

Report:	Electromagnetic compatibility and Radio spectrum Matters		Report no:	21CH-01312.R22 *
Product:	XC Tracer Maxx II			
Applicant:	XC Tracer GmbH, Junkerngasse 53, 3011 Bern, SWITZERLAND			
Manufacturer:	XC Tracer GmbH, Junkerngasse 53, 3011 Bern, SWITZERLAND			
Model/Type reference:	XC Tracer Maxx II	Serial no:	2000C8, 2000C9	
Trade mark:	XC Tracer	Date of tests:	2022-04-12 to 2022-09-21	

* Replaces report 21CH-01312.R12

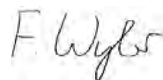
Standards		Result
A47 CFR, Part 15	(Subpart C, Intentional radiators: §§ 15.209/247)	Pass
	(Subpart B, Class B digital devices: §§ 15.107/109)	Pass

These results were achieved without any hardware modification of the EUT.

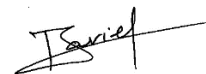
Test performed by
F. Wyler
EMC Test Engineer



Report prepared by
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EMC Test Engineer



Report controlled and approved by
T. Houriet
EMC Test Engineer



Rossens, 2023-06-05

(Issue Date)

Main language : English

The present document results from tests on one specimen and does not prejudice to the conformity of all the manufactured products.
This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.
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Foreword

The EUT contains the BLE module «U-BLOX ANNA-B112» with FCC ID: XPYANNAB1. The radio module which is included in the EUT has been tested by its manufacturer in accordance with the relevant rules and standards. Therefore these tests have not been carried out again. According to XC Tracer GmbH, this BLE radio module is installed in accordance with the instructions of its manufacturer.

The radio service FLARM and LoRa use the same radio module «Murata 1SJ-295». Only one radio service can be active at once, as the same internal amplifier is used. The FLARM and LoRa mode has been measured completely.

The XC-Tracer Maxx II devices communicate among each other based on LoRa transmission packets. However the channel frequencies used are different. In LoRa mode, the Murata module is only accredited for the frequency range from 902 – 915 MHz. As the full frequency range from 902-928 MHz was needed, the LoRa mode has been measured completely too.

In 2022-05-11 a firmware change was necessary to correct the number of hopping channels for the FLARM radio service.

The LoRa module «Murata 1SJ-295» has the FCC ID: VPYLB0QB1SJ for the frequency range 902-915 MHz
According Murata the Modules 1SJ-295 and 1SJ-296 have identical hardware.

Report Updates:

Report 21CH-01312.R02: Contains only the fully measurements for the FLARM mode.

Report 21CH-01312.R12: The complete measurement for LoRa mode with frequency range 902-928 MHz has been added.

Report 21CH-01312.R22: The antenna gain has been adapted to the XC-Tracer Maxx II Antenna report

1. Summary of test results

1.1 Mode FLARM (47 CFR Part 15.247)

§	Test Type	Result
6	Emission	CFR 47 Part 15
6.1	Channel 20dB-bandwidth CFR 47 § 15.247 (a)(1)	204 kHz
6.1.2	Carrier frequency separation CFR 47 § 15.247 (a)(1)	Pass (400 kHz)
6.1.3	Number of hopping channels CFR 47 § 15.247 (a)(1)(iii)	Pass (n = 63)
6.1.4	Time of occupancy (dwell time) CFR 47 § 15.247 (a)(1)(iii)	Pass
6.1.5	Pseudorandom frequency hopping sequence and equal hopping frequency use CFR 47 § 15.247 (a)(1)	Pass ¹
6.1.6	Antenna gain (& effective radiated power) CFR 47 § 15.247 (b)(4)	Pass (3.6 dBi)
6.1.7	Maximum output power (conducted) CFR 47 § 15.247 (b)(1)	Pass (16.8 dBm)
6.1.8	Band-edge emission (conducted) CFR 47 § 15.247 (d)	Pass
6.1.9	Spurious emissions – conducted (transmitter) CFR 47 § 15.247 (d)	Pass
6.1.10	Spurious emissions – radiated (transmitter) CFR 47 § 15.247 (d) CFR 47 § 15.209 (a) CFR 47 § 15.205	Pass
6.1.11	Radiated emission – receiver CFR 47 § 15.109	Pass
6.3	Conducted emission CFR 47 § 15.207	Pass ²
6	Emission	CFR 47 Part 2
6.4	Designation of emission FCC 47 § 2.201 FCC 47 § 2.202	200KFXD

1. Declared by manufacturer
2. Tested in mode charging (in charging mode there is no radio service possible)

1.2 Mode LoRa (47 CFR Part 15.247)

§	Test Type	Result
6	Emission	CFR 47 Part 15
6.2.1	Antenna requirement CFR 47 § 15.203	Pass
6.2.2	Channel 6 dB Bandwidth CFR 47 § 15.247 (a)	Pass
6.2.3	Duty Cycle CFR 47 § 15.247 (a)(1)(iii)	Pass
6.2.4	Maximum output power (conducted) CFR 47 § 15.247 (b)	Pass (16.8 dBm)
6.2.5	Band-edge emission (conducted) CFR 47 § 15.247 (d)	Pass
6.2.6	Power spectral density – conducted (transmitter) CFR 47 § 15.247 (e)	Pass
6.2.7	Spurious emissions – radiated (transmitter) CFR 47 § 15.247 (d) CFR 47 § 15.209 (a) CFR 47 § 15.205	Pass
6.2.8	Radiated emission – receiver CFR 47 § 15.109	Pass
6.3	Conducted emission CFR 47 § 15.207	Pass ²

1. Tested in mode FLARM
2. Tested in mode charging (in charging mode there is no radio service possible)

2. Applied standards

47 CFR Part 15 Subpart C	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart C: "Intentional Radiators"
47 CFR Part 15 Subpart B	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart B: "Unintentional Radiators"

3. Applicant

Applicant name and address	XC Tracer GmbH Junkerngasse 53 3011 Bern SWITZERLAND
Contact Person	Mr Koni Schafroth
Telephone	+41 79 478 64 14
E-mail	info@xctracer.com

4. Equipment under test

4.1 Identification*

Manufacturer name and address	XC Tracer GmbH Junkerngasse 53 3011 Bern SWITZERLAND
Production country	Switzerland
Brand name	XC Tracer
Product	XC Tracer Maxx II
Product description	Flight instrument for Paragliders & Hanggliders
Model number	XC Tracer Maxx II
Serial no	2000C8, 2000C9
Software version	maxxii_radio_firmware_20220412_0_9_7.efw (FLARM) and maxxii_radio_firmware_20220511_0_9_16.efw (LoRa)
FCC ID	2AVOQ02
Lowest Frequency considered	20 kHz (charge pump for LED driver)
Highest frequency considered	48 MHz (CPU) / 927.4 MHz (FLARM Transmitter carrier)
Supply	U = 3.7 VDC / I = 30 mA (from Battery) U = 5 VDC / I _{max} = 0.5 A (for charging the Battery on USB port)
Dimension	~ 9.5 cm x 2 cm x 7 cm (l x w x h)
Weight	~ 0.12 kg
Technical	None. The equipment is completely identified by the above-mentioned information. XC Tracer GmbH assures the traceability of the documentation and is responsible for the product identification.

* According to information provided by XC Tracer GmbH and not verified by Eurofins Electric & Electronic Product Testing AG

4.2 Pictures of the EUT



Front view



Rear view



Marking

Intentionally empty



EUT2 with temporary antenna connector



EUT2 Marking

4.3 Classification

CFR 47 Part 15	☒ Unintentional radiator (Subpart B), Receive and charging modes ☐ Class A digital device ☒ Class B digital device ☒ The highest frequency of the internal sources of the EUT is less than 108 MHz (measurement shall be made up to 1 GHz). ☐ The highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz (measurement shall be made up to 2 GHz). ☐ The highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz (measurement shall be made up to 5 GHz). ☐ The highest frequency of the internal sources of the EUT is above 1 GHz (measurement shall be made up to 5 times the highest frequency or 40 GHz, whichever is lower). ☒ Intentional radiator (Subpart C), Transmit mode ☒ The highest fundamental frequency of the EUT is less than 10 GHz (measurement shall be made up to the tenth harmonic or 40 GHz, whichever is lower). ☐ The highest fundamental frequency of the EUT is between 10 GHz and 30 GHz (measurement shall be made up to the fifth harmonic or 100 GHz, whichever is lower). ☐ The highest fundamental frequency of the EUT is above 30 GHz (measurement shall be made up to the fifth harmonic or 200 GHz, whichever is lower).
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4.4 Transmitter characteristics (according to XC Tracer GmbH)

Mode FLARM

Method of frequency generation	☒ Crystal
Transmitter operating frequency range (OFR) The OFR is the total range of frequencies covered by one type, or by a family of equipment. It is noted that a family of equipment may be capable of covering a wider frequency range than the alignment frequency range of one type of equipment.	902.6 MHz to 927.4 MHz
Channel separation (if applicable)	0.400 MHz
Number of channels	63
Maximum rated output power	16.8 dBm (at transmitter temporary RF output connector)
Variable carrier output	☒ Transmitter carrier output is not variable. RF output: $P_{OUT} = 34.6 \text{ mW}$ ☐ Transmitter carrier output is variable. Max. RF output: $P_{OUT \text{ MAX}} = \dots \text{ mW}$ Min. RF output: $P_{OUT \text{ MIN}} = \dots \text{ mW}$ ☐ RF output continuously variable ☐ RF output stepped: 1 dB per step
Modulation	☐ Amplitude ☐ Frequency: Deviation kHz ☐ Phase ☐ Pulse Pulse repetition frequency Duty cycle ☒ Other FSK
	☒ Transmitter can be operated without modulation ☐ Transmitter can only be operated with modulation

Mode LoRa

Method of frequency generation	☒ Crystal
Transmitter operating frequency range (OFR) The OFR is the total range of frequencies covered by one type, or by a family of equipment. It is noted that a family of equipment may be capable of covering a wider frequency range than the alignment frequency range of one type of equipment.	903 MHz to 927 MHz
Channel separation (if applicable)	0.200 MHz
Number of channels	121
Maximum rated output power	16.76 dBm (at transmitter temporary RF output connector)
Variable carrier output	☒ Transmitter carrier output is not variable.
Modulation	☒ Other LoRa (500 kHz)
	☐ Transmitter can be operated without modulation ☒ Transmitter can only be operated with modulation

4.5 Receiver characteristics (according to XC Tracer GmbH)

Mode FLARM

Receiver operating frequency range	902.6 MHz to 927.4 MHz
Channel separation (if applicable)	0.400 MHz
Number of channels	63

Mode LoRa

Receiver operating frequency range	903 MHz to 927 MHz
Channel separation (if applicable)	0.200 MHz
Number of channels	121

4.6 Antenna specifications (according to XC Tracer GmbH)

The EUT uses an internal PCB antenna. It is specified in the XC-Tracer Maxx II Antenna report.

Antenna for FLARM and LoRa

Model No. of antenna: XC_Tracer_Maxx_R01_Antenna_2020-01-14

Type of antenna: PCB antenna soldered directly to the main PCB

Peak Gain of the antenna: 3.6 dBi

Frequency range: 866-930 MHz

The mounting of the antenna is fixed to the radio module and no other antenna should be used.

4.7 Ports

Port	Cable			Remark
	Max. length	Type	Screen	
USB	2 m (≤ 3 m)	USB C	Yes	EUT not intended to transmit when USB cable is connected. EUT switches to charging mode when USB cable is connected

5. Test conditions

5.1 Climatic conditions, location and date

Location	Date	Temp.	Pressure	Rel. humidity
Eurofins Electric & Electronic Product Testing AG 1728 Rossens SWITZERLAND	2022-04-12 to 2022-09-21	See § 6		

5.2 Test facility and methodology

The test site is accepted by FCC:
 - Test Firm Registration Number: 683197
 - Designation Number: CH5001

Conducted and radiated measurements are performed according to the ANSI C63.4-2014 and C63.10-2013 procedures.

5.3 Attendant persons

Test Engineer(s):

Mr F. Wyler
 EMC Test Engineer

Other(s):

Name	Company
Mr Koni Schafroth	XC Tracer GmbH

5.4 Test configuration

See set-up drawings and pictures in relevant test paragraph

5.5 Operating conditions

Powered by Battery 3.7 VDC if not stated otherwise in § 6

Mode FLARM, Power setting 18 dBm

- Continuous hopping transmission of random data on sixtythree frequencies
- Normal operation: transmission of random data with hopping sequence
- Continuous reception on single frequency
- Continuous transmission of random data on one frequency, Duty cycle 11% (for measurement purposes only)

Mode LoRa, Power setting 18 dBm:

- Continuous reception on single frequency
- Continuous transmission of random data on one frequency, Duty cycle 17% (for measurement purposes only)

Normal Operation (according to XC Tracer GmbH)

- Usage of frequency band is software controlled to 1 %. Every second one FLARM package is transmitted with a duration of around 5 msec. Every few seconds one LoRa package is transmitted with a duration of 20-30 msec.

5.6 Auxiliary equipment

The following equipment is used for the monitoring of the EUT or is necessary for the EUT but is not part of the EUT

Product	Brand	Model No.	ID	Remark
AC – USB adaptor	Apple	A2164	Reference	100 – 240 V _{AC} input, 5 V _{DC} output (USB). Used for conducted tests in charging mode
AC – USB adaptor	Apple	W010A051	Reference Eurofins	100 – 240 V _{AC} input, 5 V _{DC} output (USB). Used for radiated tests in charging mode



AC – USB adaptor
used for conducted tests in charging mode



Marking on AC - USB adaptor



AC – USB adaptor
used for radiated tests in charging mode



Marking on AC - USB adaptor

6. Test results

6.1 Mode FLARM**6.1.1 Channel 20dB-bandwidth**

Introduction: Channel-bandwidth measured at -20 dBc.

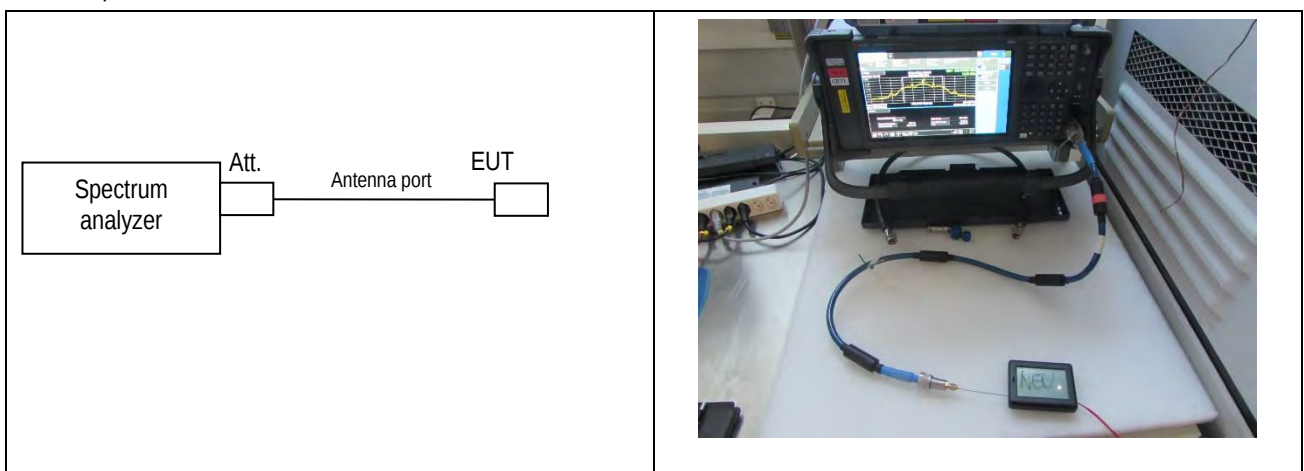
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Method: Measurement on the temporary antenna connector

Limit: - - -

Test set-up:



Remarks: - - -

Test equipment:

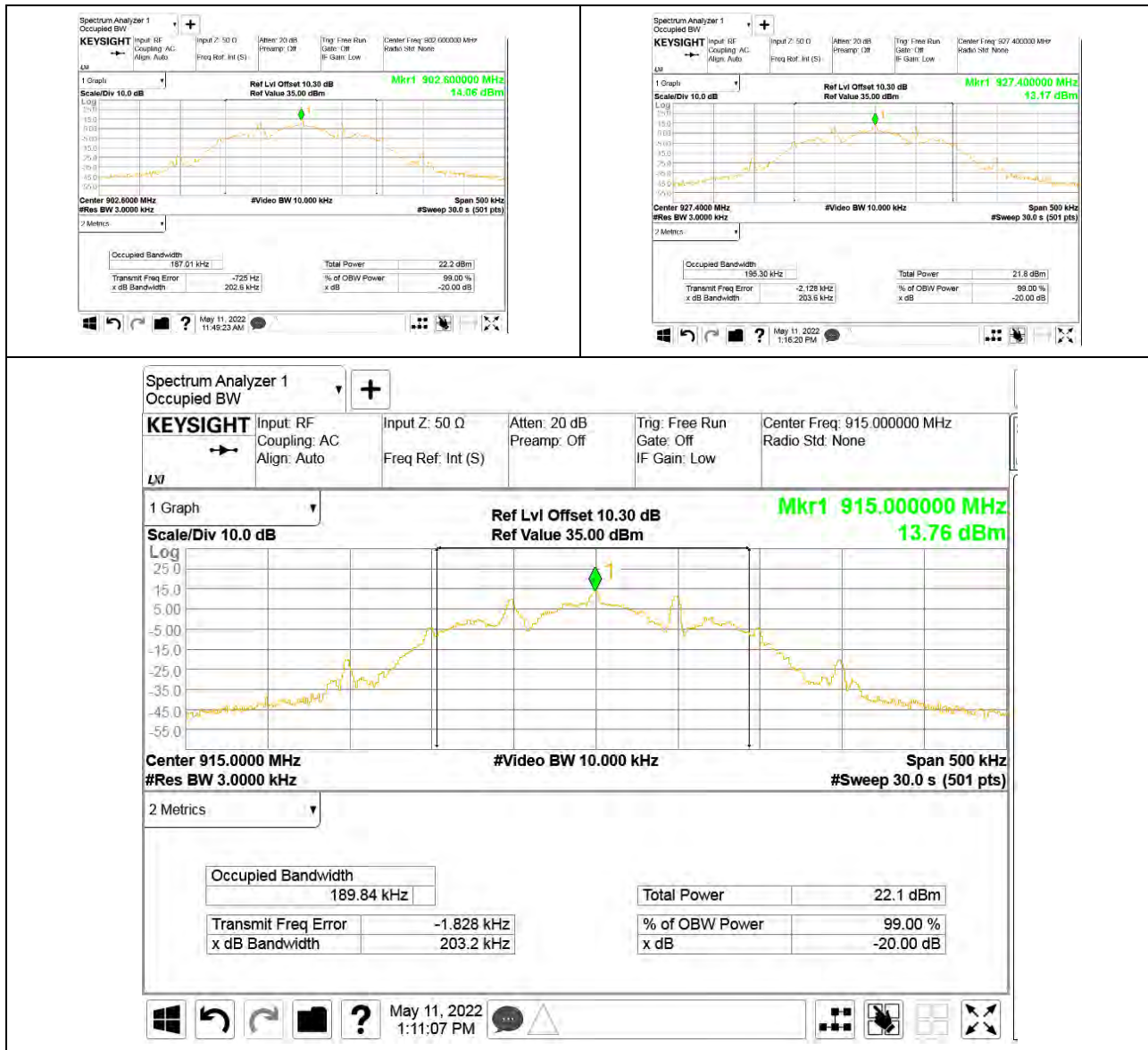
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C9)
 Operating mode: TX, f = 902.6 / 915.0 / 927.4 MHz, modulated, power setting 18 dBm
 Cables connected to the EUT: Temporary antenna cable
 Remarks: Measured on temporary antenna connector
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
 Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

902.6	203	---
915.0	203	---
927.4	204	---



Place and date of test:
 Operator:

Rossens, 2022-05-11
 F. Wyler

6.1.2 Carrier frequency separation

Introduction: Determination of the frequency separation of two adjacent channels.

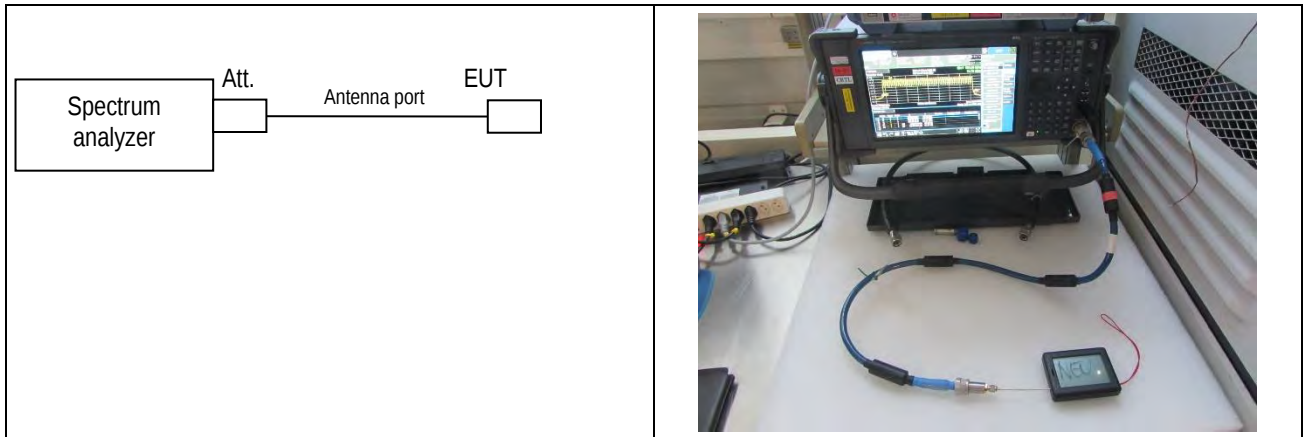
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: $\pm 2.6 \mu\text{Hz/Hz}$

Method: Measurement of the frequency separation on the temporary antenna connector.

Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx II (ID: 2000C9)

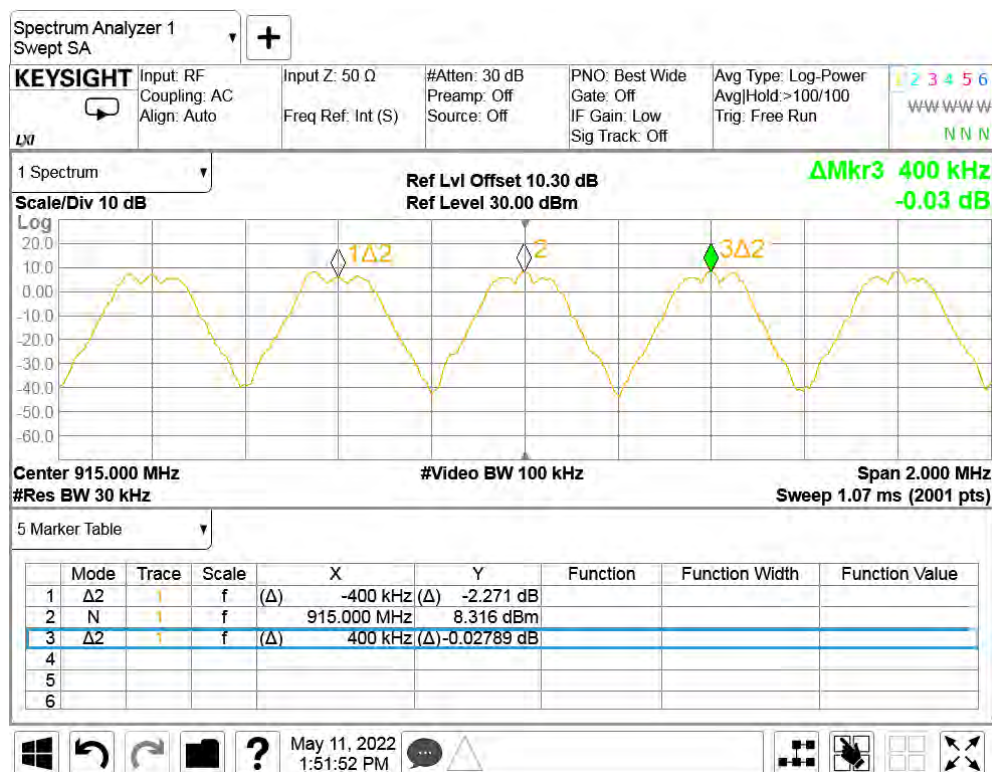
Operating mode: Continuously hopping on all channels, power setting 18 dBm

Cables connected to the EUT: Temporary antenna cable

Remarks: Measured on temporary antenna connector

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

Carrier frequency separation = 400 kHz > 204 kHz (see § 6.1)Place and date of test:
Operator:Rossens, 2022-05-11
F. Wyler

6.1.3 Number of hopping channels

Introduction: Number of hopping channels used in the frequency hopping system.

