±4.8 dB				

Test equipment (please refer to chapter 6 for details)

3 - 9, 16 - 17

5.2.3.3 Test results (above 1 GHz)

Ambient temperature:	22 °C
Relative humidity:	30 %; 35 %

Date	04.10.2021; 05.10.2021; 15.10.2021; 21.10.2021
Tested by	P. NEUFELD

Position of EUT: For tests for f between 1 GHz and the 10th harmonic, the EUT was set-up on a positioner device with a height of 150 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Plots for each frequency range are submitted below.

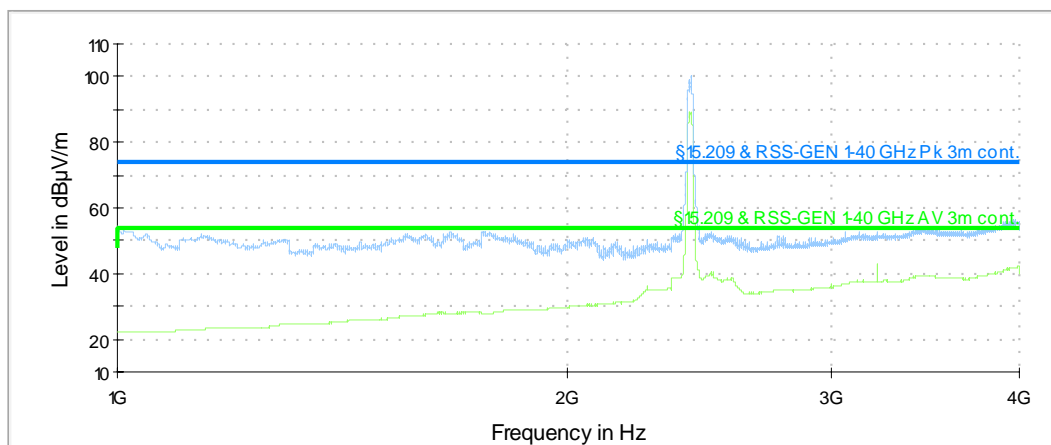
Remark: Max Peak [dB μ V/m] = Reading [dB μ V] + Correction [dB μ V/m]
 Average [dB μ V/m] = Reading [dB μ V] + Correction [dB μ V/m]
 Correction [dB μ V/m] = AF [dB/m] + Cable attenuation [dB] + optional preamp gain [dB]+DCCF [dB] (if applicable)
 Margin [dB] = Limit [dB μ V/m] – Max Peak // Average [dB μ V/m]

Only the worst-case emissions from the antenna port conducted pre-tests were tested as radiated tests. Since emissions @ 3.2 GHz were failed during the antenna-port conducted pre-tests, all modes were retested in the frequency range 1-4 GHz.

5.2.3.3.1 Plots

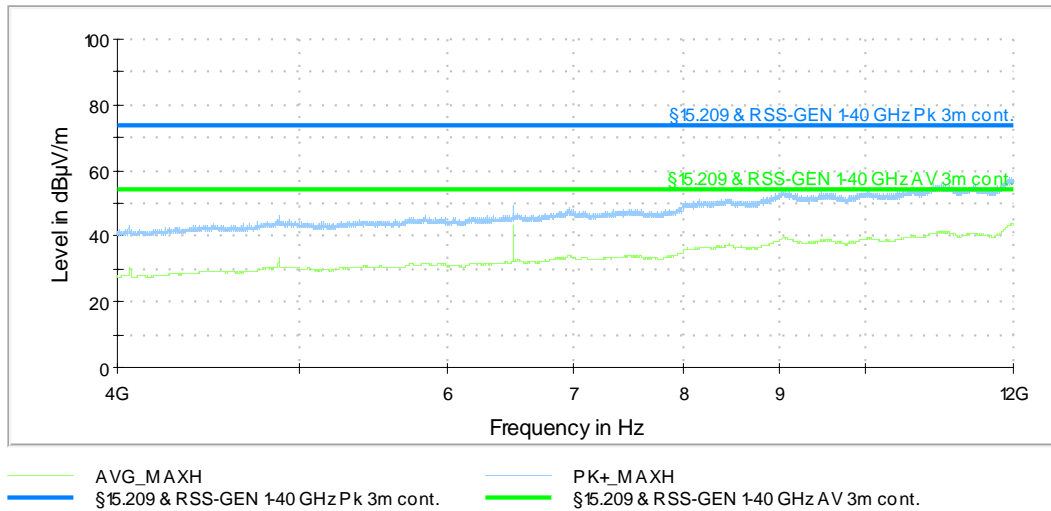
Only the plots from the worst-case emissions are submitted below.