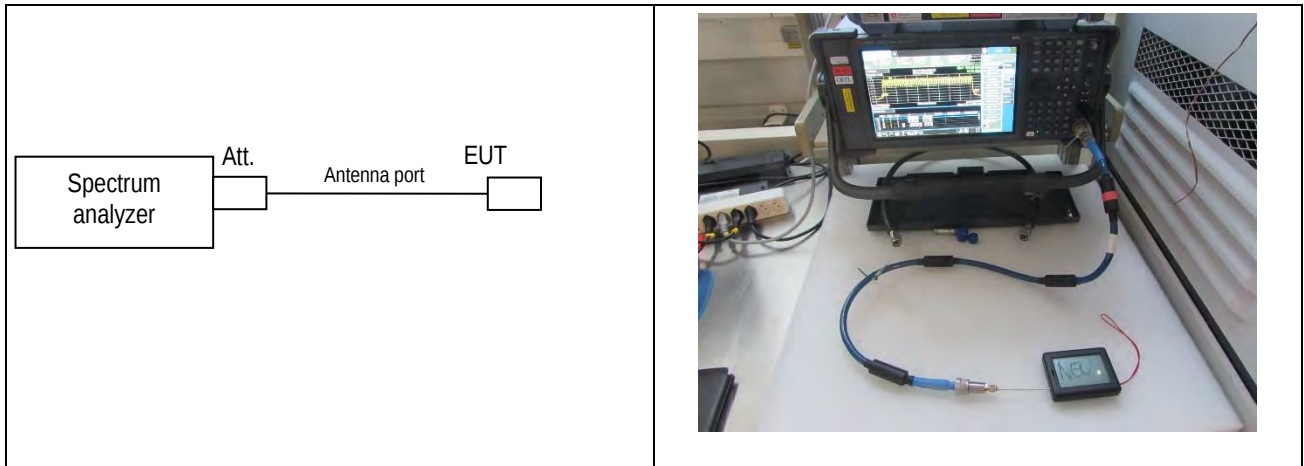
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: $\pm 2.6 \mu\text{Hz/Hz}$

Method: Measurement of the frequency separation on the temporary antenna connector.

Requirement: For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx II (ID: 2000C9)

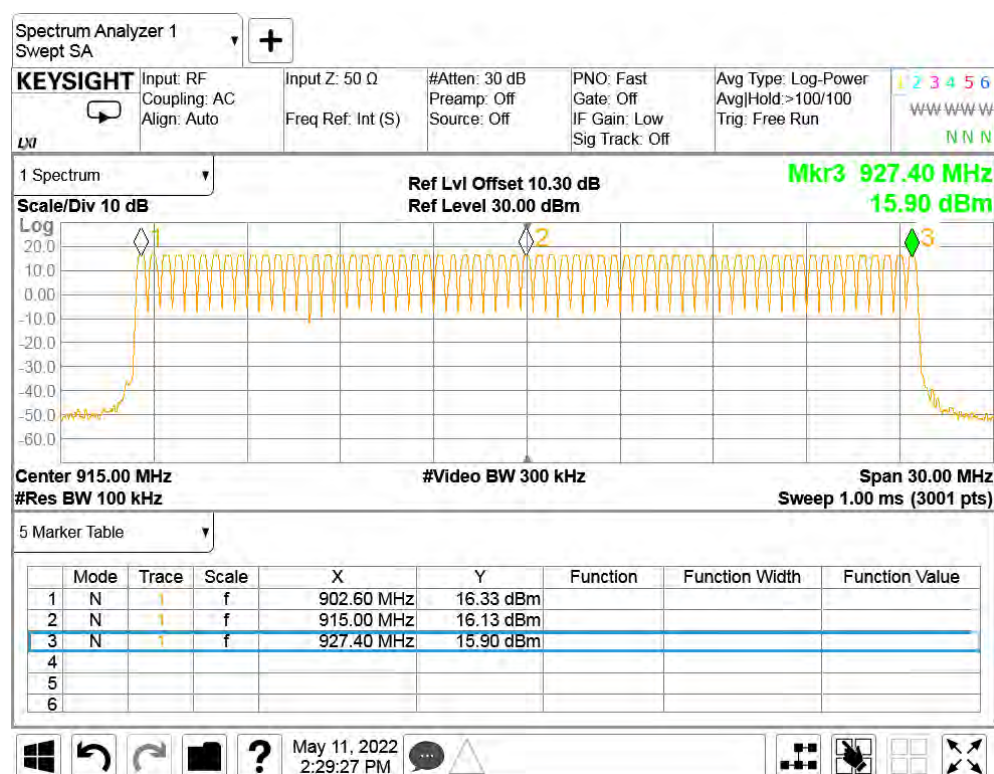
Operating mode: Continuously hopping on all channels, power setting 18 dBm

Cables connected to the EUT: Temporary antenna cable

Remarks: Measured on temporary antenna connector

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa



Number of hopping channels = 63 > 50

Place and date of test:
Operator:

Rossens, 2022-05-11
F. Wyler

6.1.4 Time of occupancy (dwell time)

Introduction: Average duration during which the system stays on one channel.

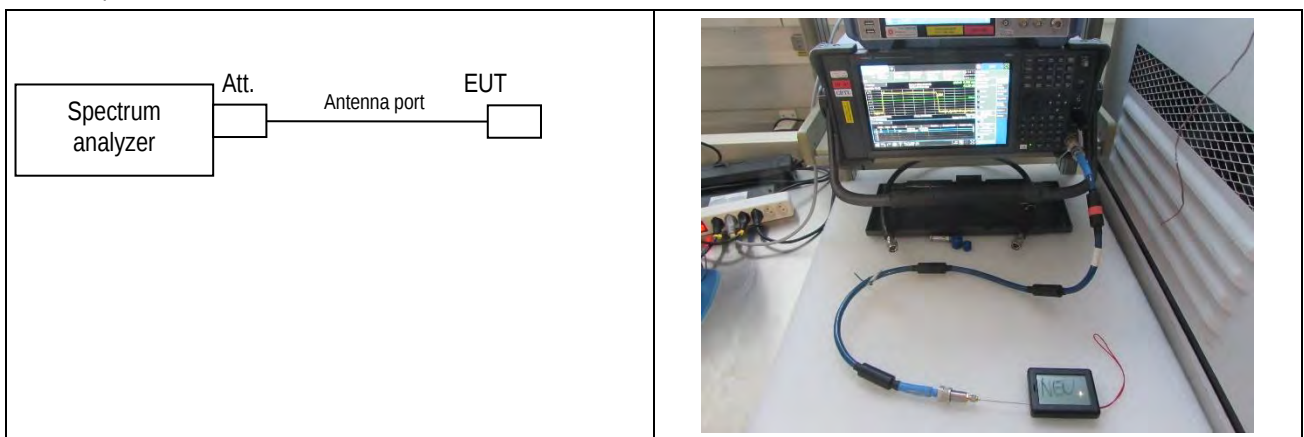
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: $\pm 2.6 \mu\text{s/s}$

Method: Measurement on the antenna connector or a test fixture.

Requirement: For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx II (ID: 2000C9)

Operating mode: Continuously hopping on all channels, power setting 18 dBm

Cables connected to the EUT: Temporary antenna cable

Remarks: Measured on temporary antenna connector

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

Frequency (MHz)	Measured Dwell time (ms)	Average use ratio of one frequency in a 20 second period	Maximum occupied dwell time of each frequency* (ms)	Limit	Result
902.6	5.33	0.317	1.69	400 ms in 20 s period	Pass
915.0	5.28	0.317	1.67	400 ms in 20 s period	Pass
927.4	5.28	0.317	1.67	400 ms in 20 s period	Pass

*Note: One frequency is used per second (declared by manufacturer), so in average, each frequency is used (20 s / 63 channels) in a 20 second period (also see § 6.1.5)

Example of pulse duration at frequency 915 MHz

Place and date of test:
Operator:

Rossens, 2022-05-11
F. Wyler

6.1.5 Pseudorandom frequency hopping sequence and equal hopping frequency use Declared by manufacturer:

Pseudorandom frequency hopping sequence:

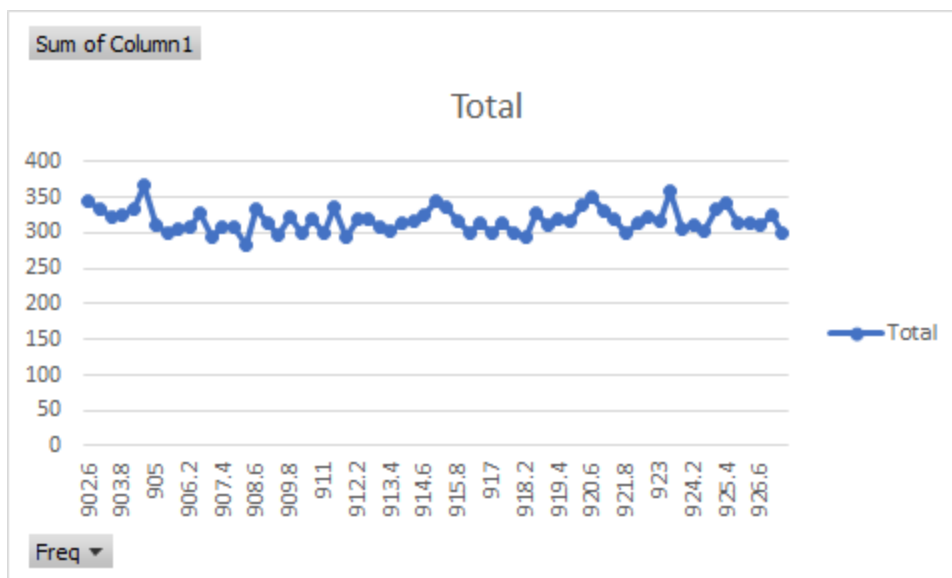
Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, to demonstrate that the sequence meets the requirement specified in the definition of an FHSS system, found in Section 2.1(c). Per the definition in Section 2.1(c), the hop set shall appear as random in the near term, shall appear as evenly distributed in the long term, and sequential hops shall be randomly distributed in both direction and magnitude of change.

The hopping sequence is generated from a pseudo-random source, based on the current GPS time. Two frequencies are used per second.

Equal hopping frequency use:

Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g., that each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event).

The figure shows the number of times a particular frequency was used over 10.000 s:



Since the frequency selection is pseudo-random based on the timestamp, and since every frequency slot is used for exactly one transmission, it is clear that on average you get uniform usage also.

6.1.6 Antenna gain & effective radiated power

Introduction: The effective radiated power is the power radiated by the antenna of a transmitter in its direction of maximum gain under specified conditions of measurement. The antenna gain is the difference (in dB) of the radiated ERP power and the conducted power.

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. uncertainty: ± 3 dB ($f < 300$ MHz) / ± 3.3 dB ($f > 300$ MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The ERP / EIRP values are determined replacing the EUT by a substitution antenna (dipole or other). The limits on the plots represent the equivalent field levels for the required power limits.

Limit: Antenna gain 6 dBi (for a maximum conducted power of 1 W = 30 dBm). If antennas with directional gains exceeding 6 dBi are used, the maximum peak output power shall be reduced as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☐ 05-56	☐ 11-29	
HF Wattmeter	☒ 05-72				
Thermocouple detector	☒ 09-04				
Substitution Antenna	☒ 89-01				
Frequency Generator	☒ 22-02				
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☐ 07-31	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☒ 05-38	☐ 19-15			
Decoupling clamps	☒ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☒ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13		☐ Vitam, Rev. 2.4.14	☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx II (ID: 2000C9)

Operating mode: TX, f = 902 / 915 / 928 MHz, modulated, power setting 18 dBm

Cables connected to the EUT: - - -

Remarks: RBW = 300 kHz, VBW 910 kHz; Peak detector

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 24 °C Humidity: 29 % Pressure QFE: 919 hPa

f [MHz]	Measurement with EUT		Power at substitution ant.		Meas. with subst. ant.	Parameters of substitution ant.		Result			Polarisation
	U [dBuV]	preamp [dB]	P [dBm]	factor [dB]	U [dBuV]	gain [dB]	att. Cable [dB]	corr. [dB]	P ERP [dBm]	P ERP [W]	
902	87.3	0.0	10.0	-10	73.1	2.1	0	-70.96	16.34	43.05 mW	Vertical
902	92.1	0.0	10.0	-10	76.4	2.1	0	-74.34	17.76	59.70 mW	Horizontal
915	87.3	0.0	10.0	-10	72.8	2.1	0	-70.67	16.63	46.03 mW	Vertical
915	91.8	0.0	10.0	-10	75.9	2.1	0	-73.80	18.00	63.10 mW	Horizontal
928	84.3	0.0	10.0	-10	71.8	2.1	0	-69.67	14.63	29.04 mW	Vertical
928	90.5	0.0	10.0	-10	74.8	2.1	0	-72.67	17.83	60.67 mW	Horizontal

The antenna gain is the difference (in dB) of the radiated ERP power and the conducted power of § 6.1.7 :

frequency [MHz]	Conducted power [dBm]	Radiated power ERP [dBm]	Antenna gain [dBi]	Remarks
902	16.76	17.76	1.00	- - -
915	16.57	18.00	1.43	- - -
928	16.34	17.83	1.49	- - -

The measured antenna gain for radiated measurements is somewhat smaller than the declared antenna gain in chapter 4.6. However this is within the measurement error.

The device has an built in internal antenna, which can not be changed (Pass)

The antenna gain is specified in chapter 4.6 is 3.6 dBi < 6 dBi (Pass)

Place and date of test:
Operator:

Rossens, 2022-04-22 and 05-11
F. Wyler

6.1.7 Maximum output power (conducted)

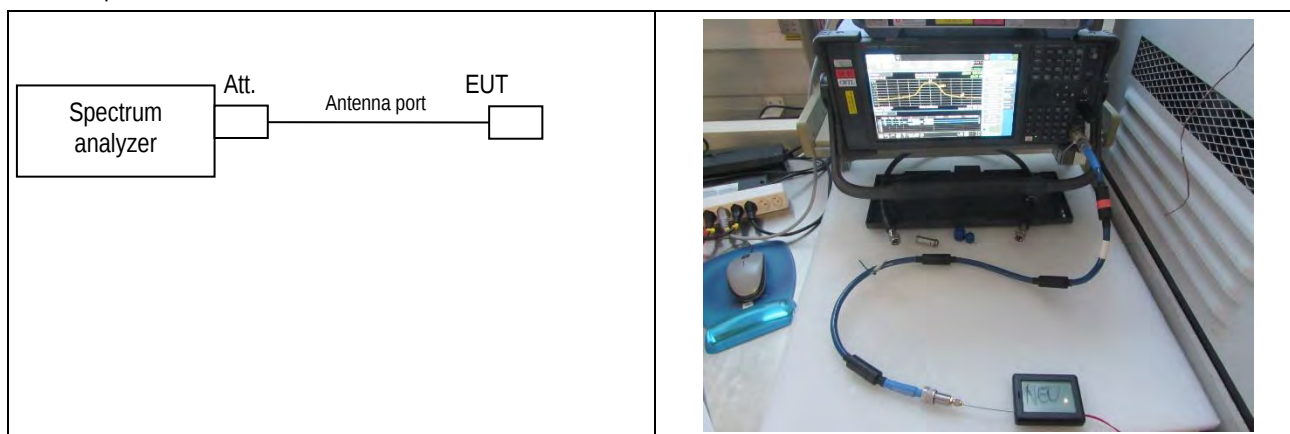
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Requirement: For frequency hopping systems operating in the 902-928 MHz band, the maximum peak conducted output power of the intentional radiator shall not exceed 1 watt (30 dBm) for systems employing at least 50 hopping channels.

Test set-up:



Remarks: - - -

Test equipment:

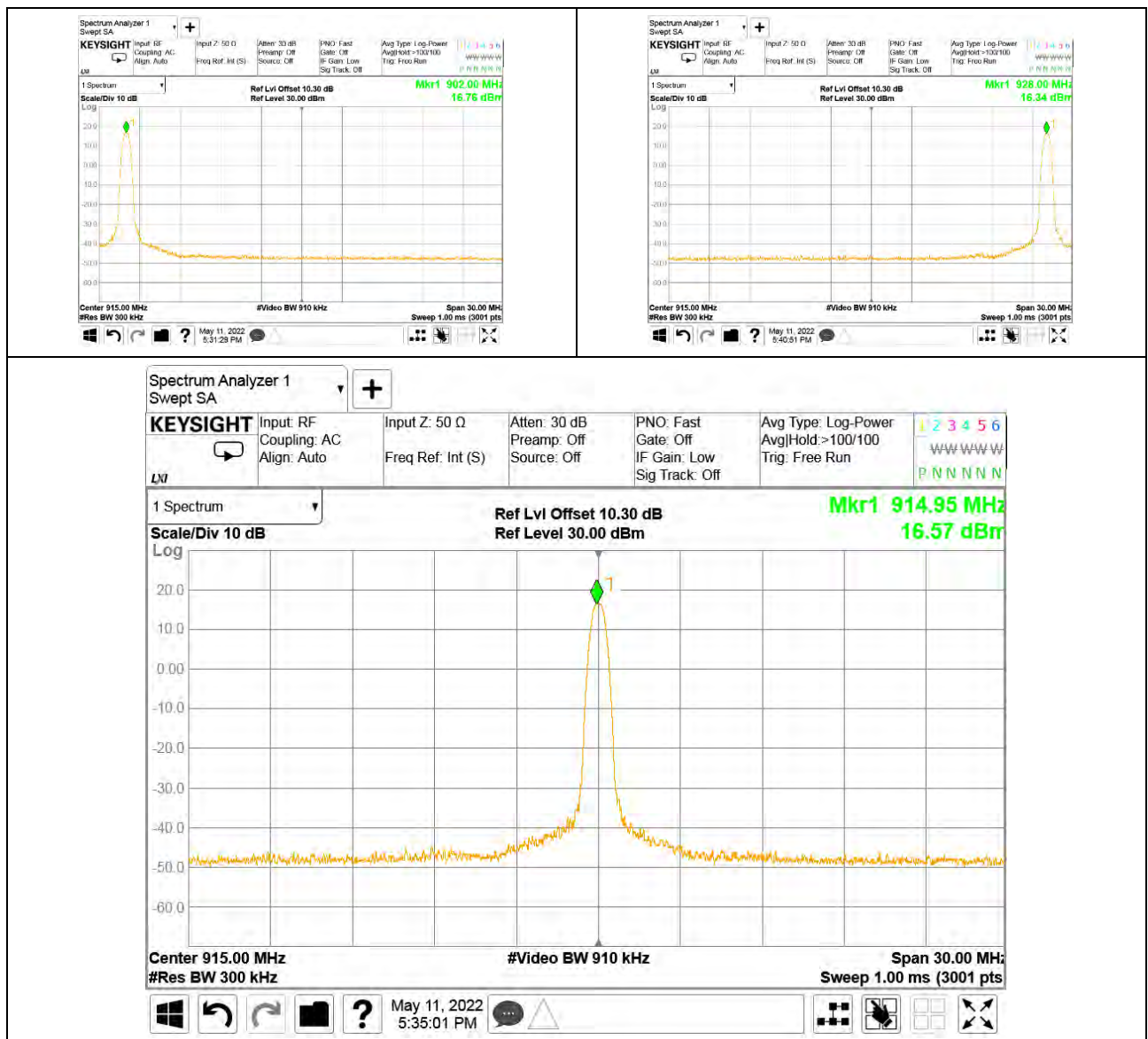
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C9)
 Operating mode: TX, f = 902 / 915 / 928 MHz, modulated, power setting 18 dBm
 Cables connected to the EUT: Temporary antenna cable
 Remarks: Measured on temporary antenna connector
 RBW = 300 kHz, VBW = 910 kHz; Peak detector
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
 Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

frequency [MHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass	
						Yes	No
902	23	---	16.76	30	Maximum conducted emission	☒	☐
915	23	---	16.57	30	- - -	☒	☐
928	23	---	16.34	30	- - -	☒	☐



Place and date of test:
 Operator:

Rossens, 2022-05-11
 F. Wyler

6.1.8 Band-edge emission (conducted)

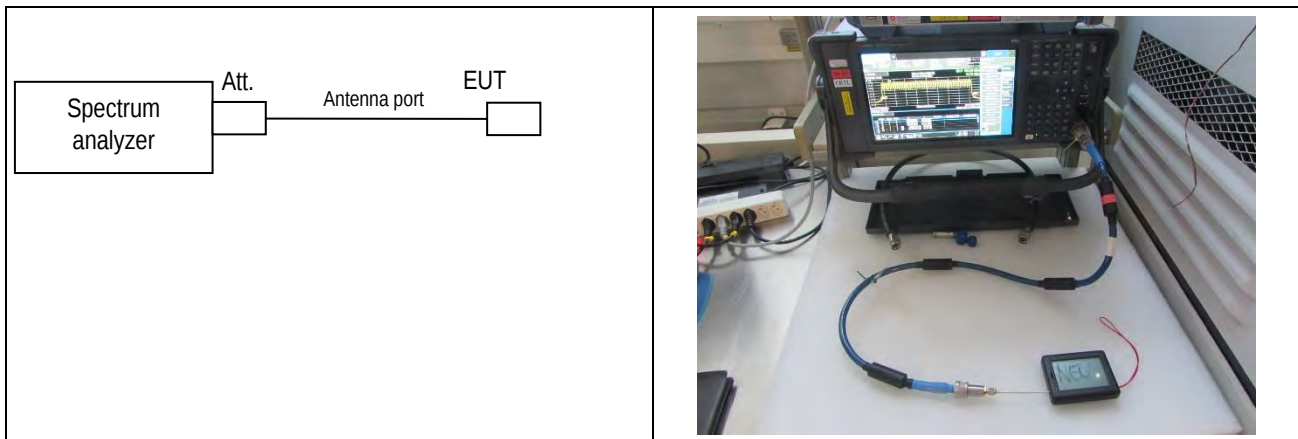
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Requirement: In any 100 kHz bandwidth outside the frequency band, the radio frequency power 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.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result:	☒ pass	☐ fail	☐ not applicable	☐ not tested
---------	--	-------------------------------	---	-------------------------------------

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx II (ID: 2000C9)

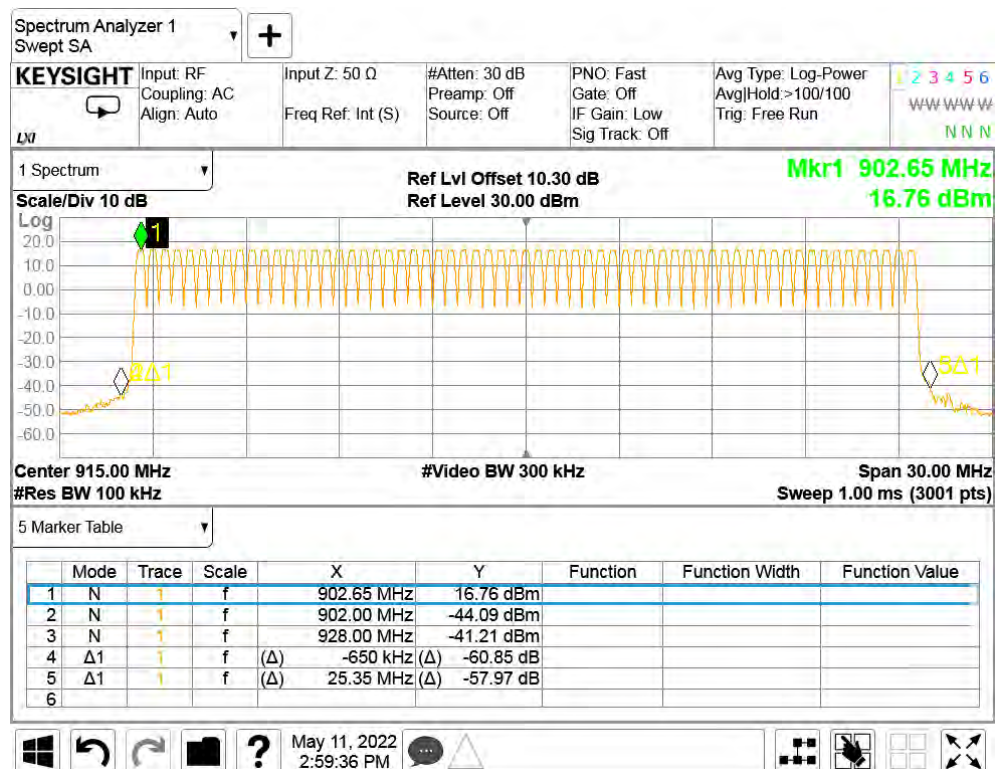
Operating mode: TX, modulated, power setting 18 dBm. See results hereafter

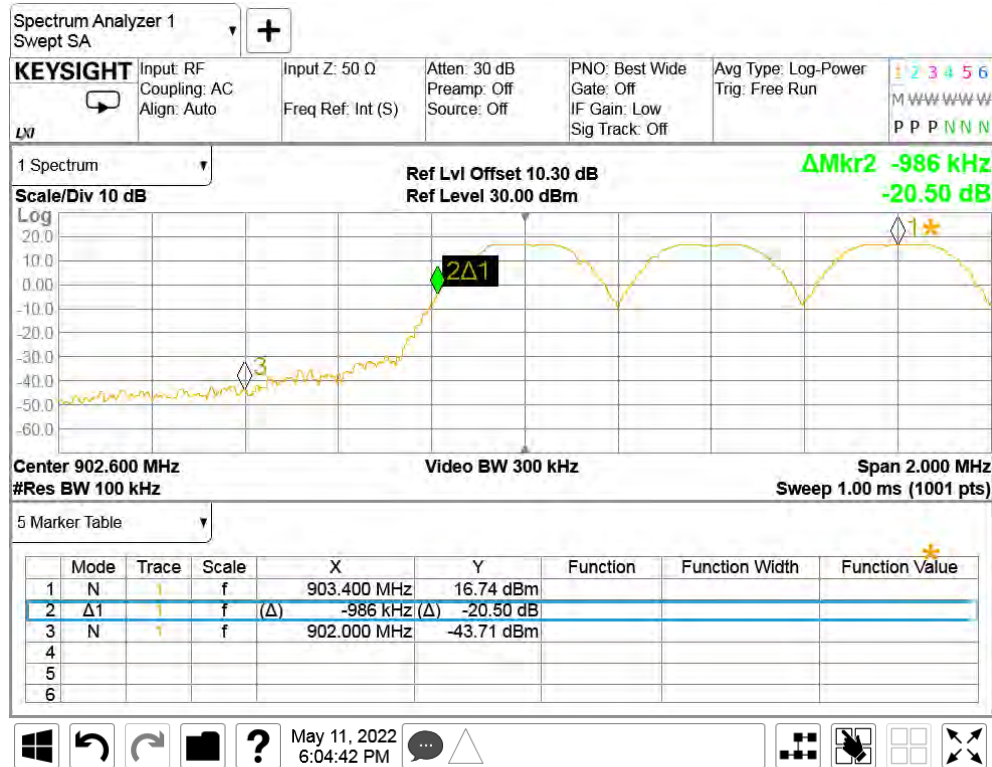
Cables connected to the EUT: Temporary antenna cable

Remarks: Measured on temporary antenna connector

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

Conclusion: Pass**f = 902.6 MHz and 928.0 MHz, hopping**

f = 902.6 MHz, hopping**f = 927.4.0 MHz, hopping**

f = 902.6 MHz, non hopping**f = 927.4 MHz, non hopping**

Place and date of test:
Operator:

Rossens, 2022-05-11
F. Wyler

6.1.9 Spurious emissions – conducted (transmitter – 9 kHz to 9.5 GHz)

Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. Uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

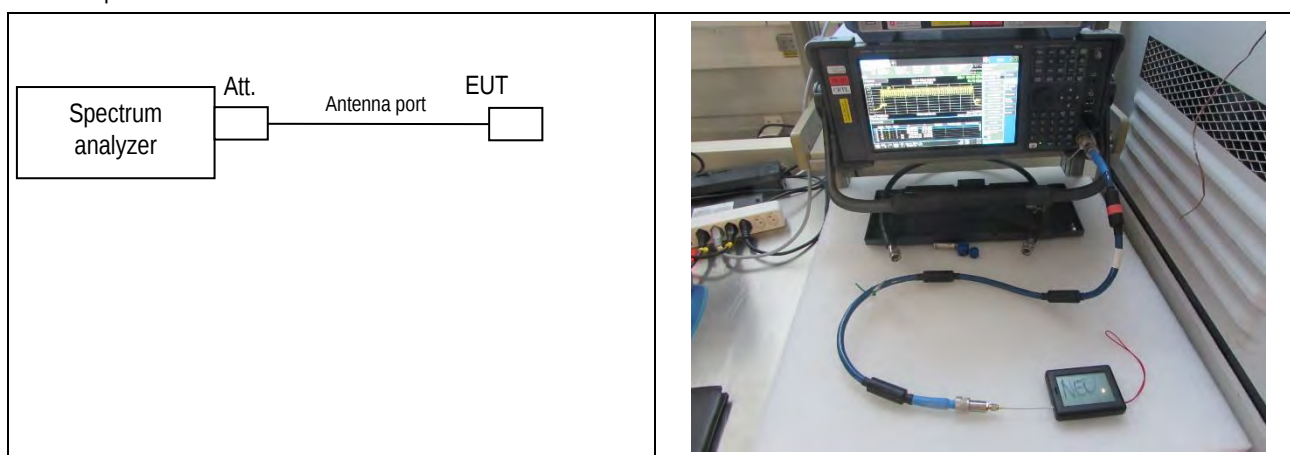
Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Requirement: In any 100 kHz bandwidth outside the frequency band, the radio frequency power 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

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 40 % Pressure QFE: 939 hPa

Test set-up:



Remarks: Emissions near band-edges are checked under § 6.1.8

Test equipment:

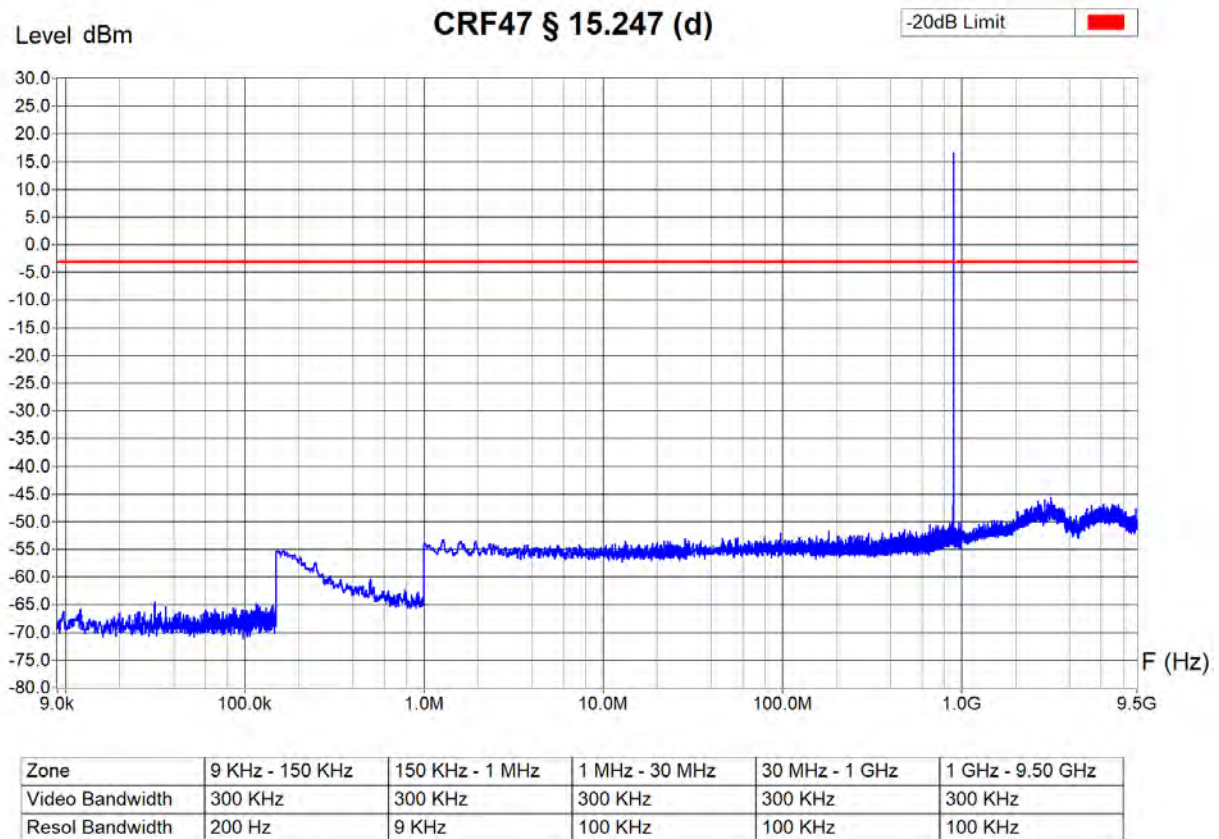
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement Type : Power Interference
 Port : Temporary Antenna Connector
 Clamp position : -



Equipment Under Test : XC Tracer Maxx II, ID 2000C9
 Set-Up : See photos
 Operating Conditions : Tx F=902.6 MHz, modulated, Power setting 18 dBm
 Remarks : Highest RF Power in the 100 KHz bandwidth within 902-928 MHz is 16.8 dBm
 Peak detector sweep

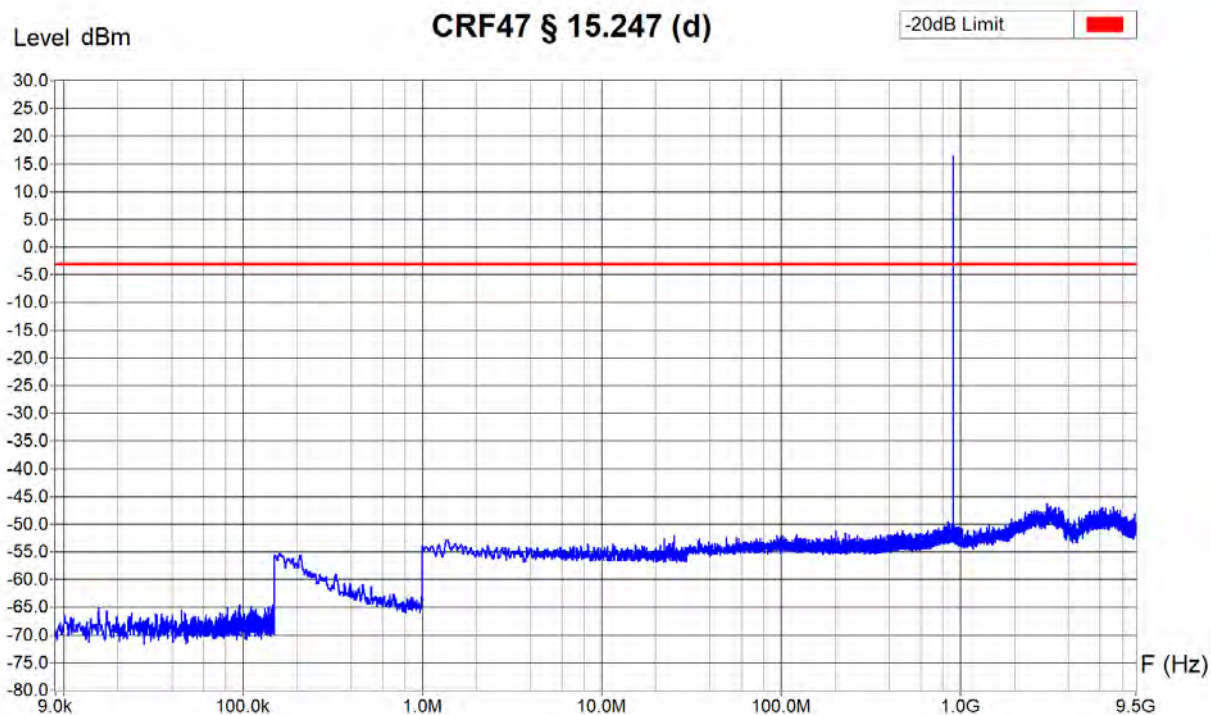


Operator: F. Wyler
 Date/Time: 11.05.2022 16:52
 Filename:
 1_CP_9k-9.5G_cond_902M6.png/
 .txt

Measurement Type : Power Interference
 Port : Temporary Antenna Connector
 Clamp position : -



Equipment Under Test : XC Tracer Maxx II, ID 2000C9
 Set-Up : See photos
 Operating Conditions : Tx F=915.0 MHz, modulated, Power setting 18 dBm
 Remarks : Highest RF Power in the 100 KHz bandwidth within 902-928 MHz is 16.8 dBm
 Peak detector sweep



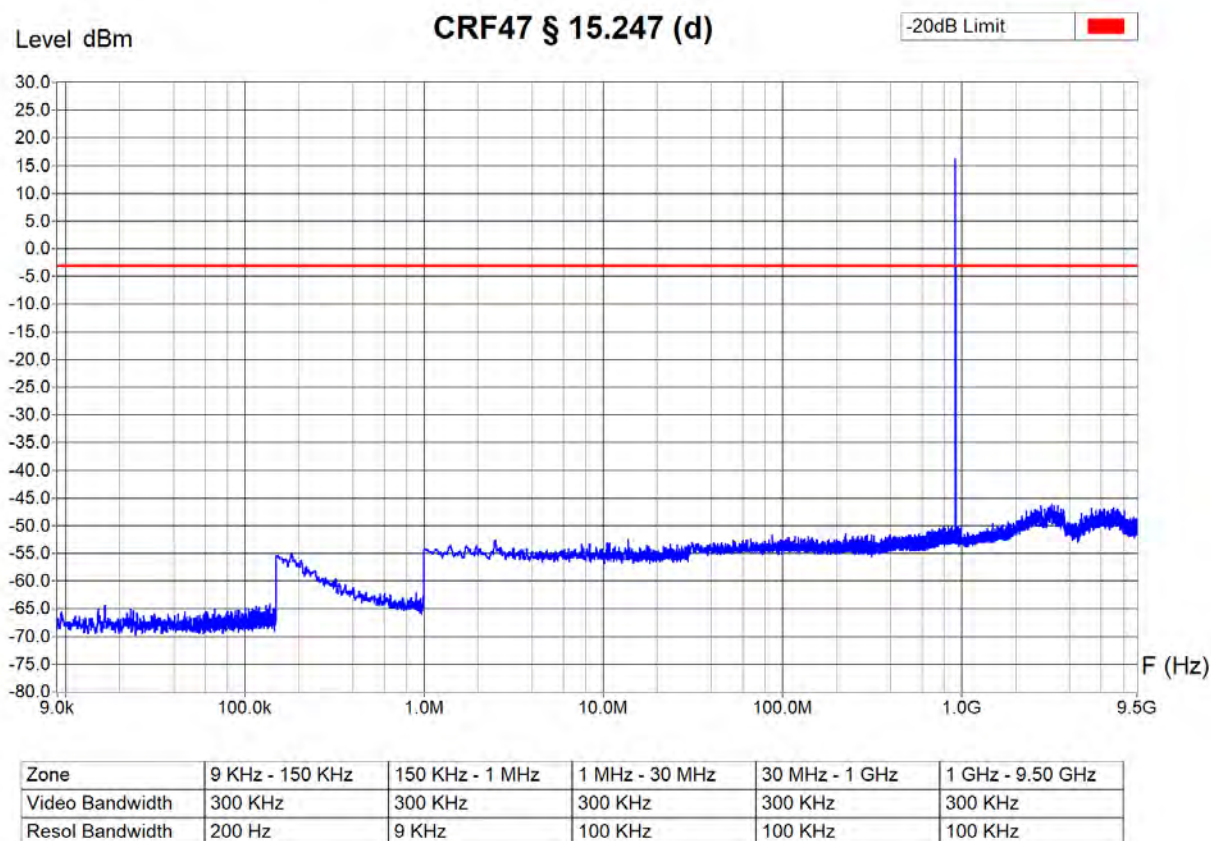
Zone	9 KHz - 150 KHz	150 KHz - 1 MHz	1 MHz - 30 MHz	30 MHz - 1 GHz	1 GHz - 9.50 GHz
Video Bandwidth	300 KHz	300 KHz	300 KHz	300 KHz	300 KHz
Resol Bandwidth	200 Hz	9 KHz	100 KHz	100 KHz	100 KHz

Operator: F. Wyler
 Date/Time: 11.05.2022 17:04
 Filename:
 2_CP_9k-9.5G_cond_915M.png/
 .txt

Measurement Type : Power Interference
 Port : Temporary Antenna Connector
 Clamp position : -



Equipment Under Test : XC Tracer Maxx II, ID 2000C9
 Set-Up : See photos
 Operating Conditions : Tx F=927.4 MHz, modulated, Power setting 18 dBm
 Remarks : Highest RF Power in the 100 KHz bandwidth within 902-928 MHz is 16.8 dBm
 Peak detector sweep



Operator: F. Wyler
 Date/Time: 11.05.2022 17:10
 Filename:
 3_CP_9k-9.5G_cond_927M4.png/
 .txt

6.1.10 Spurious emissions, transmit mode – radiated**6.1.10.1 9 kHz to 30 MHz**Test site: ☒ SAC3 ☐ SAC10Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1 m (height of the equipment under test above floor)

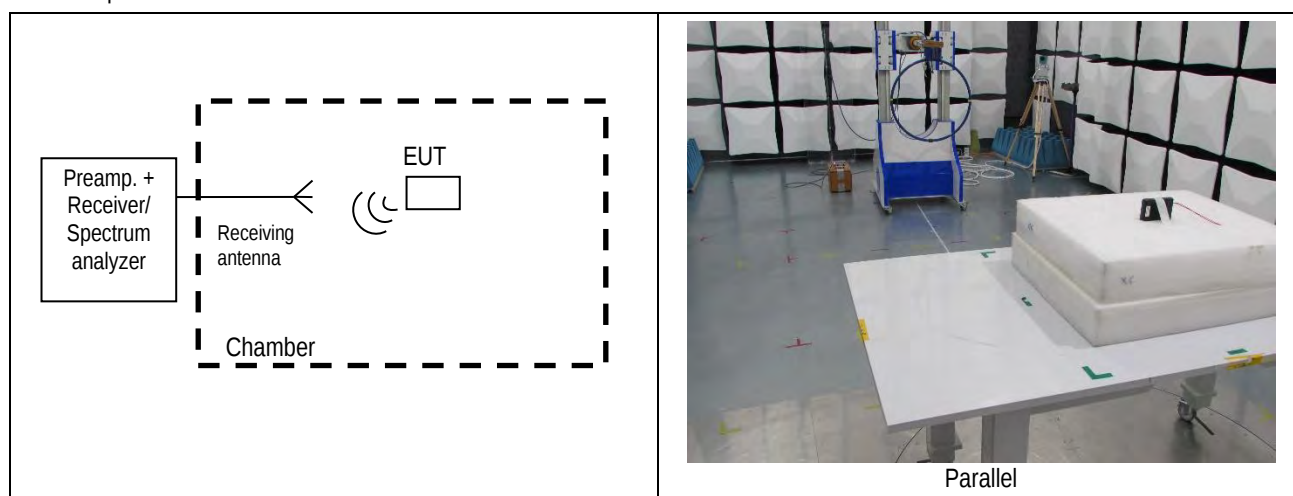
Meas. Uncertainty: ± 2.8 dB

Test method: The magnetic disturbance radiated by the equipment under test is measured using a spectrum analyzer and a wide band magnetic antenna. The antenna is placed at 1 m height, first in the direction of the apparatus under test, then at 90° to the apparatus and if required also horizontally. If possible the turning table is operated through 360° during the measurement. The recording is carried out taking into account the maximum value of the disturbance appearing during the functioning of the apparatus under test. The peak values are recorded continuously on a graph. The values exceeding the limits are re-measured using a measuring receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 24 °C Humidity: 29 % Pressure QFE: 919 hPa

Test set-up:



Remarks: Limit values expressed in dB μ V/m and transformed to a measuring distance of 10 m (factor used = 40 dB/decade) if necessary
e.g.: for f = 10 MHz the limit is 30 μ V/m at 30 m;

$$20 \log \left(\frac{30 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 40 \log \left(\frac{30 m}{3 m} \right) = 69.5 \frac{dB \mu V}{m} \text{ at } 3m$$

“Parallel” means measurement antenna axis towards EUT

Test equipment:

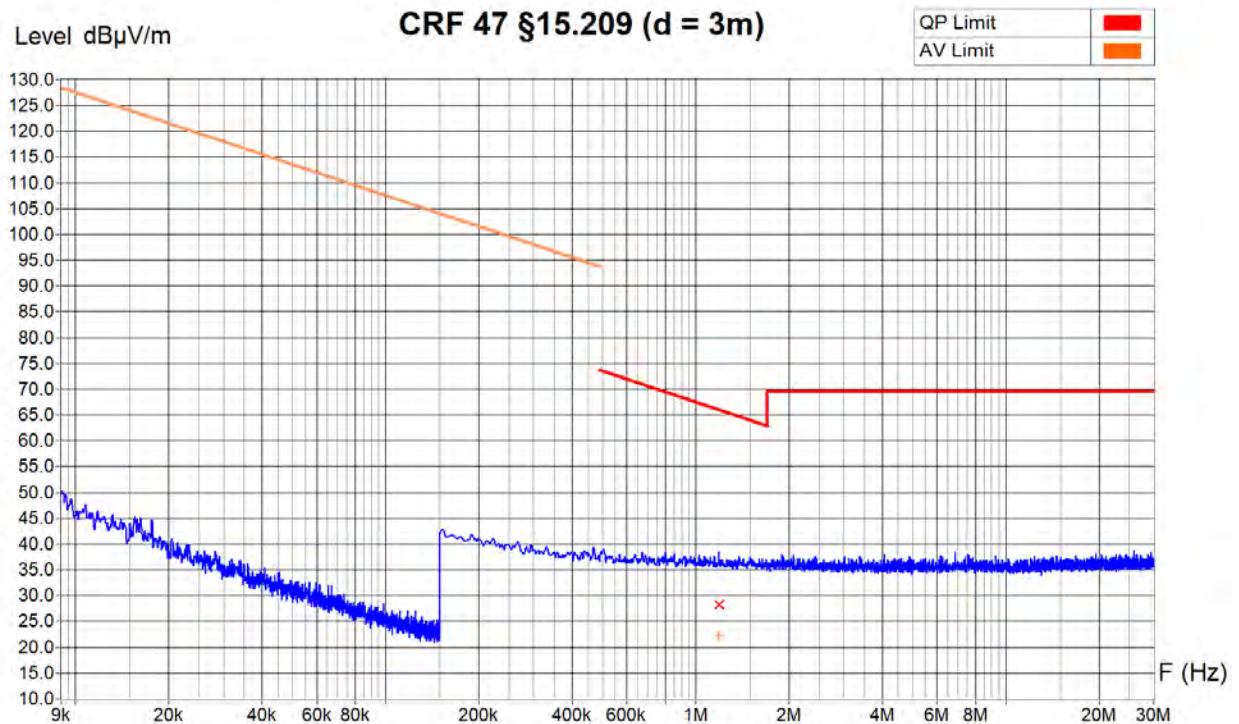
Spectrum analyser	☒ 21-07 ☐ 184454	☐ 25953
Receiver	☒ 21-07 ☐ 184454	☐ 25953
Preamplifier	☐ 14-27 ☐ 168520	
Antenna, (log-per)	☐ 168585 ☐ 26021	
Antenna, (H-Feld)	☒ 90-25	
Antenna, (Horn)	☐ 07-31	
Antenna, (Horn)	☐ 98-12	
Cables	☒ SAC3_1.0, 2.0, 3.0	☐ 49076/4 (1-18 GHz)
Software and Revision	☒ Vitam, Rev. 2_4_13	☐ RadiMation 2016.1.6

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement Type : Radiated Field
Polarisation : Parallel
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 902 MHz, modulated, Power setting 18 dBm
Remarks : None



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
1.19 MHz	38.7 dB μ V/m	28.3 dB μ V/m	22.1 dB μ V/m	37.8 dB

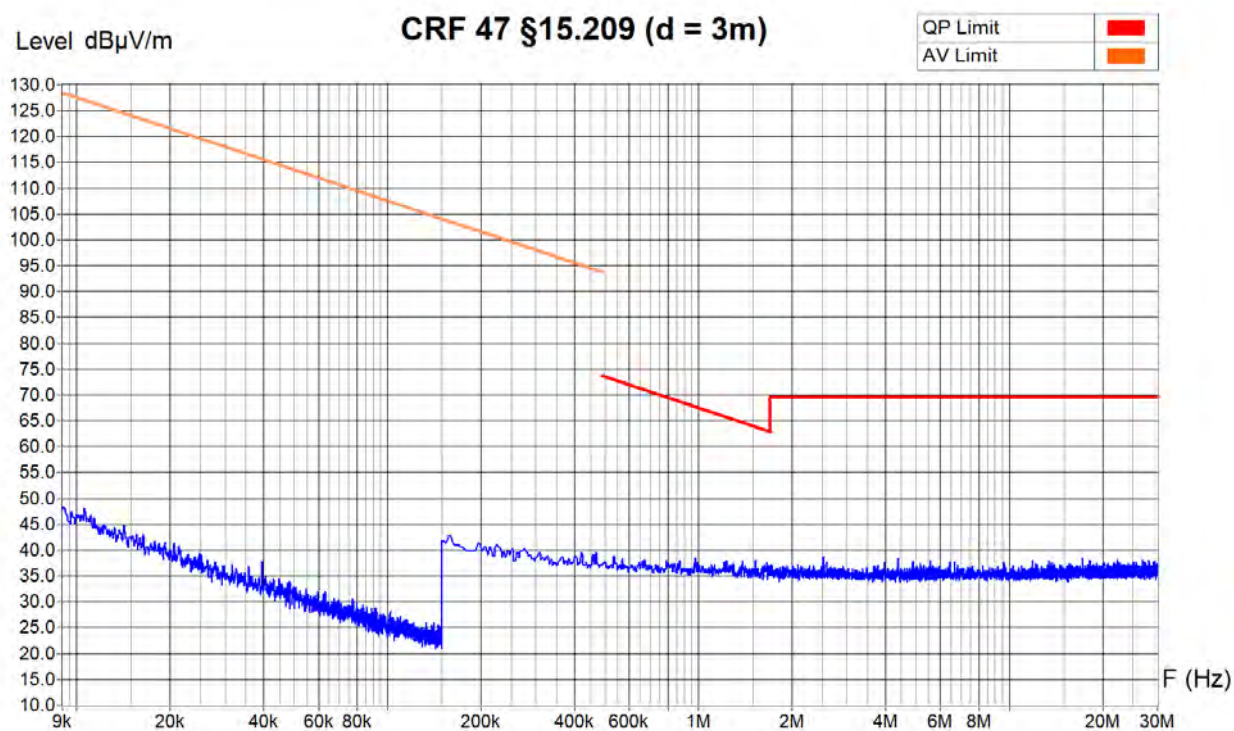
Sample calculation with all conversion and correction factors used				
Frequency [MHz]	Receiver QP value [dB μ V]	Cable att. corr. [dB]	Antenna factor corr. [dB]	QP field [dB μ V/m]
1.19	7.8	+0.2	+20.3	= 28.3