Spurious emissions from 1 GHz to 4 GHz (operation mode 7):

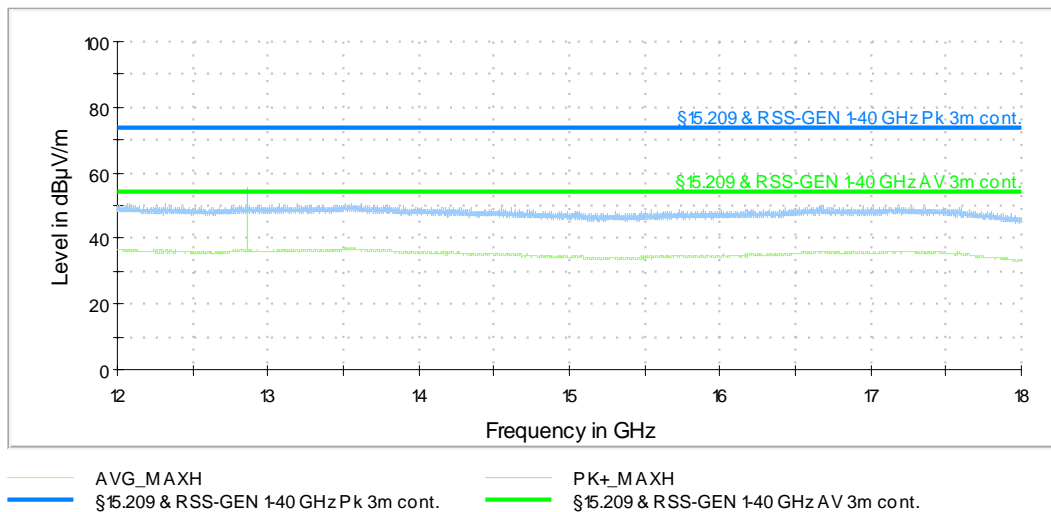


— Preview Result 2-AVG
— §15.209 & RSS-GEN 1-40 GHz Pk 3m cont.
— Preview Result 1-PK+
— §15.209 & RSS-GEN 1-40 GHz AV 3m cont.

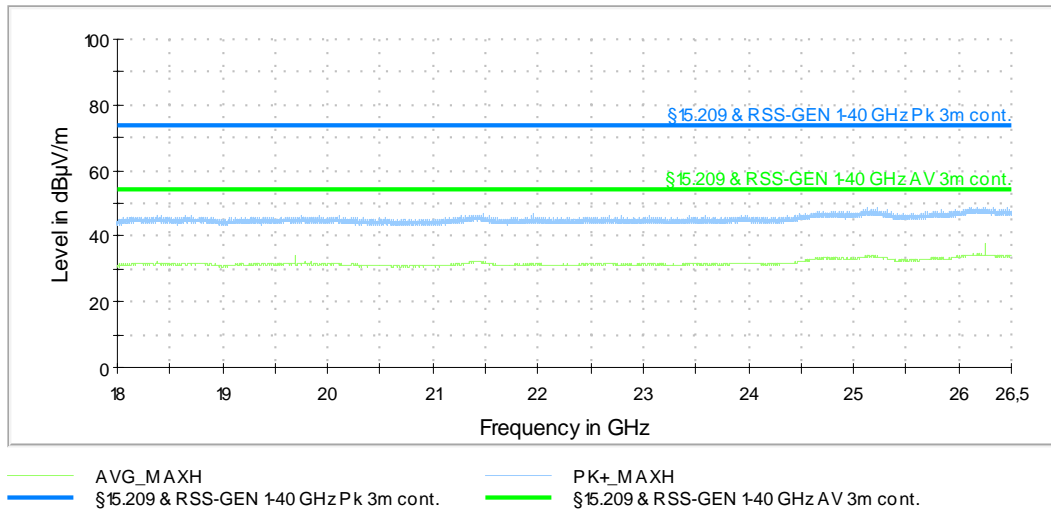
Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



Spurious emissions from 12 GHz to 18 GHz (operation mode 4):



Spurious emissions from 18 GHz to 26.5 GHz (operation mode 6):



5.2.3.3.2 Result tables

5.2.3.3.2.1 (operation mode 1):

Frequency [MHz]	MaxPeak [dBµV/m]	Average [dBµV/m]	Limit [dBµV/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2412.750	---	96.25	---	---	H	113	30	35.3	Fund.
2412.750	104.74	---	---	---	H	113	30	35.3	Fund.
3216.000	---	41.95	54.0	12.1	H	126	30	38.5	Passed
3216.000	53.20	---	74.0	20.8	H	126	30	38.5	Passed
4023.100	---	29.23	54.0	24.8	H	226	90	6.6	Passed
4023.100	42.02	---	74.0	32.0	H	226	90	6.6	Passed
4824.200	44.87	---	74.0	29.1	H	226	30	9.8	Passed
4824.200	---	30.96	54.0	23.0	H	226	30	9.8	Passed
6432.000	49.59	---	74.0	24.4	H	225	90	12.6	Passed
6432.000	---	42.62	54.0	11.4	H	225	90	12.6	Passed
12864.000	---	50.96	54.0	3.0	H	310	90	10.7	Passed
12864.000	56.00	---	74.0	18.0	H	310	90	10.7	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.2 (operation mode 2):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2437.750	---	98.55	---	---	H	125	30	35.4	Fund.
2437.750	107.03	---	---	---	H	125	30	35.4	Fund.
3249.250	---	39.58	54.0	14.4	H	267	150	38.7	Passed
3249.250	52.64	---	74.0	21.4	H	267	150	38.7	Passed
4062.450	42.20	---	74.0	31.8	H	251	90	6.6	Passed
4062.450	---	30.10	54.0	23.9	H	251	90	6.6	Passed
4874.200	45.61	---	74.0	28.4	H	314	90	9.9	Passed
4874.200	---	32.54	54.0	21.5	H	314	90	9.9	Passed
6498.650	---	44.40	54.0	9.6	H	224	90	12.9	Passed
6498.650	50.55	---	74.0	23.5	H	224	90	12.9	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.3 (operation mode 3):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2462.750	---	99.37	---	---	H	126	30	35.4	Fund.
2462.750	107.84	---	---	---	H	126	30	35.4	Fund.
3282.750	---	38.35	54.0	15.7	H	253	150	38.6	Passed
3282.750	52.04	---	74.0	22.0	H	253	150	38.6	Passed
4102.750	---	30.84	54.0	23.2	H	234	60	6.6	Passed
4102.750	42.95	---	74.0	31.1	H	234	60	6.6	Passed
4923.950	---	32.01	54.0	22.0	H	232	90	10.1	Passed
4923.950	44.92	---	74.0	29.1	H	232	90	10.1	Passed
6565.250	---	41.49	54.0	12.5	H	226	90	13.1	Passed
6565.250	49.83	---	74.0	24.2	H	226	90	13.1	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.4 (operation mode 4):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2411.000	---	92.39	---	---	H	124	30	35.3	Fund.
2411.000	101.99	---	---	---	H	137	30	38.5	Fund.
3216.000	---	42.04	54.0	12.0	H	137	30	38.5	Passed
3216.000	53.93	---	74.0	20.1	H	124	30	35.3	Passed
12864.000	---	51.77	54.0	2.2	H	318	90	10.7	Passed
12864.000	55.90	---	74.0	18.1	H	318	90	10.7	Passed
19296.500	---	33.97	54.0	20.0	H	205	90	8.9	Passed
19296.500	45.00	---	74.0	29.0	H	205	90	8.9	Passed
25727.500	---	36.77	54.0	17.2	V	255	120	10.0	Passed
25727.500	46.60	---	74.0	27.4	V	255	120	10.0	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.5 (operation mode 5):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2436.000	---	98.08	---	---	H	114	30	35.4	Fund.
2436.000	107.00	---	---	---	H	114	30	35.4	Fund.
3249.250	---	40.05	54.0	14.0	H	267	150	38.7	Passed
3249.250	52.50	---	74.0	21.5	H	267	150	38.7	Passed
12997.150	---	50.17	54.0	3.8	H	312	90	10.6	Passed
12997.150	54.70	---	74.0	19.3	H	312	90	10.6	Passed
19496.000	44.90	---	74.0	29.1	V	232	90	8.8	Passed
19496.000	---	35.87	54.0	18.1	V	232	90	8.8	Passed
25994.500	47.10	---	74.0	26.9	V	115	30	10.6	Passed
25994.500	---	38.77	54.0	15.2	V	115	30	10.6	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.6 (operation mode 6):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2461.000	---	97.16	---	---	H	124	30	35.4	Fund.
2461.000	106.53	---	---	---	H	124	30	35.4	Fund.
3282.750	---	38.80	54.0	15.2	H	256	30	38.6	Passed
3282.750	52.50	---	74.0	21.5	H	256	30	38.6	Passed
13130.550	---	47.07	54.0	6.9	H	313	90	10.7	Passed
13130.550	53.50	---	74.0	20.5	H	313	90	10.7	Passed
19696.000	---	37.37	54.0	16.6	H	205	90	8.7	Passed
19696.000	45.50	---	74.0	28.5	H	205	90	8.7	Passed
26261.250	---	39.17	54.0	14.8	V	246	150	10.8	Passed
26261.250	47.30	---	74.0	26.7	V	246	150	10.8	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.7 (operation mode 7):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2413.250	102.12	---	---	---	H	113	30	35.3	Fund.
2413.250	---	92.79	---	---	H	113	30	35.3	Fund.
3216.000	53.17	---	74.0	20.8	H	119	30	38.5	Passed
3216.000	---	42.55	54.0	11.4	H	119	30	38.5	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.8 (operation mode 8):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2438.250	---	97.81	---	---	H	115	30	35.4	Fund.
2438.250	106.98	---	---	---	H	115	30	35.4	Fund.
3249.250	---	39.91	54.0	14.1	H	273	150	38.7	Passed
3249.250	52.37	---	74.0	21.6	H	273	150	38.7	Passed
3994.750	---	42.64	54.0	11.4	V	290	150	41.0	Passed
3994.750	56.11	---	74.0	17.9	V	290	150	41.0	Passed
Measurement uncertainty					+/- 5.9 dB				