Operator: F. Wyler
Date/Time: 22 Apr 2022 18:15
Filename: ME1_TX902M_Par_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Parallel
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
Remarks : None



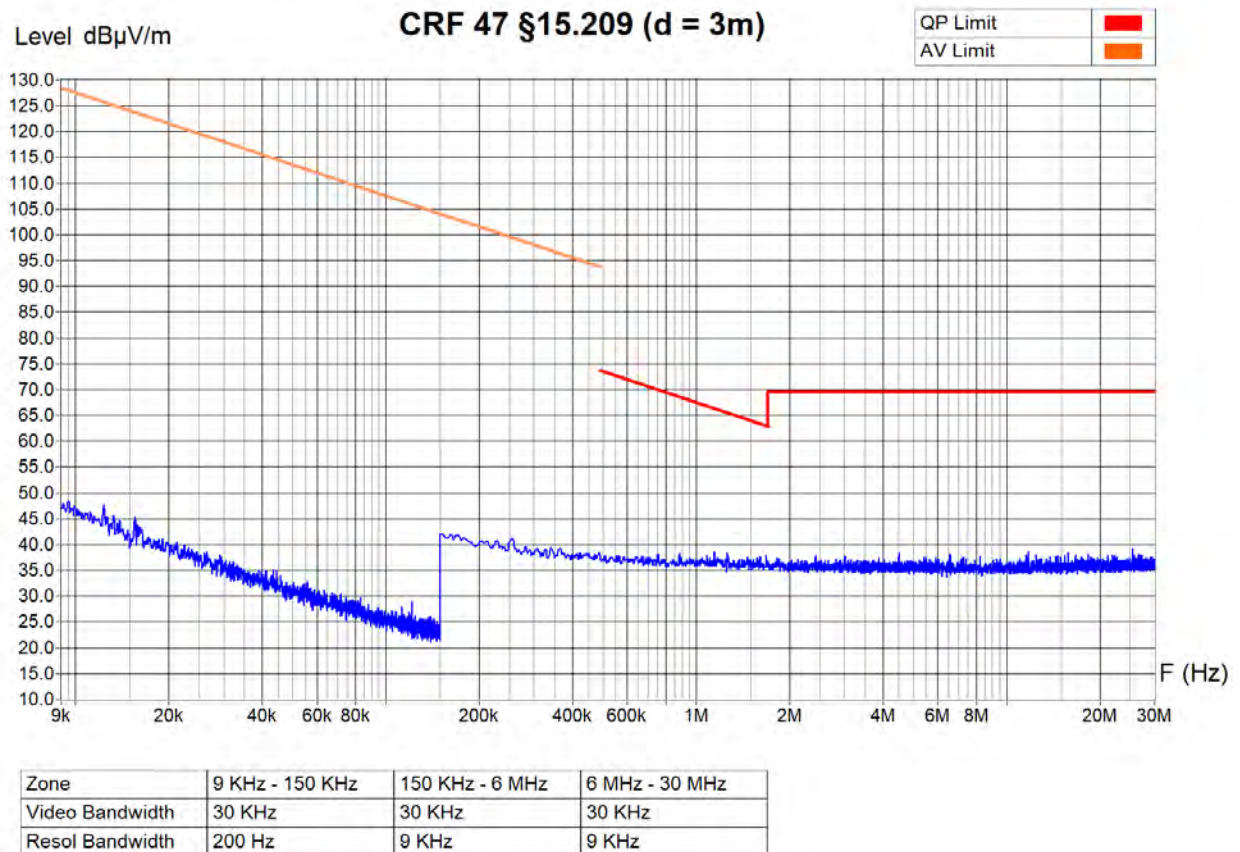
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
Date/Time: 22 Apr 2022 18:33
Filename:
ME2_TX915M_Par_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Parallel
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 928 MHz, modulated, Power setting 18 dBm
Remarks : None

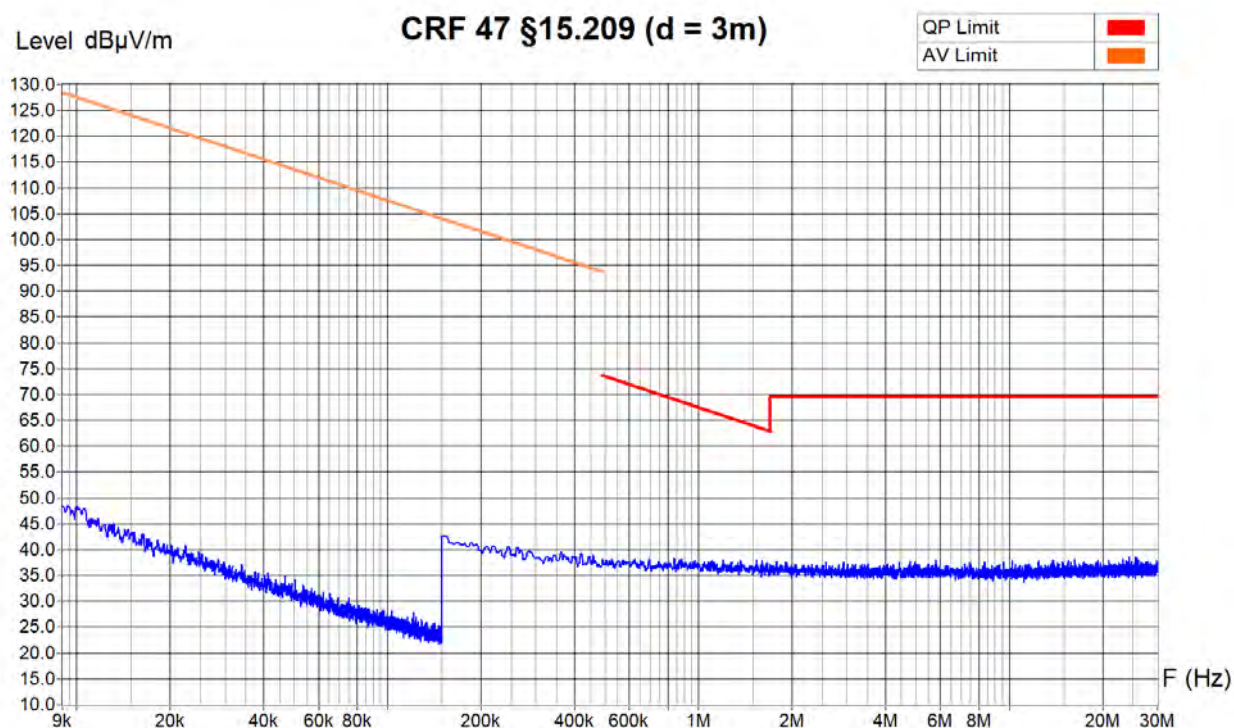


Operator: F. Wyler
Date/Time: 22 Apr 2022 18:40
Filename:
ME3_TX928M_Par_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Perpendicular
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 902 MHz, modulated, Power setting 18 dBm
Remarks : None



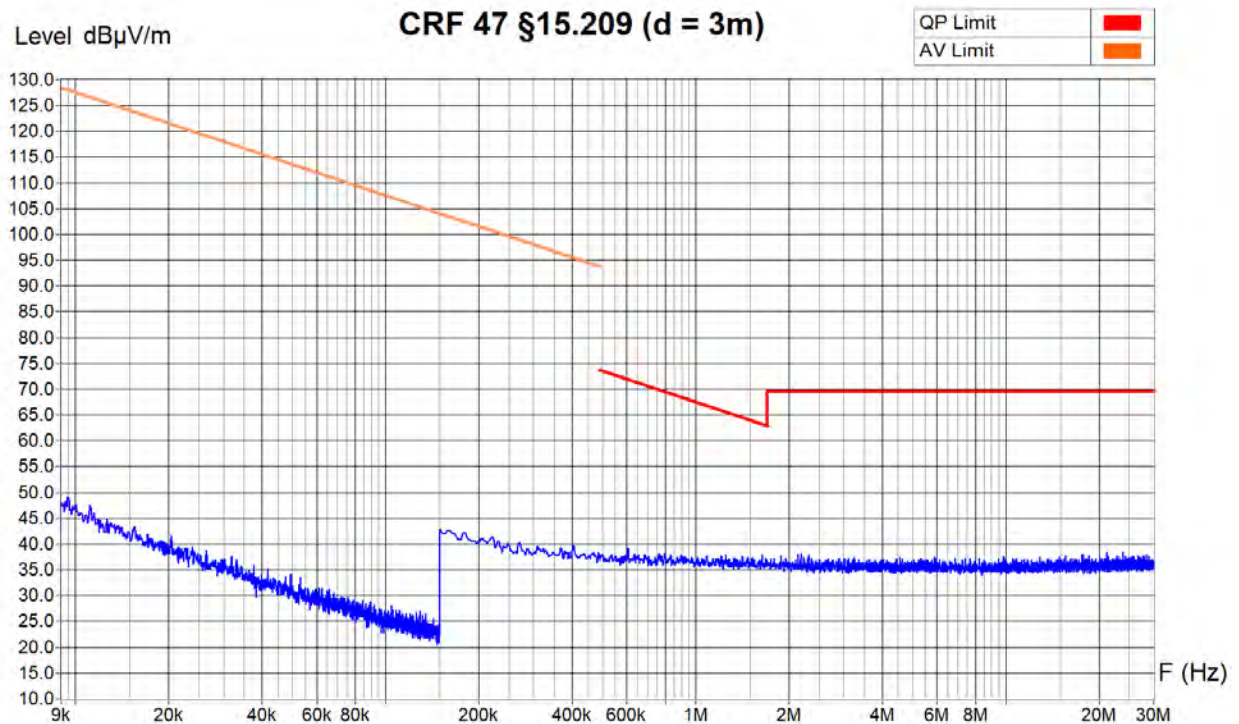
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
Date/Time: 22 Apr 2022 19:27
Filename:
ME4_TX902M_Per_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Perpendicular
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
Remarks : None



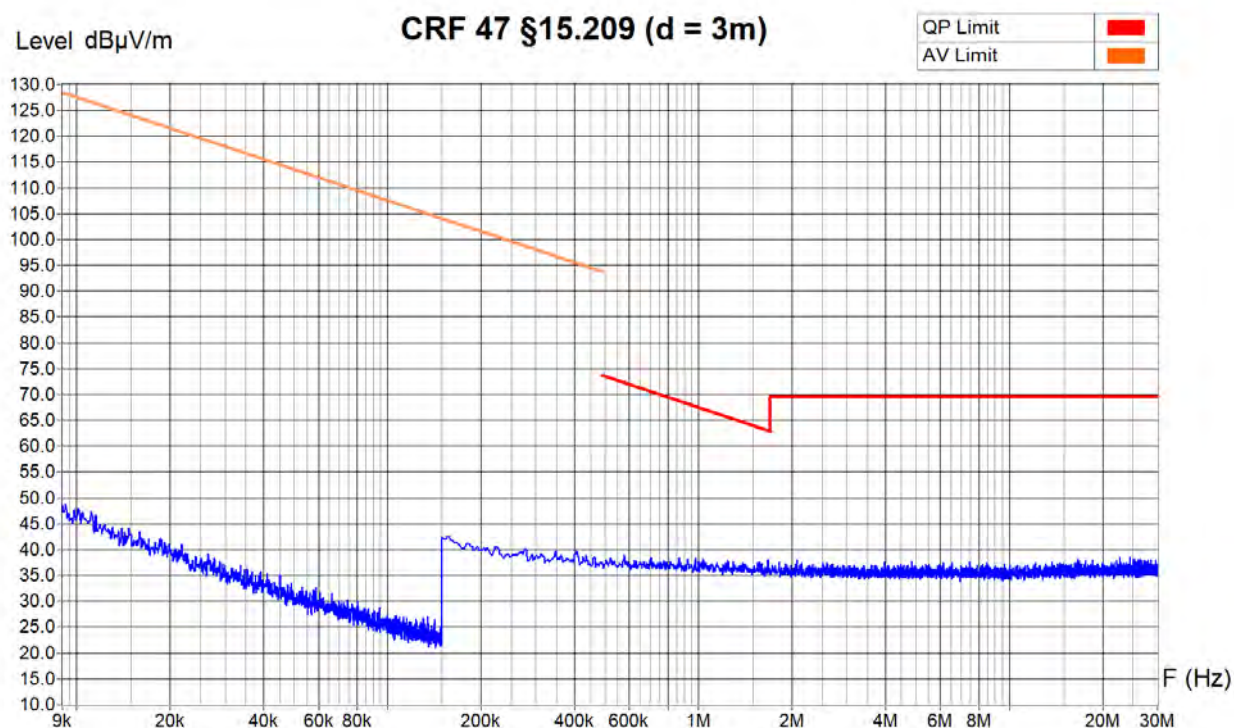
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
Date/Time: 22 Apr 2022 19:20
Filename:
ME5_TX915M_Per_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Perpendicular
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
 Set-Up : Chamber SAC3, See photos, Peak detector sweep
 Operating Conditions : TX, f = 928 MHz, modulated, Power setting 18 dBm
 Remarks : None



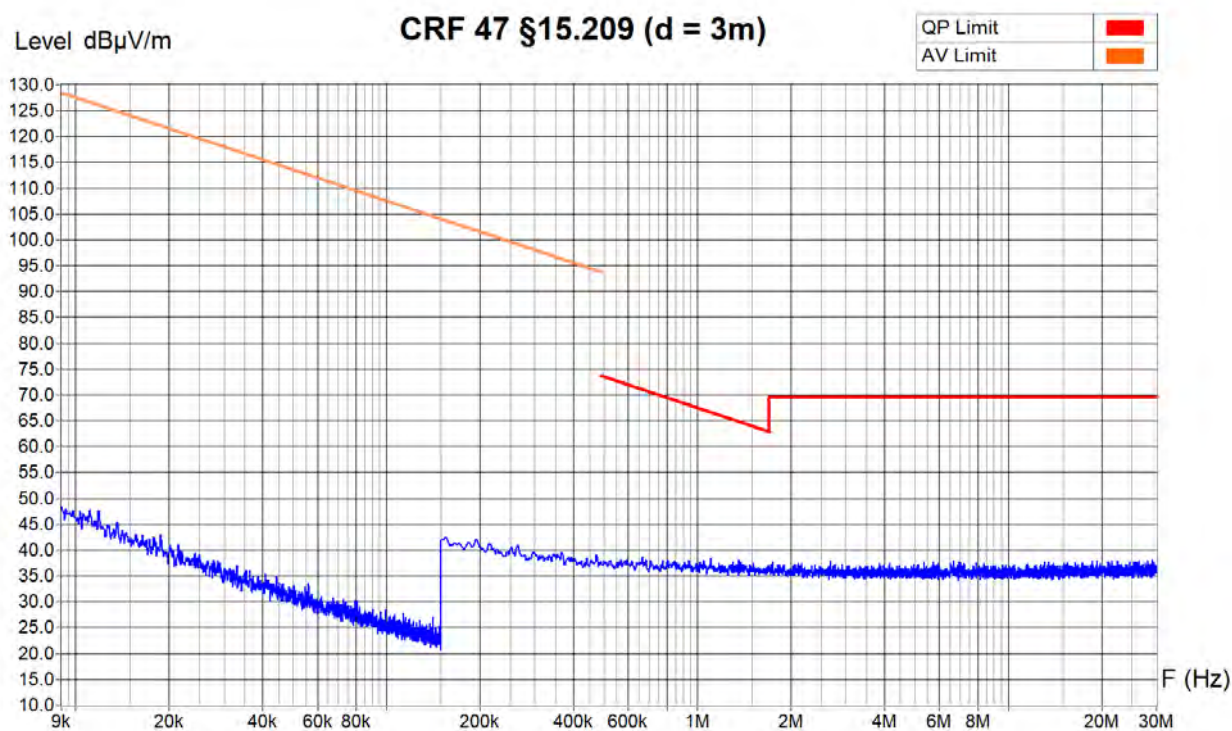
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
 Date/Time: 22 Apr 2022 18:46
 Filename:
 ME6_TX928M_Per_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 902 MHz, modulated, Power setting 18 dBm
Remarks : None



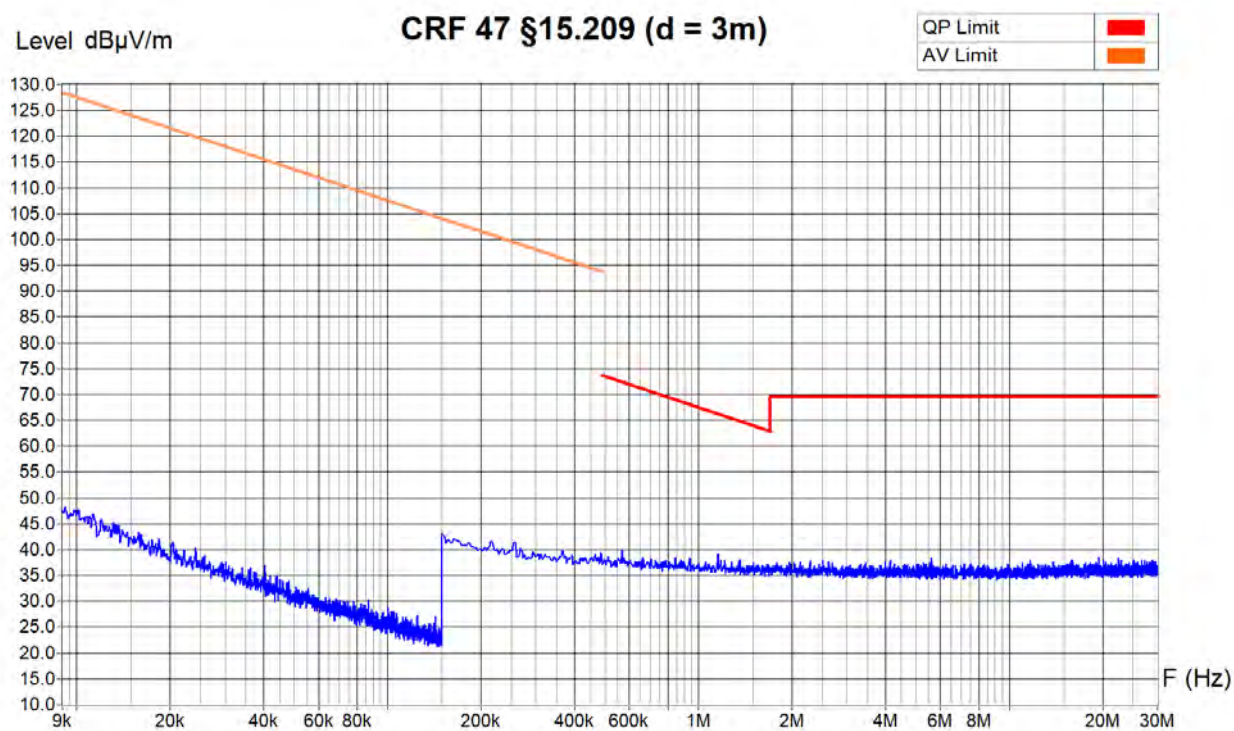
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
Date/Time: 22 Apr 2022 19:37
Filename:
ME7_TX902M_Hor_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
Remarks : None



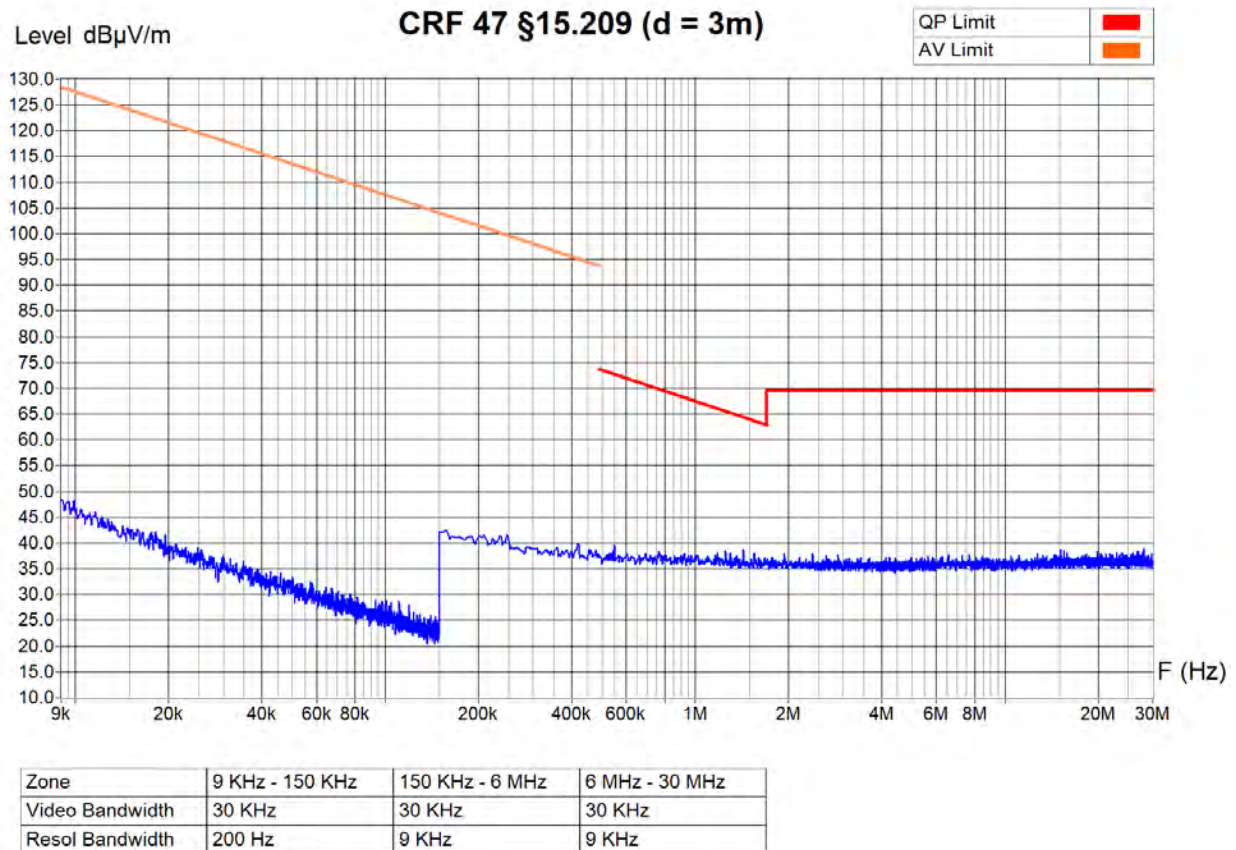
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: F. Wyler
Date/Time: 22 Apr 2022 19:44
Filename:
ME8_TX915M_Hor_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 928 MHz, modulated, Power setting 18 dBm
Remarks : None



Operator: F. Wyler
Date/Time: 22 Apr 2022 19:49
Filename:
ME9_TX928M_Hor_FCC.png/.txt

6.1.10.2 30 MHz to 1 GHzTest site: ☒ SAC3 ☐ SAC10Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