5.2.3.3.2.9 (operation mode 9):

Frequency [MHz]	MaxPeak [dB μ V/m]	Average [dB μ V/m]	Limit [dB μ V/m]	Margin (dB)	Pol	Azimuth [deg]	Elevation [deg]	Corr. [dB/m]	Comment
2463.250	---	95.17	---	---	H	123	30	35.4	Fund.
2463.250	104.66	---	---	---	H	123	30	35.4	Fund.
3282.750	---	38.40	54.0	15.6	H	85	150	38.6	Passed
3282.750	51.25	---	74.0	22.8	H	85	150	38.6	Passed
Measurement uncertainty					+/- 5.9 dB				

Test equipment (please refer to chapter 6 for details)
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5.3 Conducted emissions on power supply lines

5.3.1 Test setup (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)			
Used	Setup	See sub-clause	Comment
<input checked="" type="checkbox"/>	Test setup (AC power line conducted)	5.1.3	
<input type="checkbox"/>	Not applicable, because ...	-	

5.3.2 Test method (Conducted emissions on power supply lines)

Test setup (Conducted emissions on power supply lines)				
Used	Clause [3]	Name of method	Sub-clause	Comment
<input checked="" type="checkbox"/>	6.2.3.2	Tabletop equipment testing	5.1.3.1	Provided AC switching power adaptor
<input type="checkbox"/>	6.2.3.3	Floor-standing equipment testing		

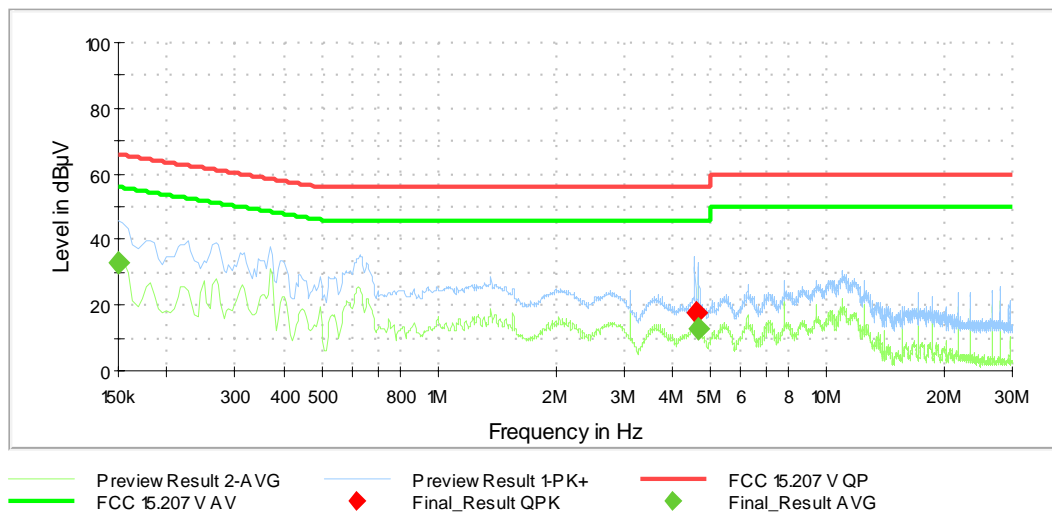
Since the applicant does not provide an AC/DC power supply with the radio module, a representative AC/DC power supply from the laboratory was used for the test. See 1.5.1 for details.