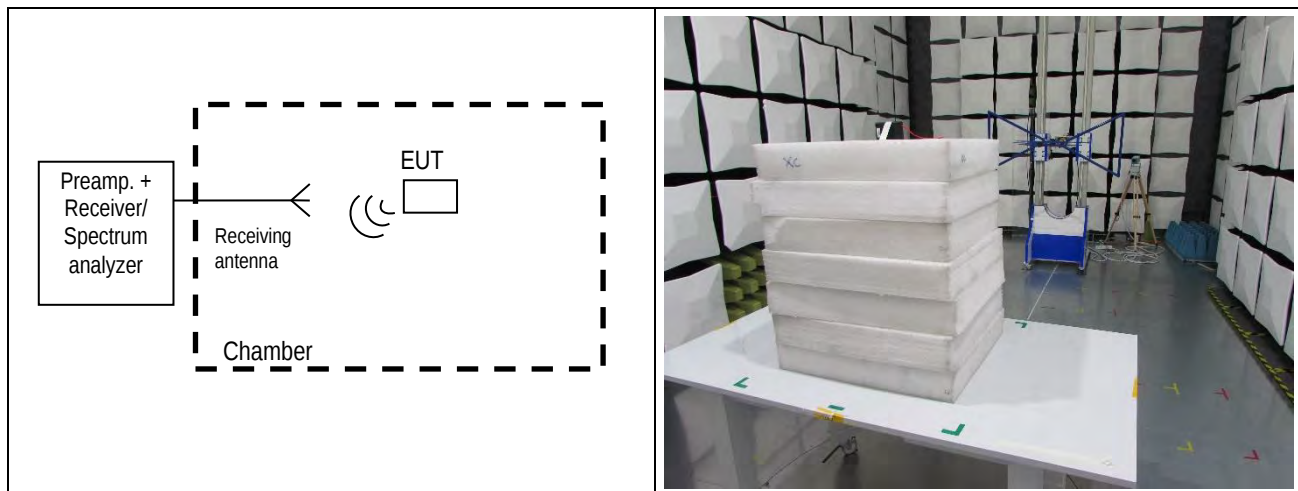
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 35 % Pressure QFE: 935 hPa

Test set-up:



Remarks: - Limit values expressed in dBμV/m and transformed to a measuring distance of 3 m (factor used = 20 dB/decade) if necessary
e.g.: for f = 40 MHz the limit is 100 μV/m at 3 m;

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

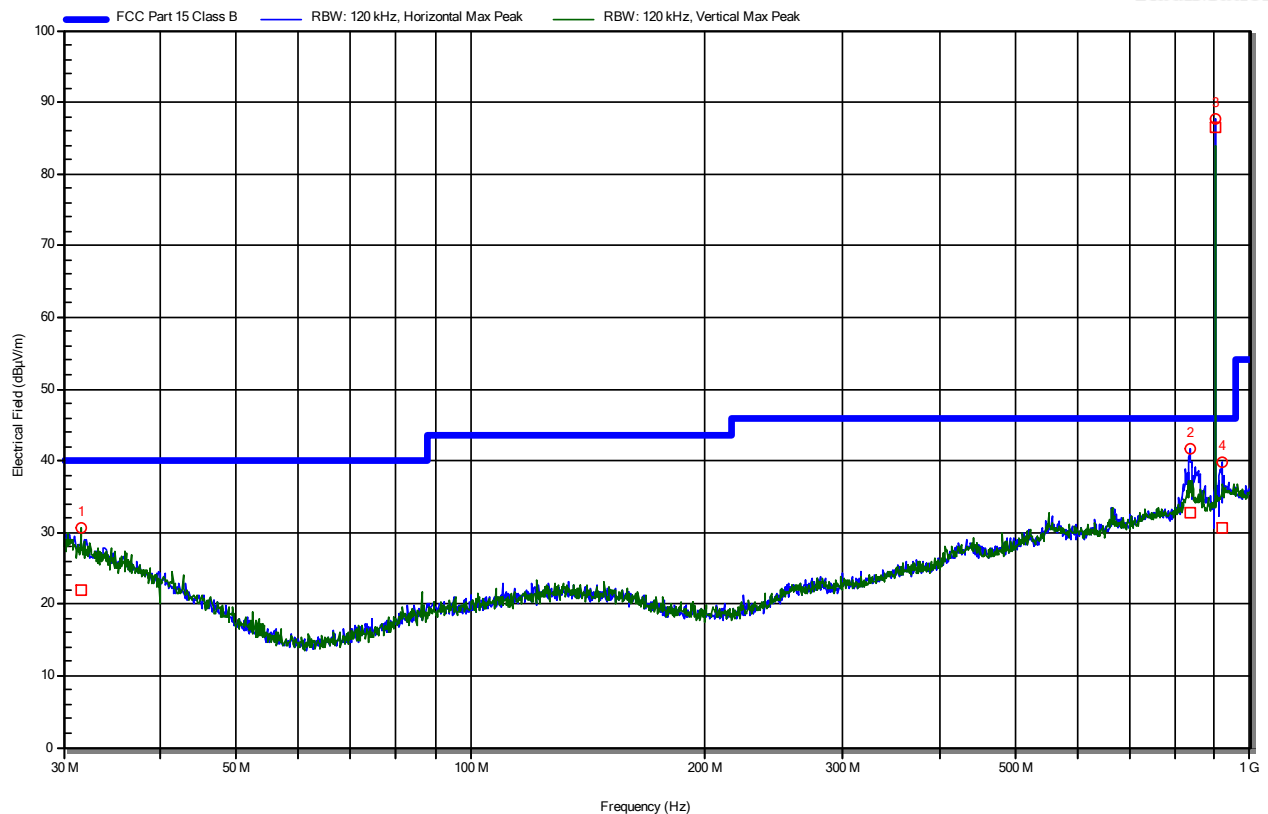
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☐ 05-56	☐ 21-07 internal	
Notch filter	☐ 04-19	☒ 04-21	☐ 19-11	☐ 13-14	
Antenna, (bi-con-log)	☒ 05-38	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D		
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE				
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14	☒ RadiMation 2020.1.8		

Result:	☒ pass	☐ fail	☐ not applicable	☐ not tested
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Measurement	RE 30 MHz to 1 GHz			Date and time	13 Apr 2022 14:00:08	Test ID	#12	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)	Distance	3 m		
Notes	ME 12 (final 902 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 902 MHz, Power setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver								
Test Place	ROS-SAC3			Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)				
Equipment	Device Type ID Antenna tower 17-02 Cable antenna -> preamp 15-15 Cable antenna -> preamp 15-16 Spectrum analyser 21-07 Cable antenna -> preamp 11-61 Antenna 05-38 Turn table 17-02			Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 90 dBμV RBW: 120 kHz, VBW: 1 MHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s				

CFR 47 §§ 15.209/109 Cl B (d = 3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	31.545 MHz	30.7 dBμV/m	22.1 dBμV/m	40 dBμV/m	-17.9 dB	90 degrees	1 m	Vertical	Pass
2	837.428 MHz	41.8 dBμV/m	32.7 dBμV/m	46 dBμV/m	-13.3 dB	180 degrees	3 m	Horizontal	Pass
3	901.944 MHz	87.7 dBμV/m	86.4 dBμV/m	46 dBμV/m	40.4 dB	180 degrees	1 m	Horizontal	Pass *
4	921.523 MHz	39.8 dBμV/m	30.5 dBμV/m	46 dBμV/m	-15.5 dB	180 degrees	1 m	Horizontal	Pass

* This is the carrier of the radio service

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver QP Value [dBμV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	QP field [dBμV/m]
837.4	+7.9	+2.4	0.0	+22.4	= 32.7

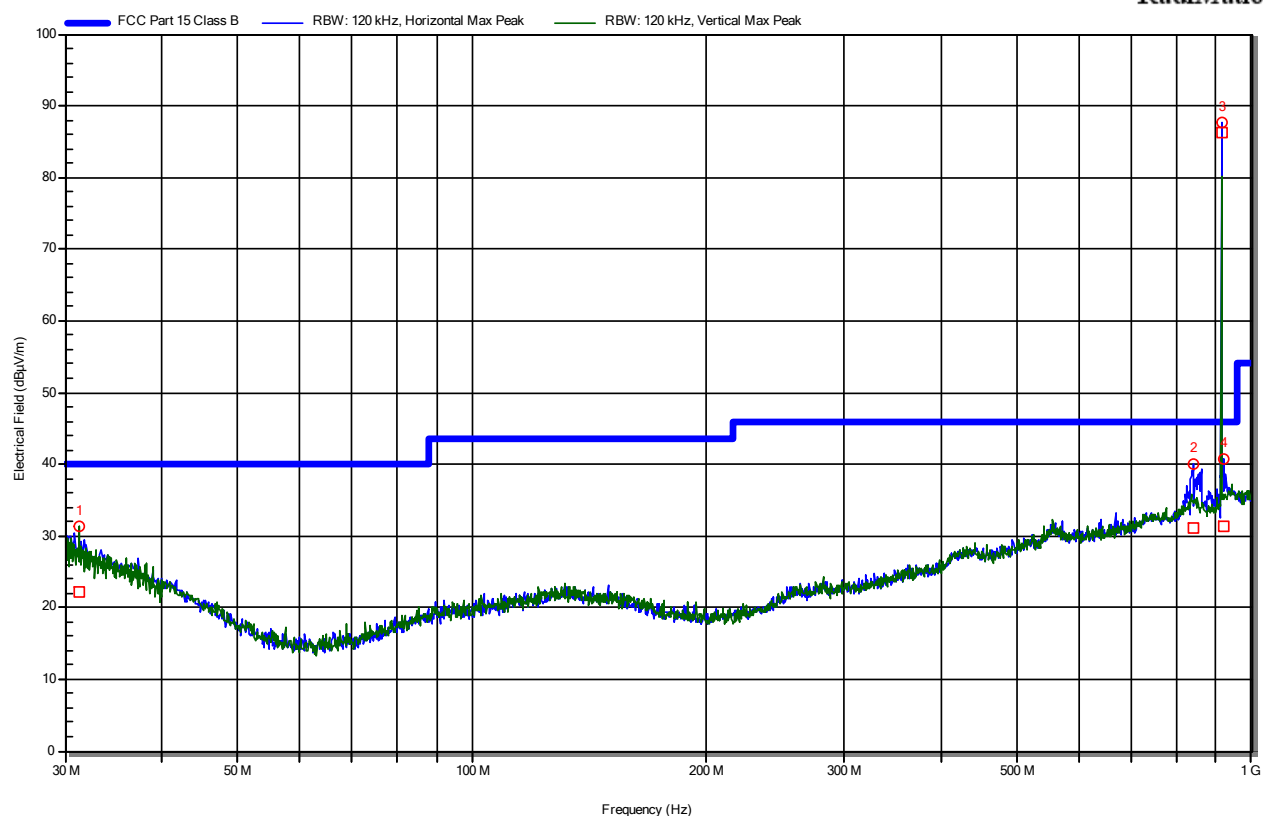
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	RE 30 MHz to 1 GHz		Date and time	13 Apr 2022 14:29:42	Test ID	#13	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)	Distance	3 m	
Notes	ME 13 (final 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz, Power setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Cable antenna -> preamp Spectrum analyser Cable antenna -> preamp Antenna Turn table	ID 17-02 15-15 15-16 21-07 11-61 05-38 17-02	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 90 dBµV RBW: 120 kHz, VBW: 1 MHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 100 ms Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s				

CFR 47 §§ 15.209/109 Cl B (d = 3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	31.312 MHz	31.3 dBµV/m	22.3 dBµV/m	40 dBµV/m	-17.7 dB	90 degrees	4 m	Vertical	Pass
2	841.063 MHz	40 dBµV/m	31.1 dBµV/m	46 dBµV/m	-14.9 dB	180 degrees	2 m	Horizontal	Pass
3	914.942 MHz	87.7 dBµV/m	86.4 dBµV/m	46 dBµV/m	40.4 dB	180 degrees	1 m	Horizontal	Pass *
4	922.036 MHz	40.6 dBµV/m	31.4 dBµV/m	46 dBµV/m	-14.6 dB	180 degrees	1 m	Horizontal	Pass

* This is the carrier of the radio service

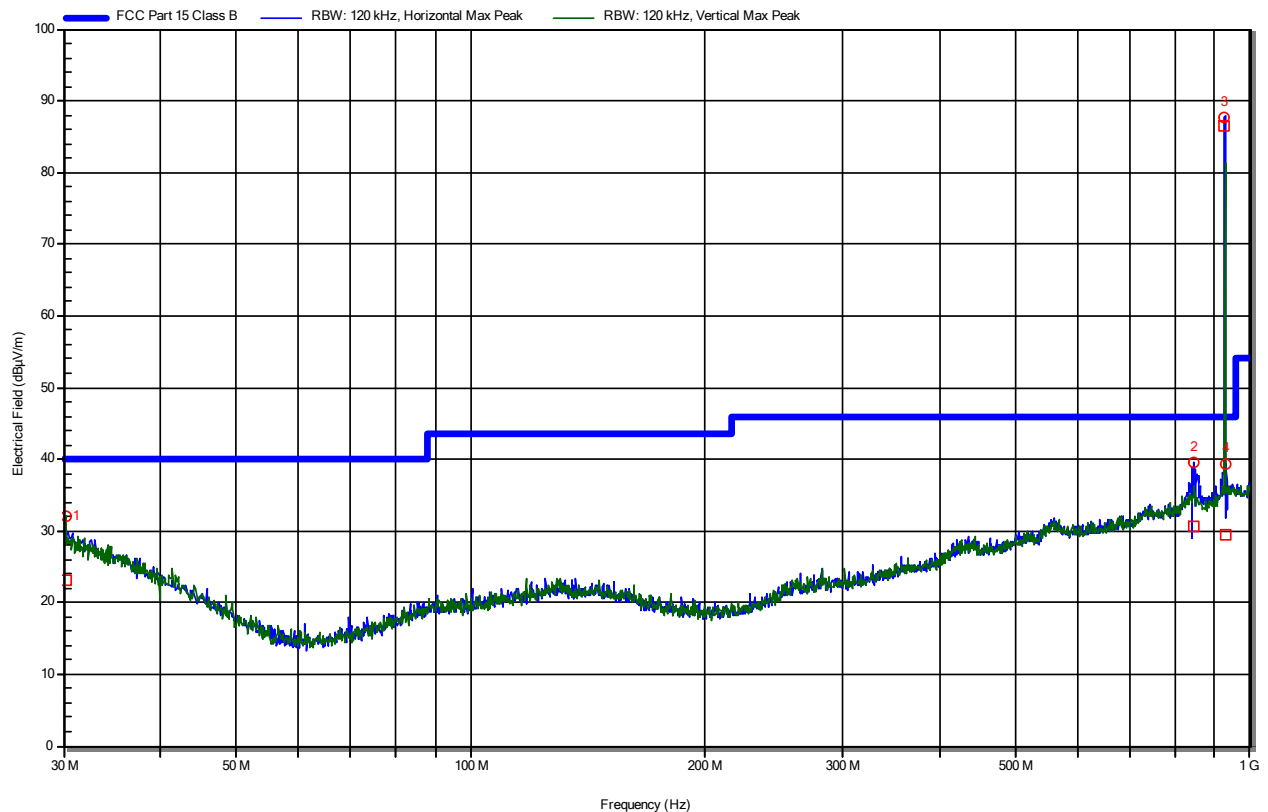
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	RE 30 MHz to 1 GHz		Date and time	13 Apr 2022 14:56:35		Test ID	#14	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)		Distance	3 m	
Notes	ME 14 (final 928 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 928 MHz, Power setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver								
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)					
Equipment	Device Type Spectrum analyser Cable antenna -> preamp Cable antenna -> preamp Cable antenna -> preamp Antenna Turn table Antenna tower	ID 21-07 11-61 15-15 15-16 05-38 17-02 17-02	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 90 dBµV RBW: 120 kHz, VBW: 1 MHz, Sweeptime: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 100 ms Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s					

CFR 47 §§ 15.209/109 Cl B (d = 3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	30.269 MHz	32.1 dBμV/m	23 dBμV/m	40 dBμV/m	-17.0 dB	0 degrees	2 m	Vertical	Pass
2	847.511 MHz	39.6 dBμV/m	30.5 dBμV/m	46 dBμV/m	-15.5 dB	180 degrees	2 m	Horizontal	Pass
3	927.947 MHz	87.8 dBμV/m	86.5 dBμV/m	46 dBμV/m	40.5 dB	0 degrees	1 m	Horizontal	Pass *
4	930.039 MHz	39.3 dBμV/m	29.5 dBμV/m	46 dBμV/m	-16.5 dB	45 degrees	1 m	Horizontal	Pass

* This is the carrier of the radio service

 Place and date of test:
 Operator:

 Rossens, 2022-04-13
 F. Wyler

6.1.10.3 1 GHz to 2.5 GHz

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. Uncertainty: ± 4.7 dB

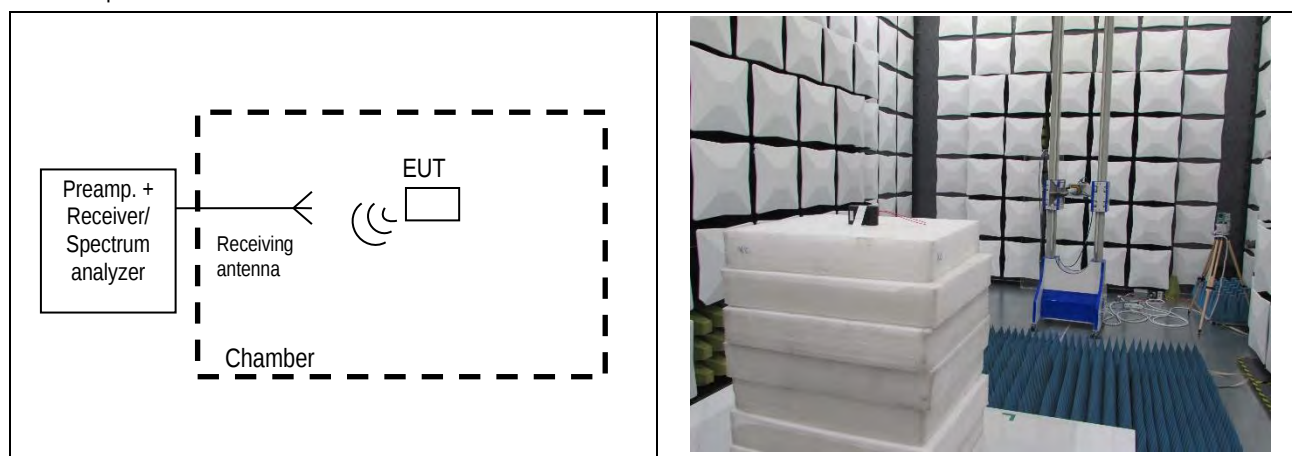
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Comment: None

Climatic conditions: Temperature: 23 °C Humidity: 30 % Pressure QFE: 932 hPa (2022-04-12)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

- Average measurements determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(\text{dB}) = 20\log(\Delta) = 20 \log (20/500) = -27.96$ dB

Test equipment:

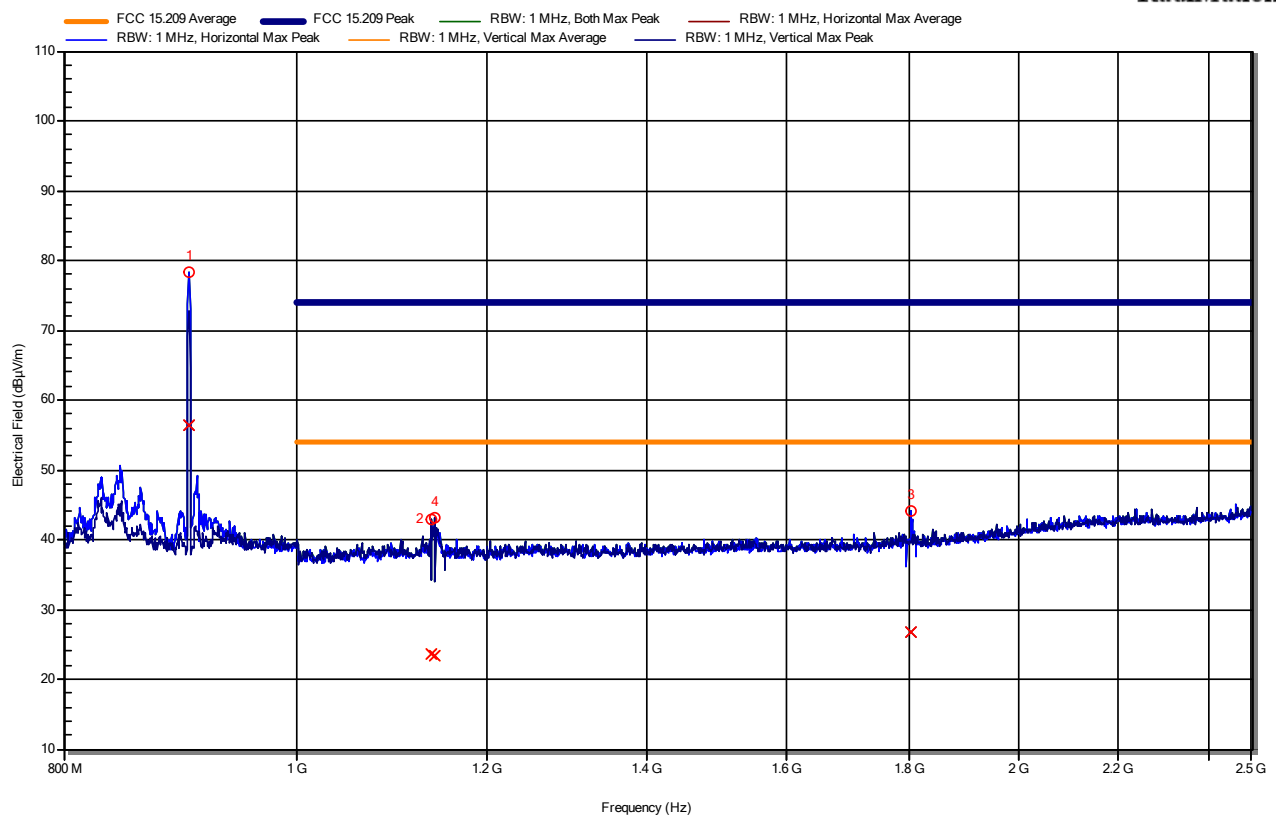
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☐ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☒ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 800 MHz to 2.5 GHz		Date and time	12.04.2022 17:47:19	Test ID	#31	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)	Distance	3 m	
Notes	ME 31 (final 902 MHz) EUT:XC Tracer MAX2 Nr 2000C8; Cables connected: --- Operating mode: TX modulated 902 MHz, TX 18 dBm; Modifications: None Remarks: Notch 04-21;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Cable antenna -> preamp Spectrum analyser Cable preamp -> analyser Antenna Turn table	ID 17-02 11-61 15-16 21-07 15-15 22-07 17-02	Settings	Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

CFR 47 §§ 15.209/109 CI B (d = 3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1 *	901.938 MHz	78.4 dBμV/m			56.4 dBμV/m		180 degrees	1 m	Horizontal	
2	1.139 GHz	42.9 dBμV/m	74 dBμV/m	-31.1 dB	23.6 dBμV/m	-30.4 dB	90 degrees	3 m	Vertical	Pass
4	1.143 GHz	43.1 dBμV/m	74 dBμV/m	-30.9 dB	23.4 dBμV/m	-30.6 dB	90 degrees	3 m	Vertical	Pass
3	1.804 GHz	44 dBμV/m	74 dBμV/m	-30.0 dB	26.8 dBμV/m	-27.2 dB	180 degrees	1 m	Horizontal	Pass

* Carrier of the radio service

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver Peak Value [dBμV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	Peak field [dBμV/m]
1.804 GHz	+15.6	+3.4	0.0	+25.0	= 44.0

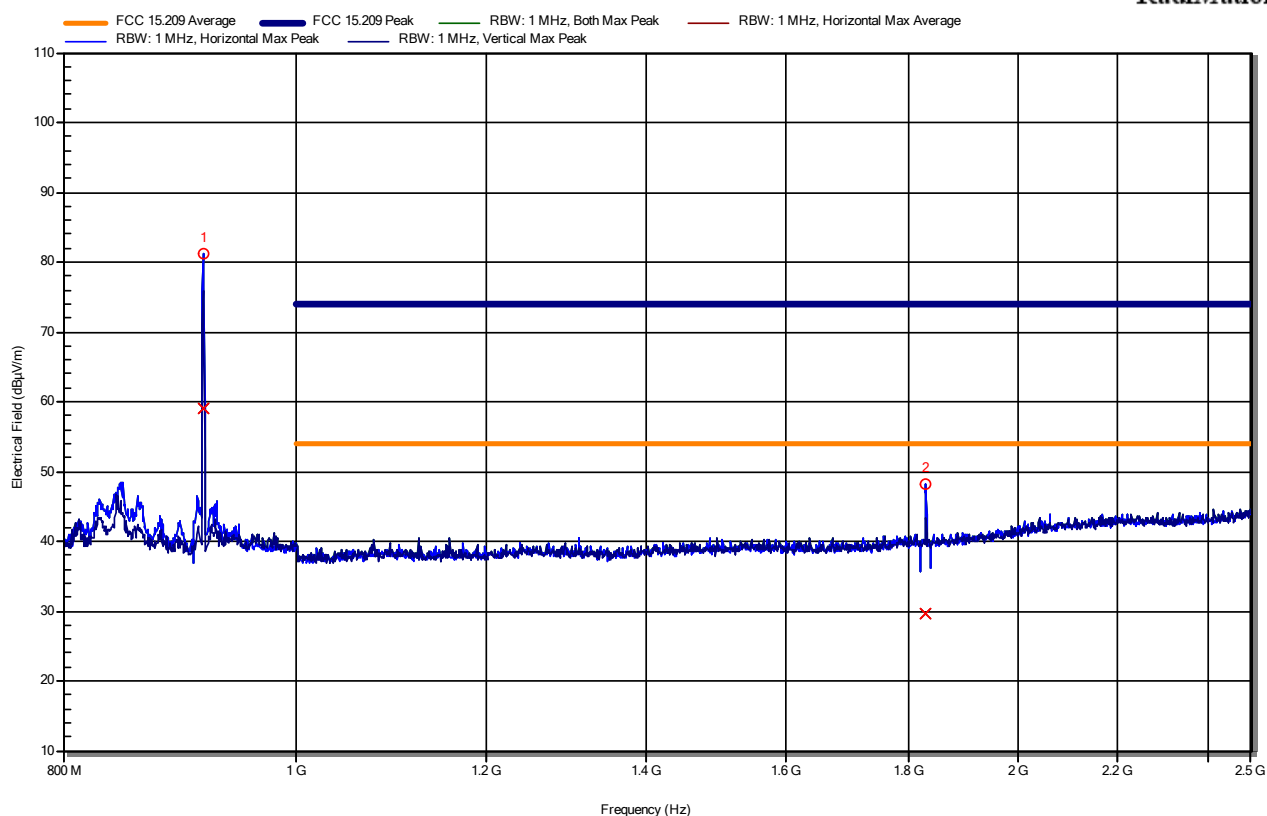
Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