5.3.3 Test results (Conducted emissions on power supply lines)

Ambient temperature:	23 °C
Relative humidity:	34 %

Date:	25.10.2021
Tested by:	P. NEUFELD

Plot (operation mode 5):



Frequency in MHz	QuasiPeak in dB(µV)	Average in dB(µV)	Limit in dB(µV)	Margin in dB	Meas. Time in ms	Bandwidth in kHz	Line	PE	Corr. in dB
0.150000	---	32.94	56.00	23.06	5000.0	9.000	L1	GND	9.8
4.597800	17.55	---	56.00	38.45	5000.0	9.000	N	GND	10.3
4.674300	---	13.07	46.00	32.93	5000.0	9.000	N	GND	10.3
Measurement uncertainty						+/- 2.8 dB			

Test result: Passed

Test equipment (please refer to chapter 6 for details)
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6 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Signal & Spectrum Analyzer	FSW43	Rohde & Schwarz	100586 & 100926	481720	30.03.2021	03.2023
2	Attenuator	WA54-10-12	Weinschel	-	481618	Calibration not necessary	
3	RF Switch Matrix	OSP220	Rohde & Schwarz		482976	Calibration not necessary	
4	Turntable	TT3.0-3t	Maturo	825/2612/.01	483224	Calibration not necessary	
5	Antenna support	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	Semi Anechoic Chamber M276	SAC5-2	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
8	Measuring software EMC32 M276	EMC32	Rohde & Schwarz	100970	482972	Calibration not necessary	
9	EMI Test receiver	ESW44	Rohde & Schwarz	101828	482979	14.11.2019	11.2021
10	Low Noise Amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2020	02.2022
11	Log.-Per. antenna	HL050	Rohde & Schwarz	100908	482977	13.08.2019	08.2022
12	Low Noise Amplifier 12 GHz - 18 GHz	LNA-30-12001800-13-10P	Narda-Miteq	2089798	482968	Calibration not necessary	
13	Standard Gain Horn 20 dB, 12 GHz-18 GHz	18240-20	Flann	267220	483025	Calibration not necessary	
14	Low Noise Amplifier 18 GHz - 26.5 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	482969	17.02.2020	02.2022
15	Standard Gain Horn 20 dB, 18 GHz -26 GHz	20240-20	Flann	266399	483026	Calibration not necessary	
16	Attenuator 6 dB	WA2-6	Weinschel		482793	Calibration not necessary	
17	Ultralog Antenna	HL562E	Rohde & Schwarz	101079	482978	18.03.2021	03.2024
18	Loop antenna	HFH2-Z2	Rohde & Schwarz	100417	481912	25.02.2021	02.2022
19	LISN	NSLK8128	Schwarzbeck	8128155	480058	11.02.2020	02.2022
20	Power supply AC	AC6803A AC	Keysight	JPVJ002509	482350	Calibration not necessary	
21	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
22	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
23	EMI Receiver / Spectrum Analyser	ESIB 26	Rohde & Schwarz	100292	481182	12.02.2020	02.2022
24	Transient Filter Limiter	CFL 9206A	Teseq	38268	481982	12.02.2020	02.2022
25	High-pass filter	WHKX4.0/18G-8SS	Wainwright Instruments	1	480587	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/RSM	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	03.03.2021	02.03.2023
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	25.02.2021	24.02.2023
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	12.05.2020	11.05.2022

8 Report History

Report Number	Date	Comment
F211717E1	09.11.2021	Initial Test Report
-	-	-
-	-	-

9 List of Annexes

Annex A	Test Setup Photos	13 pages
Annex B	External Photos	2 pages
Annex C	Internal Photo	1 page