Measurement	RE 800 MHz to 2.5 GHz		Date and time	12.04.2022 13:40:10	Test ID	#22	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)		Distance	3 m
Notes	ME 22: 0.8 to 2.5 GHz, normal operation 18 dBm, XC-Tracer MAX2 EUT normal operation ME 22 (final) EUT: XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz; Modifications: None Remarks: Notch, TX 18 dBm (after software patch);							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type ID Spectrum analyser 21-07 Cable preamp -> analyser 15-15 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-16 Antenna 22-07 Turn table 17-02 Antenna tower 17-02		Settings	Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1 *	914.97 MHz	81.2 dBμV/m			59 dBμV/m		180 degrees	1 m	Horizontal	
2	1.83 GHz	48.2 dBμV/m	74 dBμV/m	-25.8 dB	29.6 dBμV/m	-24.4 dB	180 degrees	1 m	Horizontal	Pass

* Carrier of the radio service

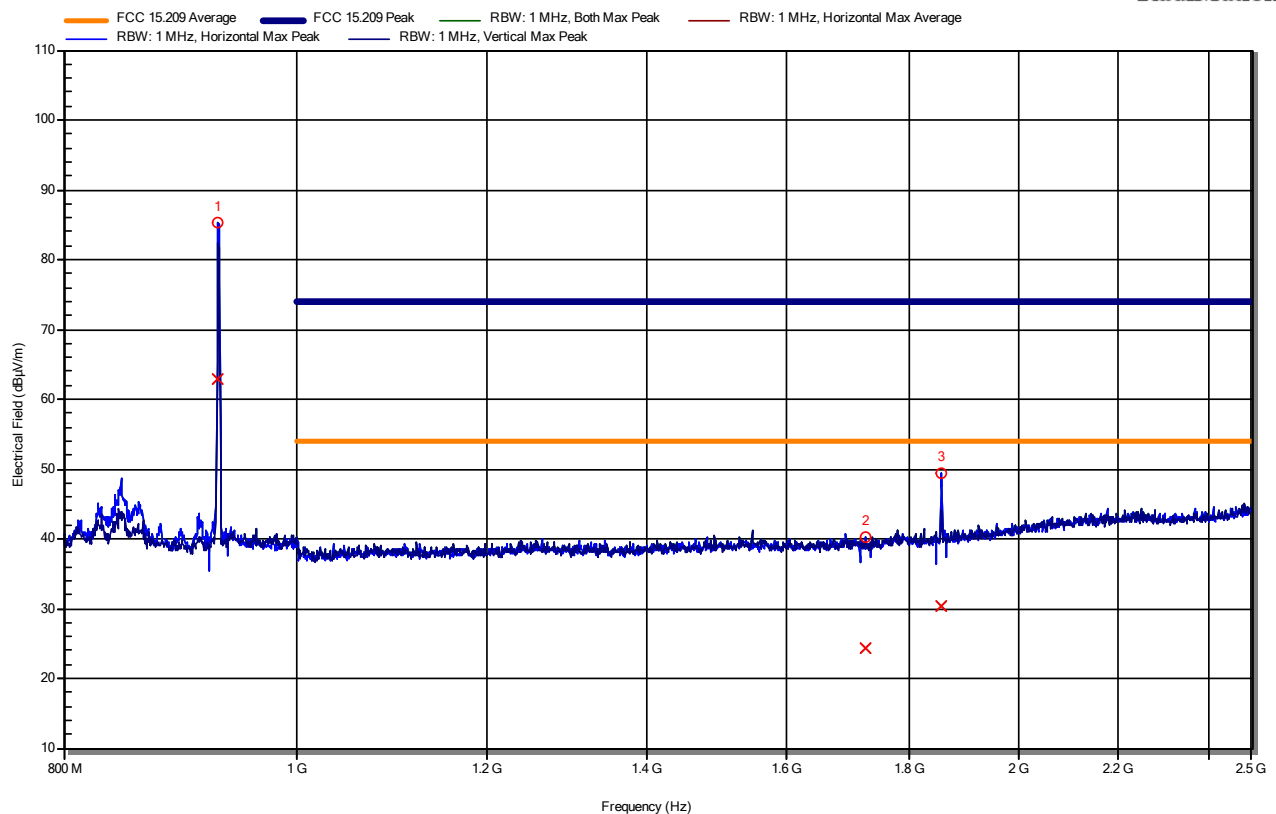
Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

Measurement	RE 800 MHz to 2.5 GHz		Date and time	12.04.2022 17:08:28	Test ID	#30	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)	Distance	3 m	
Notes	ME 30 (final 928 MHz) EUT: XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 928 MHz; Modifications: None Remarks: Notch, TX 18 dBm (after software patch);							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Cable antenna -> preamp Spectrum analyser Cable preamp -> analyser Antenna Turn table	ID 17-02 11-61 15-16 21-07 15-15 22-07 17-02	Settings	Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

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RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	927.902 MHz	85.3 dBµV/m			62.8 dBµV/m		180 degrees	1 m	Horizontal	
2	1.726 GHz	40.3 dBµV/m	74 dBµV/m	-33.7 dB	24.4 dBµV/m	-29.6 dB	292 degrees	3 m	Horizontal	Pass
3	1.856 GHz	49.5 dBµV/m	74 dBµV/m	-24.5 dB	30.5 dBµV/m	-23.5 dB	157 degrees	1 m	Horizontal	Pass

* Carrier of the radio service

Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

6.1.10.4 2.5 GHz to 10 GHz

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. Uncertainty: ± 4.7 dB

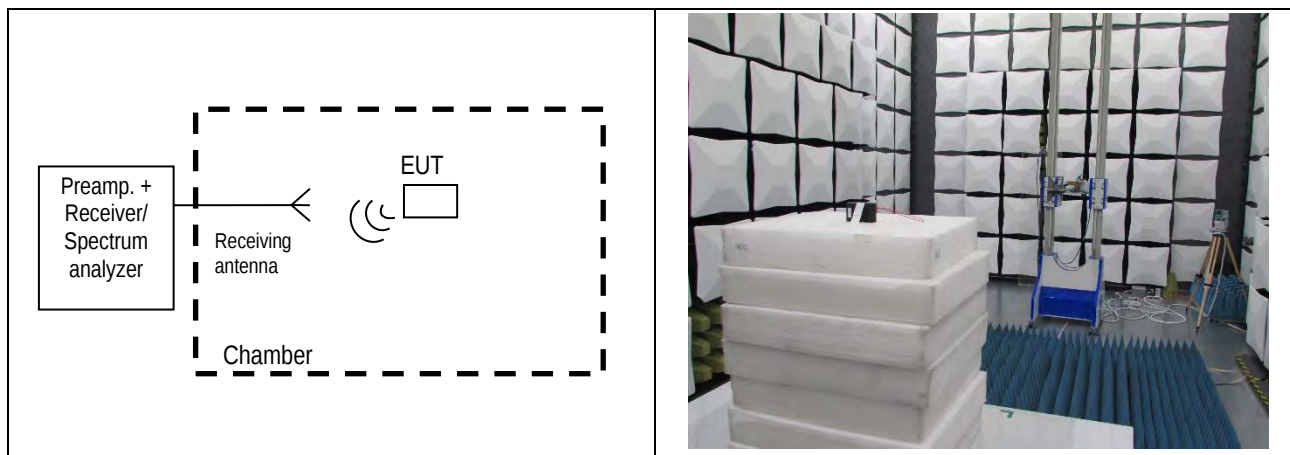
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Comment: None

Climatic conditions: Temperature: 23 °C Humidity: 30 % Pressure QFE: 932 hPa (2022-04-12)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

- Average measurements determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(\text{dB}) = 20\log(\Delta) = 20 \log (20/500) = -27.96$ dB

Test equipment:

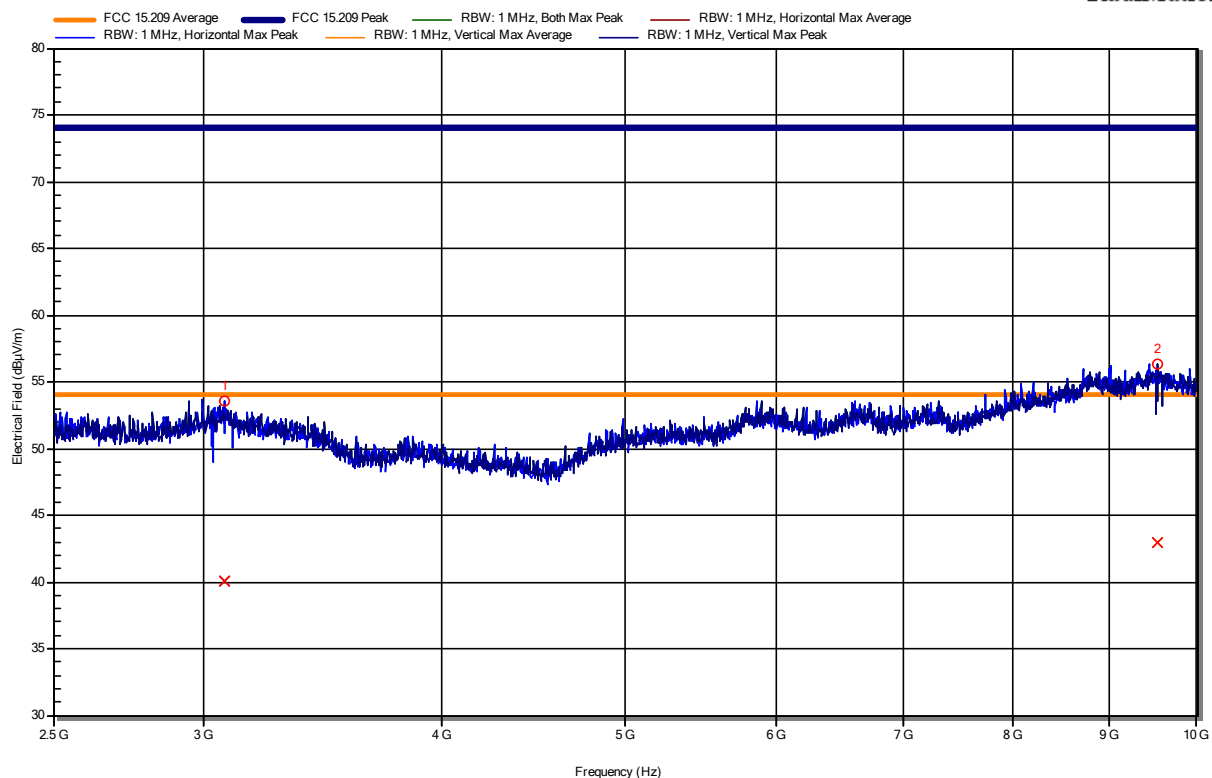
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☒ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☐ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 2.5 GHz to 10 GHz		Date and time	12.04.2022 18:23:12	Test ID	#32	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)	Distance	3 m	
Notes	ME 32 (final 902 MHz) EUT:XC Tracer MAX2 Nr 2000C8; Cables connected: --- Operating mode: TX modulated 902 MHz; Modifications: None Remarks: Notch, TX 18 dBm (after software patch);							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type Pre amplifier Cable antenna -> preamp Antenna tower Turn table Spectrum analyser Cable antenna -> preamp Antenna Cable preamp -> analyser	ID 05-56 15-16 17-02 17-02 21-07 11-61 22-07 15-15	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	3.075 GHz	53.5 dBµV/m	74 dBµV/m	-20.5 dB	40.1 dBµV/m	-13.9 dB	337 degrees	1 m	Horizontal	Pass
2	9.541 GHz	56.3 dBµV/m	74 dBµV/m	-17.7 dB	42.9 dBµV/m	-11.1 dB	45 degrees	1 m	Vertical	Pass

Sample calculation with all conversion and correction factors used

Frequency [MHz]	Receiver Peak Value [dBµV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	Peak field [dBµV/m]
3.075 GHz	+47.4	+4.6	-28.3	+29.8	= 53.5

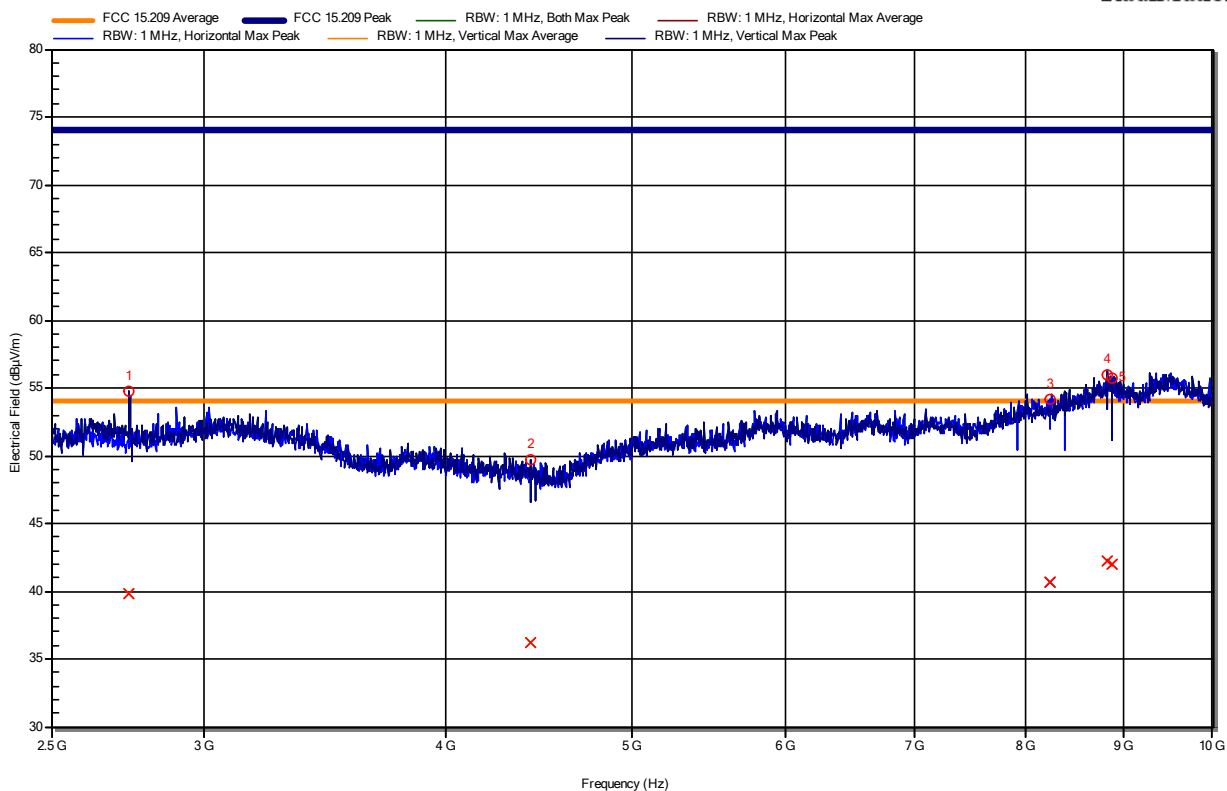
Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

Measurement	RE 2.5 GHz to 10 GHz		Date and time	12.04.2022 14:54:46	Test ID	#25	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)		Distance	3 m
Notes	ME 25: 2.5 to 10 GHz, normal operation 18 dBm, XC-Tracer MAX2 EUT normal operation ME 25 (final 915 MHz) EUT: XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz; Modifications: None Remarks: Notch, TX 18 dBm (after software patch);							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Turn table Spectrum analyser Cable antenna -> preamp Antenna Pre amplifier Cable preamp -> analyser	ID 17-02 11-61 17-02 21-07 15-16 22-07 05-56 15-15	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	2.745 GHz	54.8 dBµV/m	74 dBµV/m	-19.2 dB	39.8 dBµV/m	-14.2 dB	90 degrees	1 m	Vertical	Pass
2	4.432 GHz	49.7 dBµV/m	74 dBµV/m	-24.3 dB	36.2 dBµV/m	-17.8 dB	157 degrees	4 m	Vertical	Pass
3	8.235 GHz	54.2 dBµV/m	74 dBµV/m	-19.8 dB	40.7 dBµV/m	-13.3 dB	112 degrees	1 m	Horizontal	Pass
4	8.817 GHz	55.9 dBµV/m	74 dBµV/m	-18.1 dB	42.3 dBµV/m	-11.7 dB	225 degrees	4 m	Vertical	Pass
5	8.864 GHz	55.7 dBµV/m	74 dBµV/m	-18.3 dB	42 dBµV/m	-12.0 dB	90 degrees	1 m	Vertical	Pass

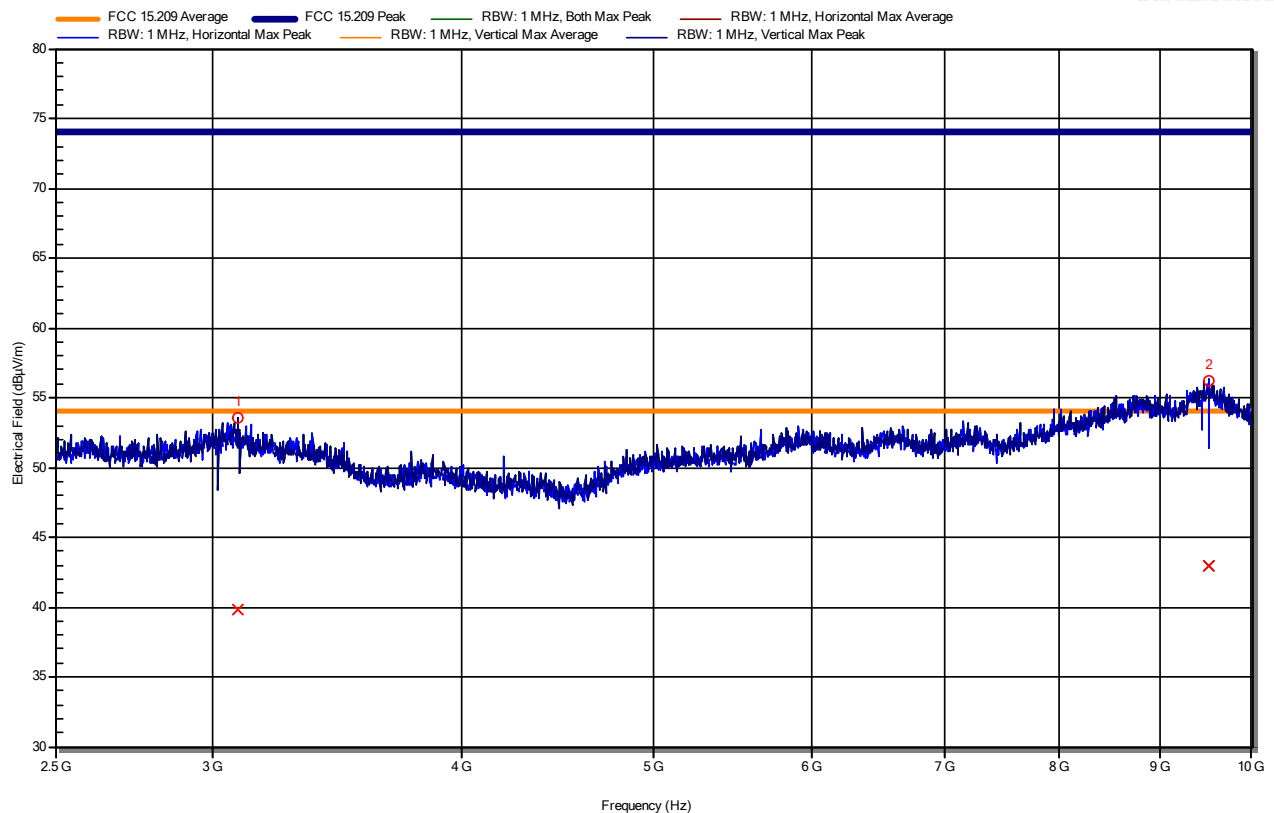
Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

Measurement	RE 2.5 GHz to 10 GHz		Date and time	12.04.2022 16:21:16	Test ID	#28	Operator	F. Wyler
EUT	Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)	Distance	3 m	
Notes	ME 28 (final 928 MHz) EUT: XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 928 MHz; Modifications: None Remarks: Notch, TX 18 dBm (after software patch);							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type	ID	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 40 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 5 s, AVG 1 s / 10 s				
	Cable antenna -> preamp	11-61						
	Turn table	17-02						
	Antenna	22-07						
	Pre amplifier	05-56						
	Antenna tower	17-02						
	Spectrum analyser	21-07						
	Cable antenna -> preamp	15-16						
	Cable preamp -> analyser	15-15						

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RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	3.091 GHz	53.5 dBµV/m	74 dBµV/m	-20.5 dB	39.8 dBµV/m	-14.2 dB	292 degrees	1 m	Vertical	Pass
2	9.514 GHz	56.2 dBµV/m	74 dBµV/m	-17.8 dB	43 dBµV/m	-11.0 dB	202 degrees	1 m	Horizontal	Pass

Place and date of test:
Operator:

Rossens, 2022-04-12
F. Wyler

6.1.11 Spurious emissions, receive mode – radiated**6.1.11.1 30 MHz to 1 GHz**

Test site: ☒ SAC3 ☐ SAC10

Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

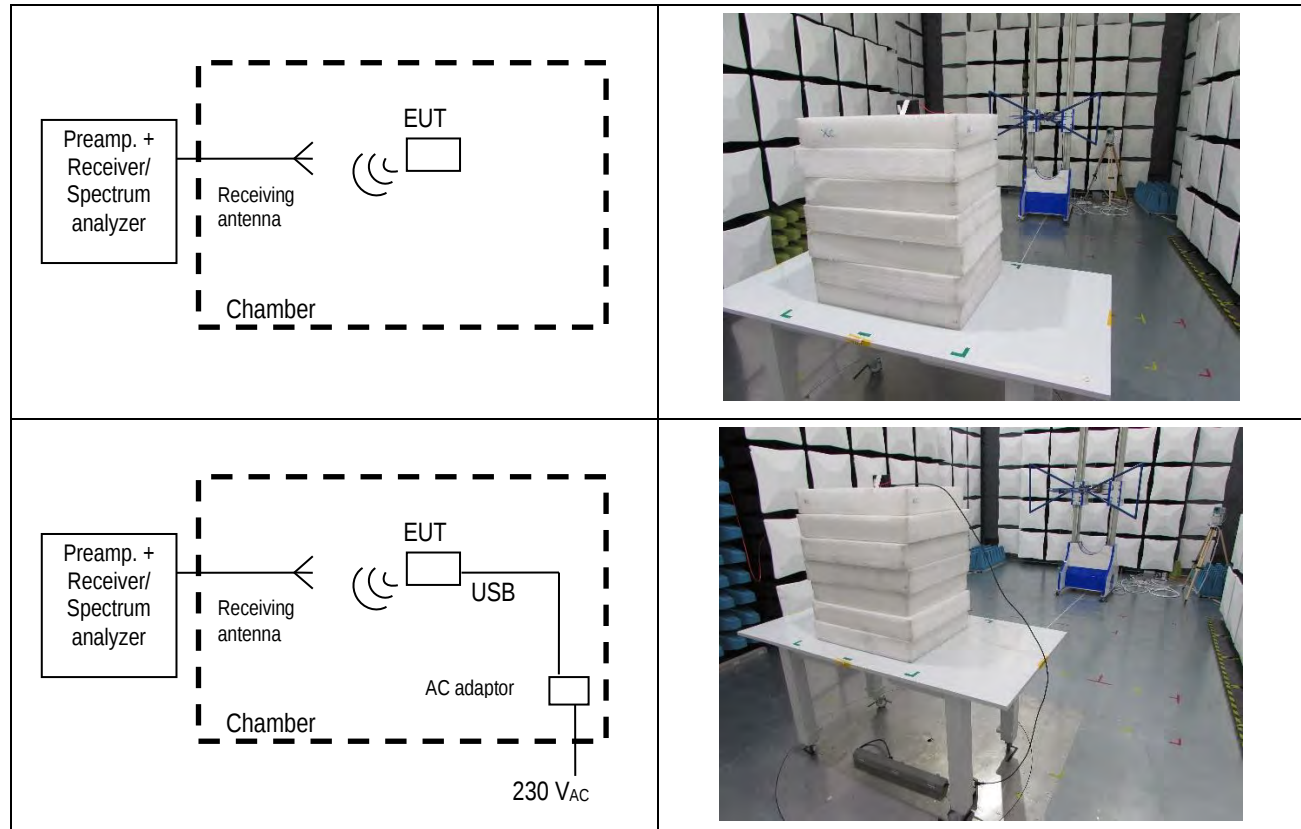
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 35 % Pressure QFE: 935 hPa (2022-04-13)

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 919 hPa (2022-04-22)

Test set-up:**Test equipment:**

Spectrum analyser	☐ 19-09	☒ 21-07					
Receiver	☐ 19-09	☒ 21-07					
Preamplifier	☐ 14-27	☐ 05-56	☐ 11-29				
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06				
Antenna (horn)	☐ 22-07	☐ 168554	☐ 90-24	☐ 09-27			
Antenna, (bi-con-log)	☒ 05-38	☐ 19-15					
Decoupling clamps	☒ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652	☐ 15653	
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)				
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14	☒ RadiMation 2020.1.8				

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Remarks:

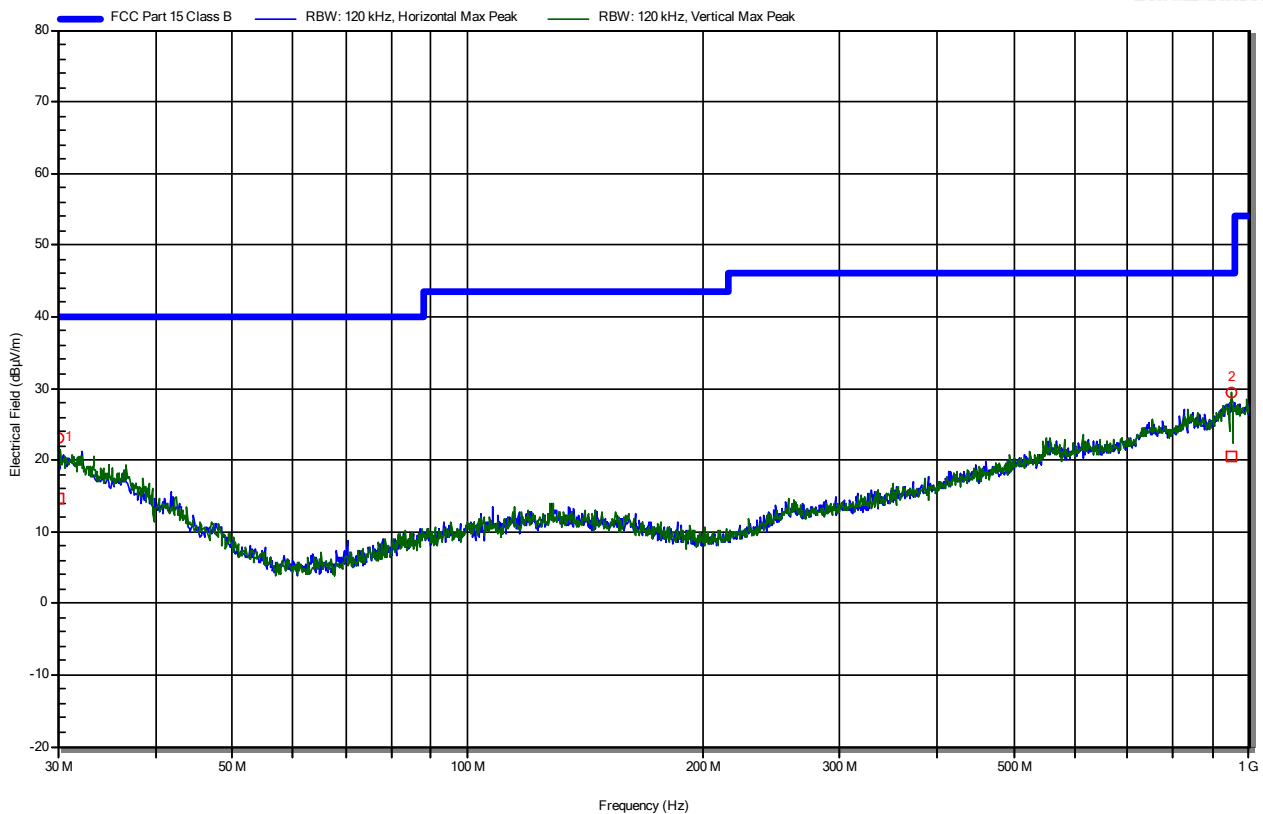
- Limit values expressed in dB μ V/m and transformed to a measuring distance of 3 m (factor used = 20 dB/decade) if necessary
e.g.: for f = 40 MHz the limit is 100 μ V/m at 3 m;

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

Measurement	RE 30 MHz to 1 GHz		Date and time	13.04.2022 16:17:30	Test ID	#19	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)		Distance	3 m
Notes	ME 19 (final 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: RX 915 MHz; Modifications: None Remarks: None							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)				
Equipment	Device Type	ID	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 90 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweep time: 100 ms, Number of Sweeps: 10 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 100 ms Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s				
	Spectrum analyser	21-07						
	Cable antenna -> preamp	11-61						
	Cable antenna -> preamp	15-15						
	Cable antenna -> preamp	15-16						
	Antenna	05-38						
	Turn table	17-02						
	Antenna tower	17-02						

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Radiation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	30.051 MHz	23 dBµV/m	14.6 dBµV/m	40 dBµV/m	-25.4 dB	135 degrees	3 m	Vertical	Pass
2	950.748 MHz	29.5 dBµV/m	20.4 dBµV/m	46 dBµV/m	-25.6 dB	270 degrees	2 m	Vertical	Pass

Sample calculation with all conversion and correction factors used

Frequency [MHz]	Analyser PK value [dBµV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	QP field [dBµV/m]
30.05	-5.2	+0.3	0.0	+19.5	= 14.6

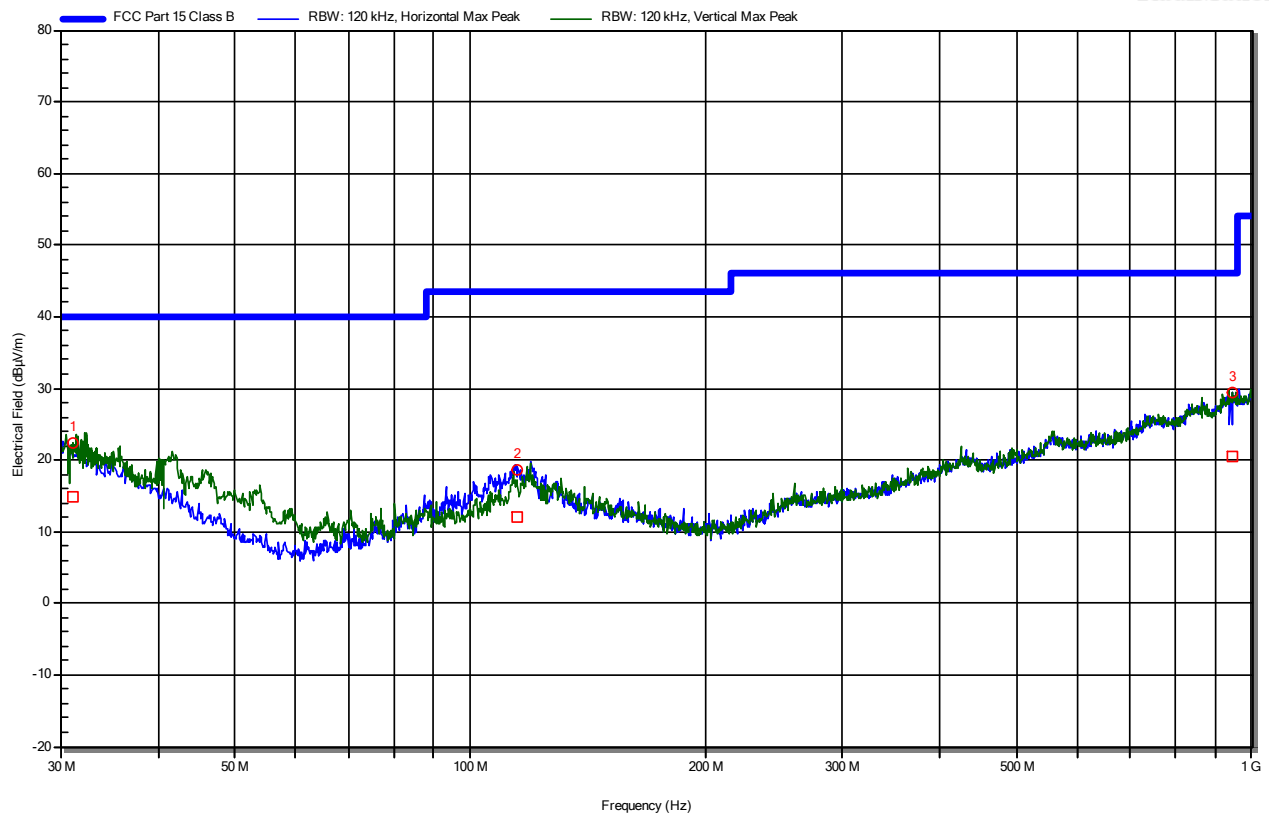
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	RE 30 MHz to 1 GHz		Date and time	22.04.2022 15:17:10	Test ID	#5	Operator	F. Wyler
EUT							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)		Distance	3 m
Notes	ME5 (final charging) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: Charging with AC/DC Adapter 120 VAC 60 Hz; Modifications: None Remarks: None							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)				
Equipment	Device Type Cable antenna -> preamp Turn table Antenna Cable antenna -> preamp Antenna tower Spectrum analyser Cable antenna -> preamp	ID 15-15 17-02 05-38 11-61 17-02 21-07 15-16	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 90 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 200 ms Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s				

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RadiMation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	31.13 MHz	22.3 dBµV/m	14.7 dBµV/m	40 dBµV/m	-25.3 dB	315 degrees	3 m	Vertical	Pass
2	114.85 MHz	18.6 dBµV/m	12 dBµV/m	43.5 dBµV/m	-31.5 dB	180 degrees	1 m	Horizontal	Pass
3	945.161 MHz	29.3 dBµV/m	20.4 dBµV/m	46 dBµV/m	-25.6 dB	225 degrees	3 m	Horizontal	Pass

Place and date of test:
Operator:

Rossens, 2022-04-22
F. Wyler

6.1.11.2 1 GHz to 10 GHz (FCC / industry Canada)

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

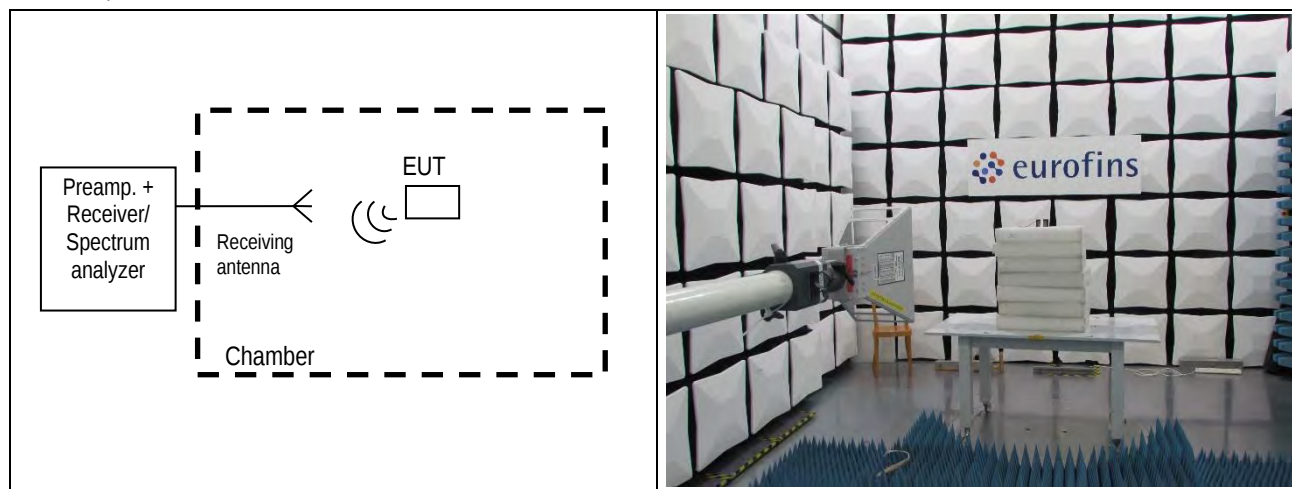
Meas. Uncertainty: ± 4.7 dB

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 23 °C Humidity: 35 % Pressure QFE: 935 hPa

Test set-up:



Remarks: Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary
e.g.: for f = 1 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

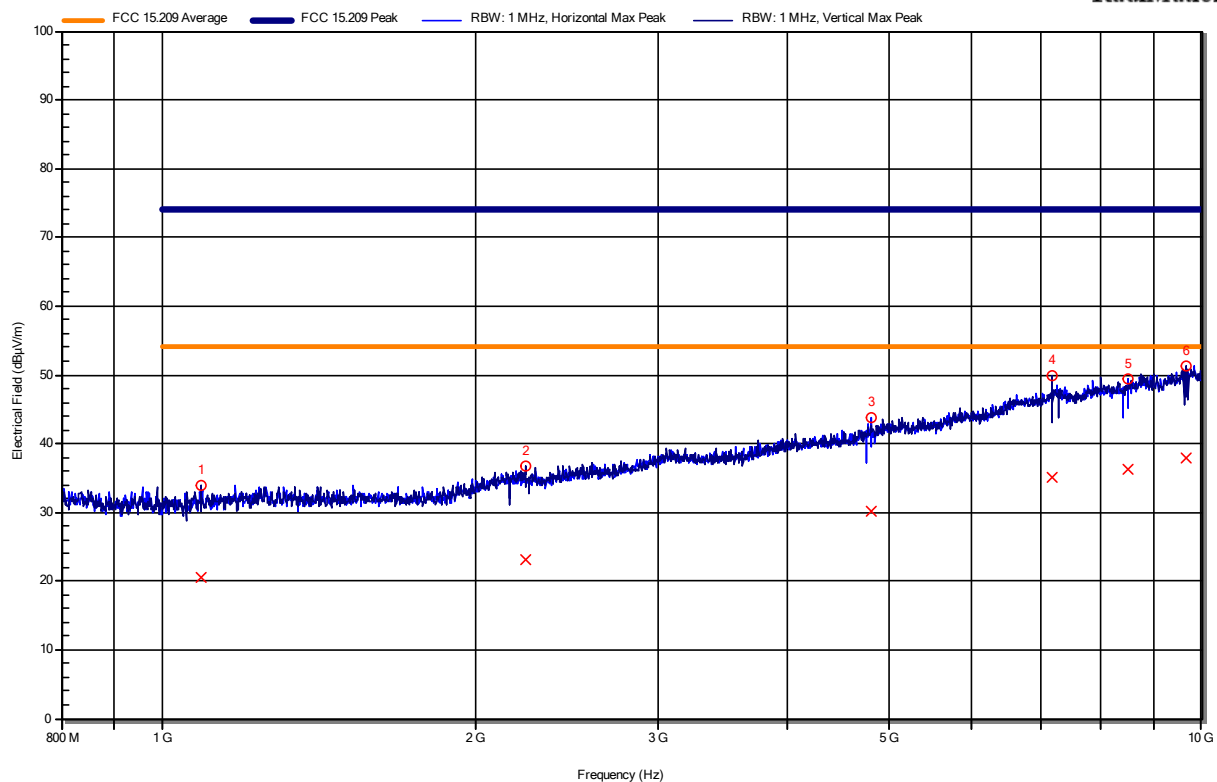
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☒ 14-27	☐ 184451	☐ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☐ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 800 MHz to 10 GHz			Date and time	13.04.2022 10:13:02	Test ID	#5	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 8 step(s)			Distance	3 m
Notes	ME5 (final RX 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: RX receiving 915 MHz; Modifications: None Remarks: None								
Test Place	ROS-SAC3			Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type ID Antenna tower 17-02 Cable antenna -> preamp 11-61 Turn table 17-02 Spectrum analyser 21-07 Cable antenna -> preamp 15-16 Antenna 22-07 Pre amplifier 14-27 Cable preamp -> analyser 15-15			Settings	Band(s): 800 MHz - 10 GHz, Reference Level: 70 dBμV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 10 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

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RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	1.092 GHz	34 dBμV/m	74 dBμV/m	-40.0 dB	20.5 dBμV/m	-33.5 dB	360 degrees	1 m	Vertical	Pass
2	2.238 GHz	36.7 dBμV/m	74 dBμV/m	-37.3 dB	23.1 dBμV/m	-30.9 dB	180 degrees	3 m	Vertical	Pass
3	4.816 GHz	43.8 dBμV/m	74 dBμV/m	-30.2 dB	30.1 dBμV/m	-23.9 dB	45 degrees	3 m	Horizontal	Pass
4	7.191 GHz	49.8 dBμV/m	74 dBμV/m	-24.2 dB	35 dBμV/m	-19.0 dB	360 degrees	2 m	Vertical	Pass
5	8.498 GHz	49.4 dBμV/m	74 dBμV/m	-24.6 dB	36.2 dBμV/m	-17.8 dB	225 degrees	3 m	Horizontal	Pass
6	9.664 GHz	51.2 dBμV/m	74 dBμV/m	-22.8 dB	37.9 dBμV/m	-16.1 dB	270 degrees	1 m	Vertical	Pass

Sample calculation with all conversion and correction factors used					
Frequency [GHz]	Analyzer Peak value [dBμV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	Peak field [dBμV/m]
4.816	45.2	5.7	-39.5	+32.4	= 43.8

Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

6.2 Mode LoRa

6.2.1 Antenna requirement

Requirement: According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Results of the test

The device has an built in internal antenna, which can not be changed (Pass)
The antenna gain is specified in chapter 4.6 is 3.6 dBi < 6 dBi (Pass)

Result:	☒ pass	☐ fail	☐ not applicable	☐ not tested
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6.2.2 Channel 6 dB Bandwidth

Introduction: Channel-bandwidth measured at -6 dBc.

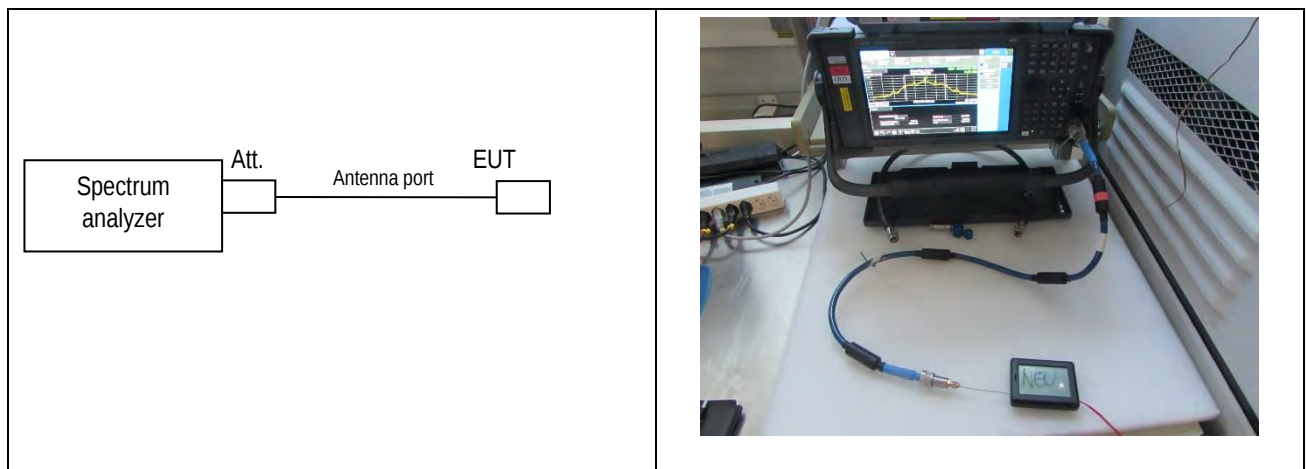
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Method: Measurement on the temporary antenna connector

Limit: For digital modulated systems operating in the 902-928 MHz band, the bandwidth must be greater than 500 kHz.

Test set-up:



Remarks: - - -

Test equipment:

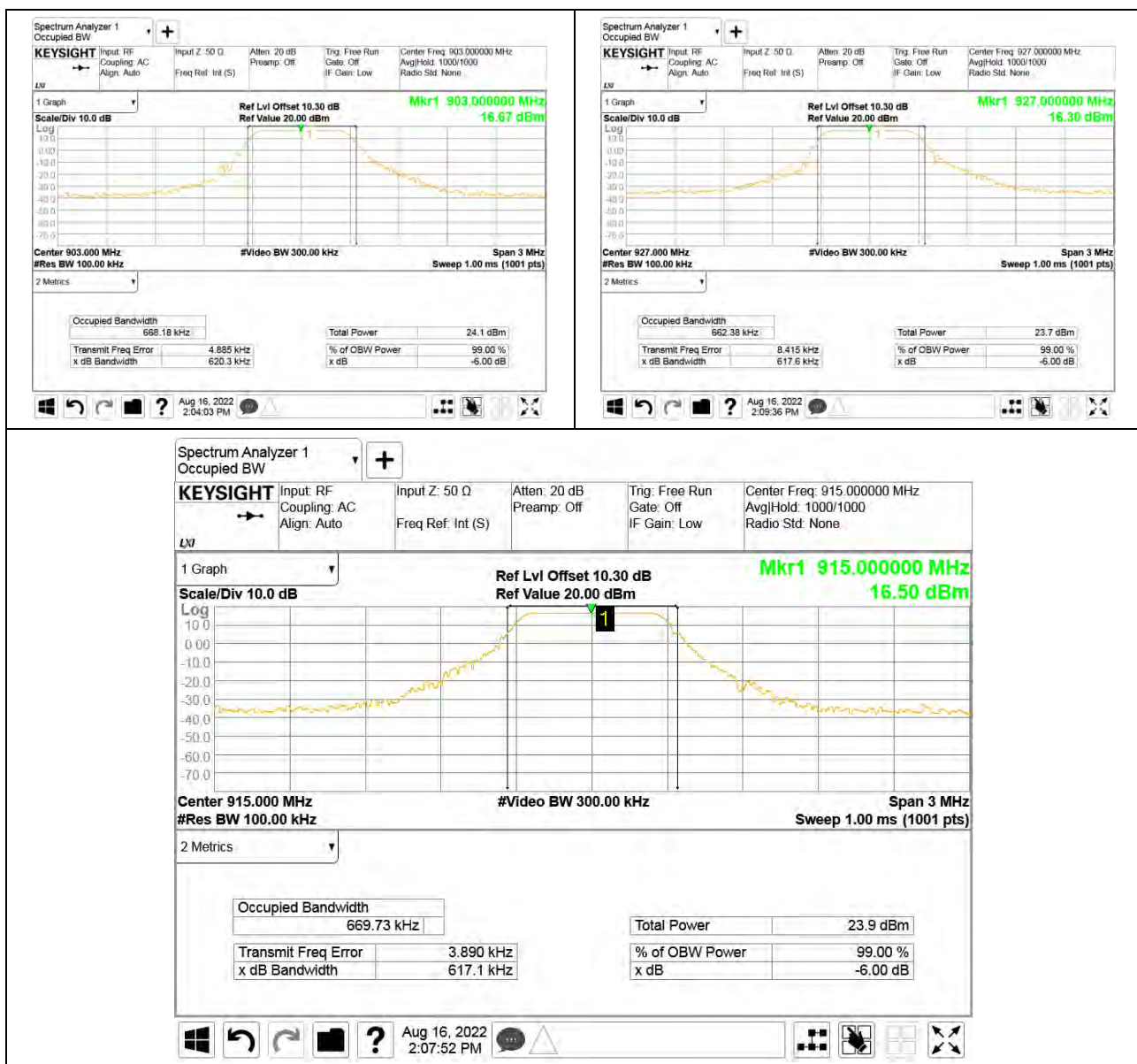
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C9)
 Operating mode: TX, f = 903 / 915.0 / 927 MHz, modulated, power setting 18 dBm
 Cables connected to the EUT: Temporary antenna cable
 Remarks: Measured on temporary antenna connector
 RBW = 100 kHz, VBW = 30 kHz; Peak detector
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
 Climatic conditions: Temperature: 25 °C Humidity: 38 % Pressure QFE: 929 hPa

frequency [MHz]	Temp [°C]	U [V]	BW [kHz]	Limit [kHz]	Remarks	Pass Yes	No
903	25	---	620.3	> 500	---	☒	☐
915	25	---	617.1	> 500	---	☒	☐
927	25	---	617.6	> 500	---	☒	☐



Place and date of test:
 Operator:

Rossens, 2022-08-16
 F. Wyler

6.2.3 Duty Cycle

Introduction: Average duration during which the system stays on one channel.

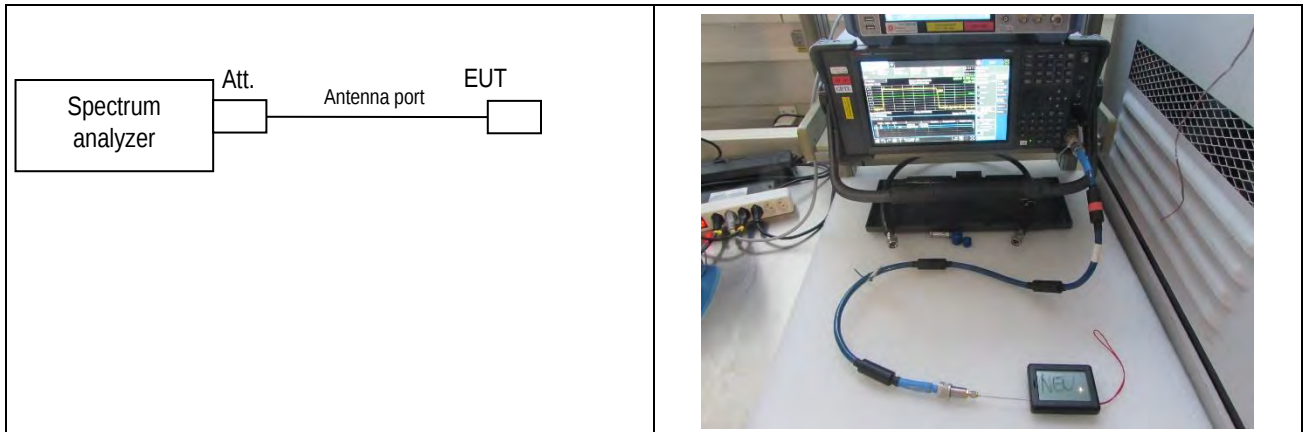
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: $\pm 2.6 \mu\text{s/s}$

Method: Measurement on the antenna connector or a test fixture.

Requirement: None, but needed for measurements

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C9)
 Operating mode: Continuously hopping on all channels, power setting 18 dBm
 Cables connected to the EUT: Temporary antenna cable
 Remarks: Measured on temporary antenna connector
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 25 °C Humidity: 38 % Pressure QFE: 929 hPa (2022-08-16)
 Climatic conditions: Temperature: 23 °C Humidity: 39 % Pressure QFE: 940 hPa (2022-09-21)

Frequency (MHz)	Measured On time (ms)	Measured Cycle time (ms)	Average On Time	10 * Log (1/ Average On time)	Limit
903	19.96	115.5	0.173	7.62 dB	None
915.0	20.01	116.5	0.171	7.75 dB	None
927	19.90	117.8	0.169	7.72 dB	None

*Note: Used for measurement of power spectral density in § 6.2.6



Place and date of test:
 Operator:

Rossens, 2022-08-16 / 2022-09-21
 F. Wyler

6.2.4 Maximum output power (conducted)

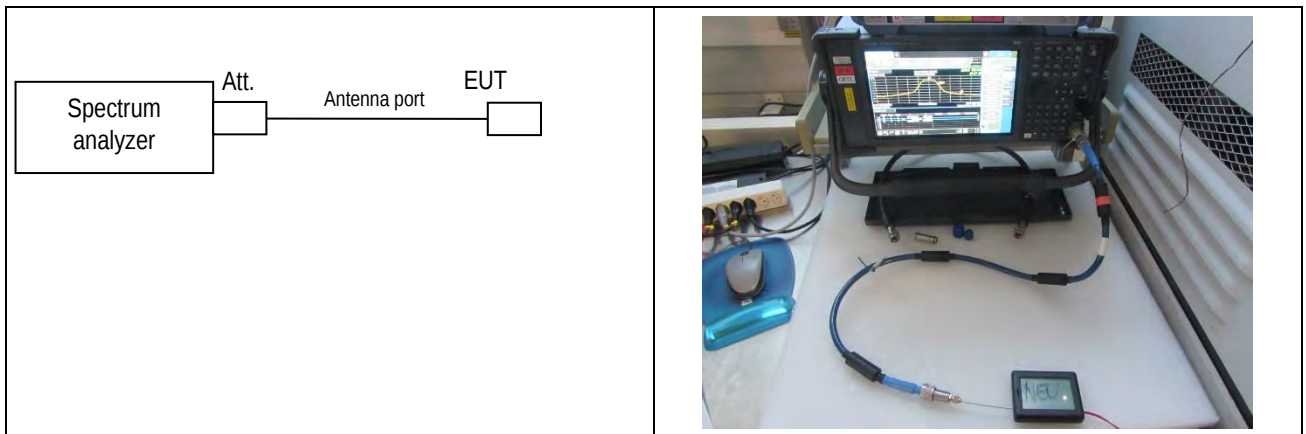
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Requirement: For digital modulated systems operating in the 902-928 MHz band, the maximum peak conducted output power of the intentional radiator shall not exceed 1 watt (30 dBm).

Test set-up:



Remarks: - - -

Test equipment:

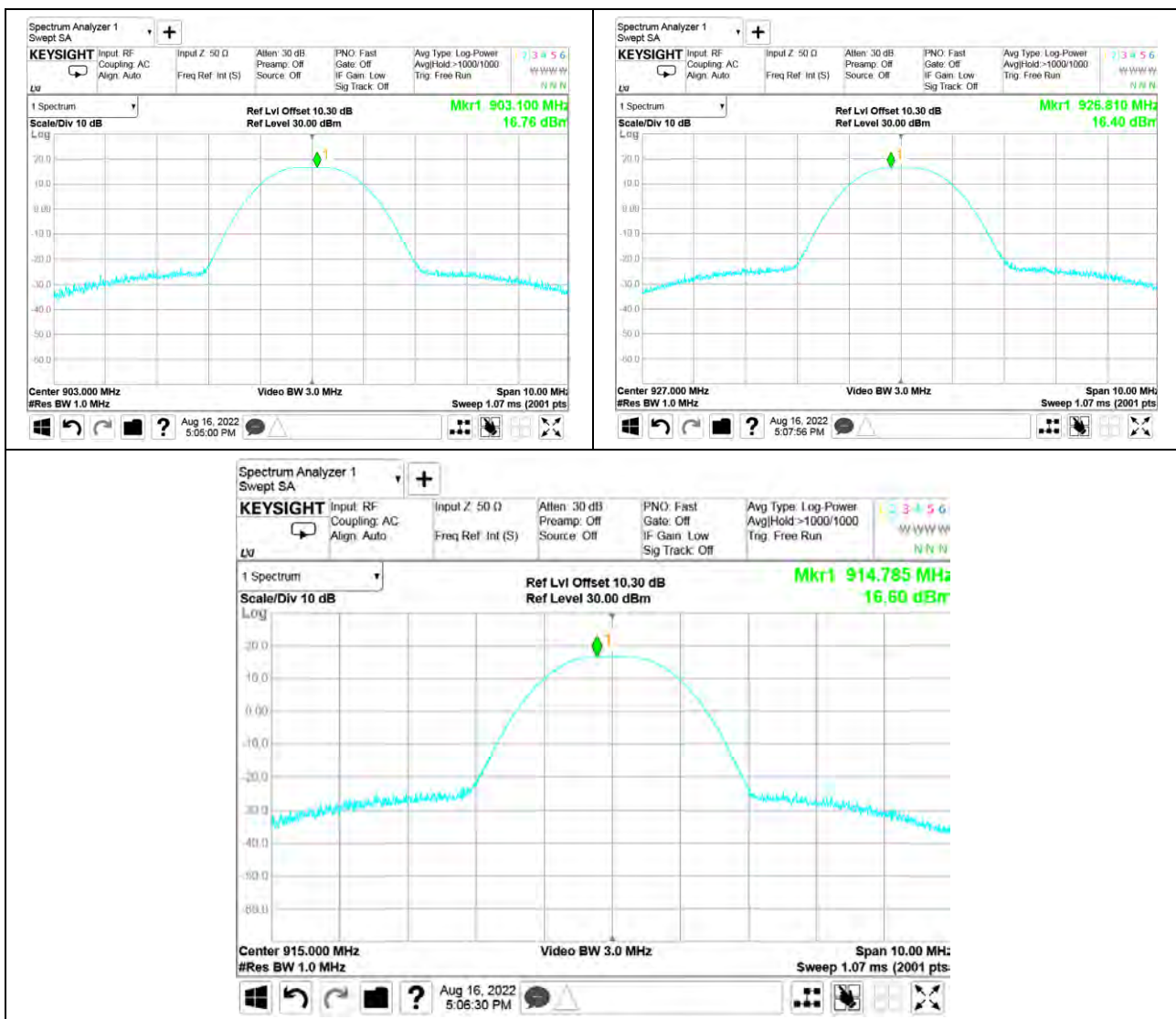
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C09)
 Operating mode: TX, f = 903 / 915.0 / 927 MHz, modulated, power setting 18 dBm
 Cables connected to the EUT: Antenna cable
 Remarks: Measured on temporary antenna connector
 RBW = 1 MHz, VBW = 3 MHz; Peak detector, Trace Max Hold
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
 Climatic conditions: Temperature: 25 °C Humidity: 38 % Pressure QFE: 929 hPa

frequency [MHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass Yes	Pass No
903	25	---	16.76	30	---	☒	☐
915	25	---	16.60	30	---	☒	☐
927	25	---	16.40	30	---	☒	☐



Place and date of test:
 Operator:

Rossens, 2022-08-16
 F. Wyler

6.2.5 Band Edge Emission

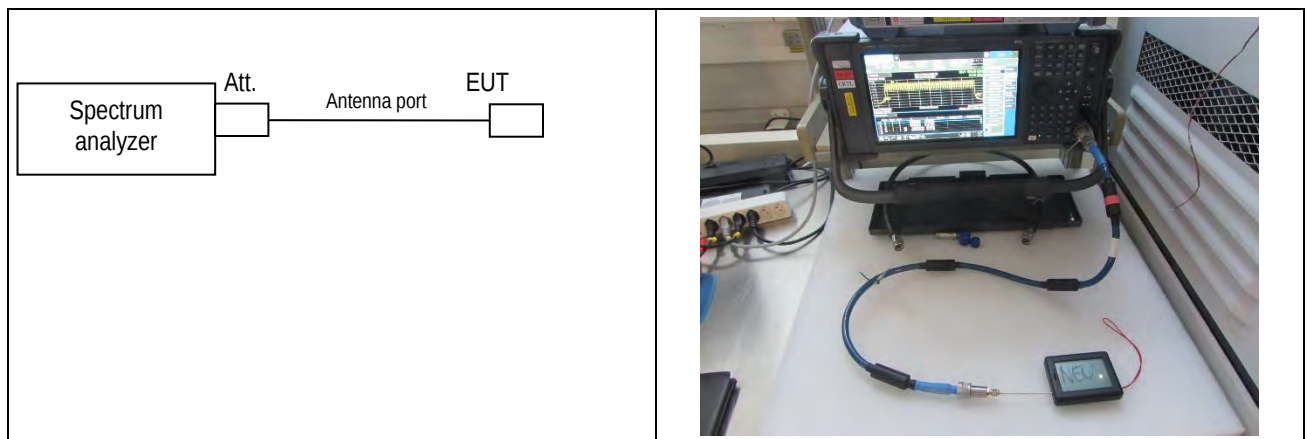
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the conducted power on the antenna connector or a test fixture.

Requirement: In any 100 kHz bandwidth outside the frequency band, the radio frequency power 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.

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

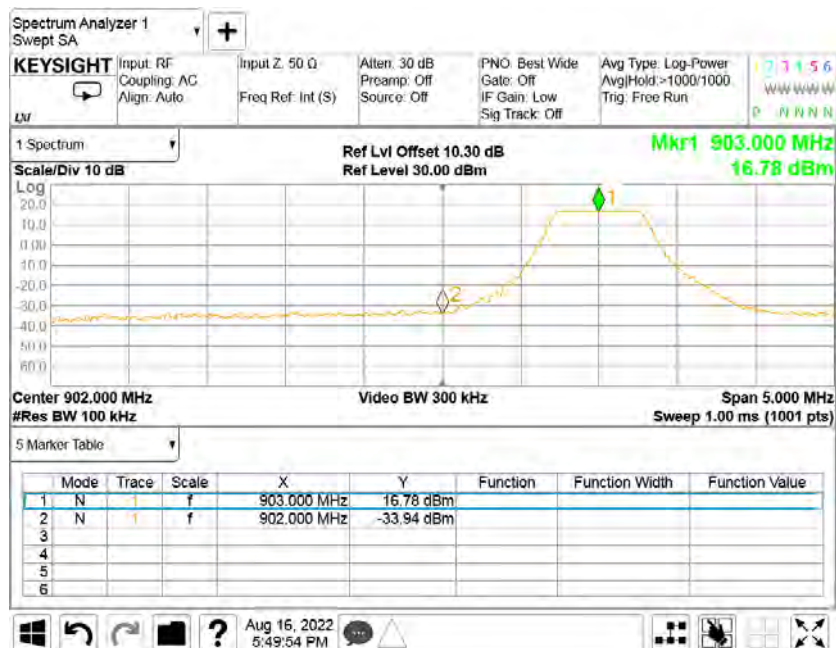
Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C9)
 Operating mode: TX, modulated, power setting 18 dBm. See results hereafter
 Cables connected to the EUT: Temporary antenna cable
 Remarks: Measured on temporary antenna connector
 Detector Peak, Trace Max Hold

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 25 °C Humidity: 38 % Pressure QFE: 929 hPa

Conclusion: Pass



Place and date of test:
Operator:

Rossens, 2022-08-16
F. Wyler

6.2.6 Power Spectral Density

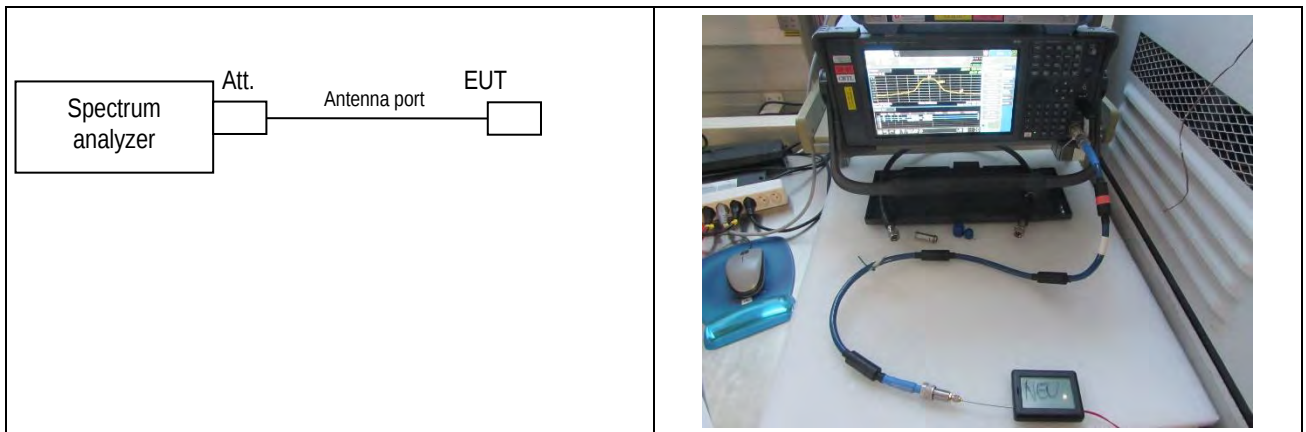
Test site: ☐ SAC10 ☐ open test site
☐ SAC3 ☒ laboratory

Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
 3GHz – 6.7GHz: ± 2.1 dB
 6.7GHz – 13.2GHz: ± 2.6 dB
 13.2GHz – 19GHz: ± 2.8 dB
 19GHz – 26.5GHz: ± 3 dB

Test method: Measurement of the power spectral density on the antenna connector or a test fixture.

Requirement: For digital modulated systems operating in the 902-928 MHz band, the power spectral density of the intentional radiator shall not exceed 8 dBm

Test set-up:



Remarks: - - -

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☐ 99-07	☐ 04-31				
Attenuator	☒ 2013-21 (10 dB)					
Cables	☒ 19-131					

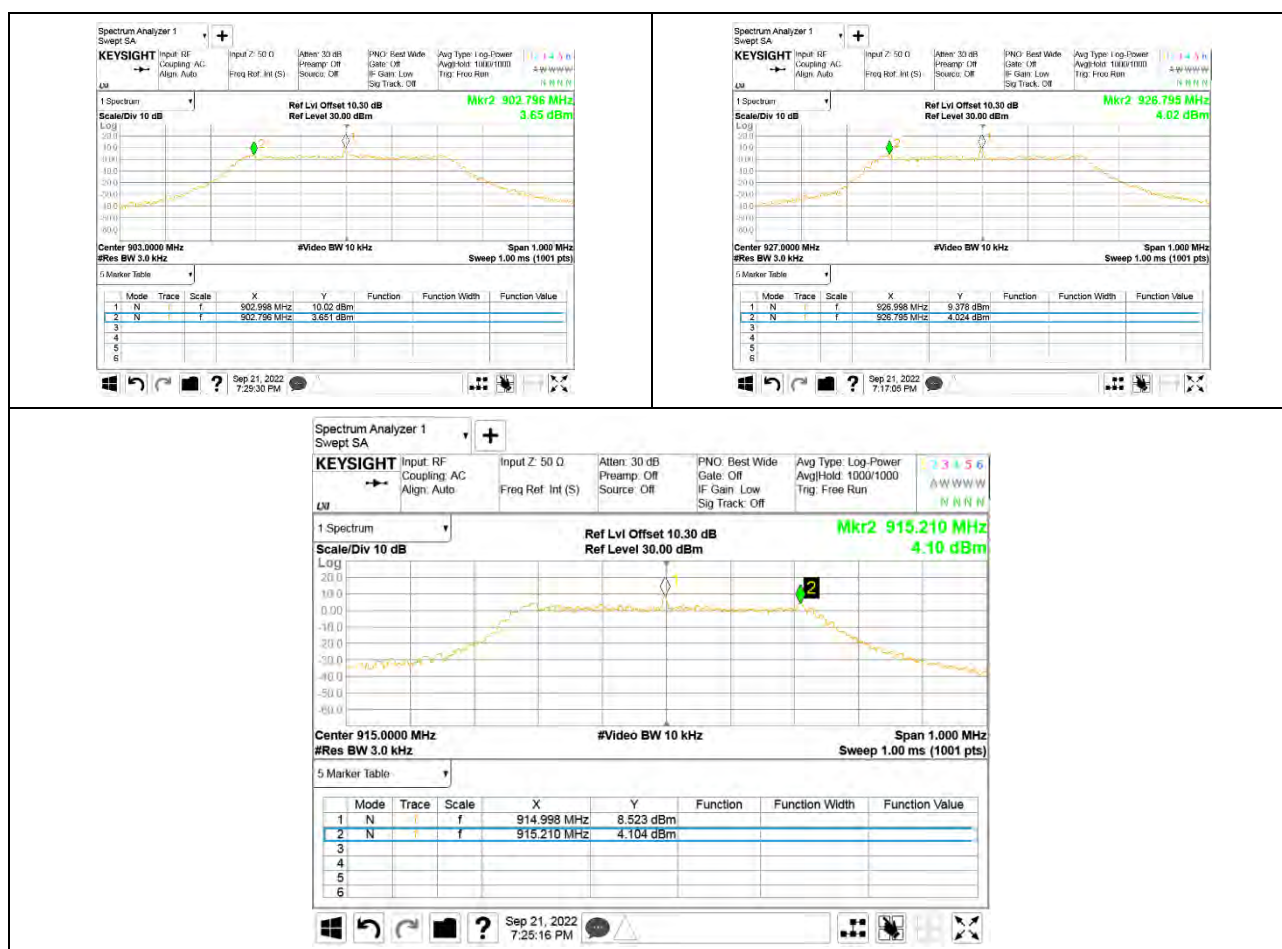
Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Results of the test

Applicant: XC Tracer GmbH
 EUT: XC Tracer Maxx II (ID: 2000C09)
 Operating mode: TX, f = 903 / 915.0 / 927 MHz, modulated, power setting 18 dBm
 Cables connected to the EUT: Antenna cable
 Remarks: Measured on temporary antenna connector
 RBW = 3 kHz, VBW = 10 kHz; Peak detector, Trace Max Hold
 Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
 Climatic conditions: Temperature: 23 °C Humidity: 39 % Pressure QFE: 940 hPa

Measurements with Peak detector and Trace Max Hold

frequency [MHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass Yes	Pass No
903	23	---	10.02	8	---	☒ *	☐
915	23	---	8.52	8	---	☒ *	☐
927	23	---	9.38	8	---	☒ *	☐



* Comment:

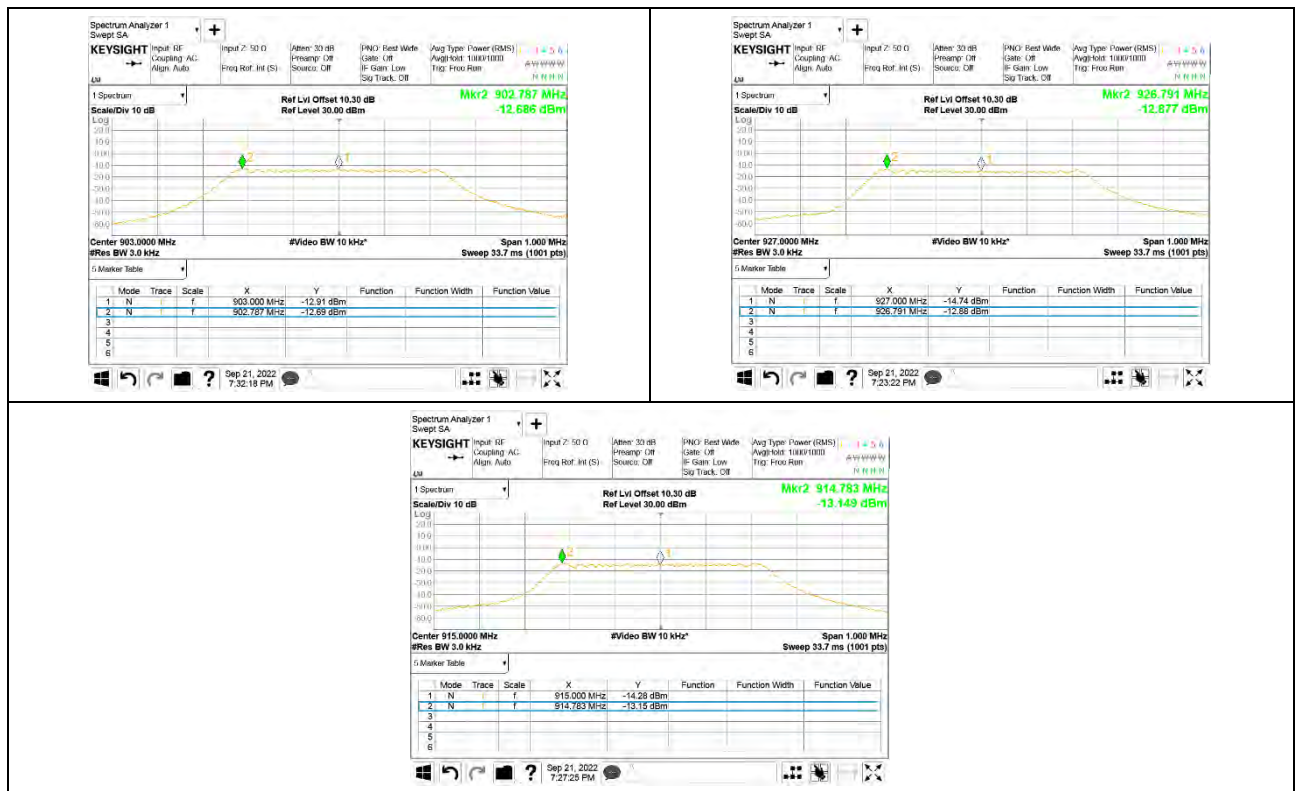
The LoRa transmission packet starts with an unmodulated chirp signal for recognition of the packet start. With Peak detector and Trace Max Hold, this results in a too height power spectral density for the carrier. Therefore the spectral density was measured with rms detector and Trace averaging, too show that the requirements is fulfilled.

Place and date of test:
 Operator:

Rossens, 2022-09-21
 F. Wyler

Second measurements with RMS detector and Trace Averaging.

frequency [MHz]	Temp [°C]	U [V]	P [dBm]	Corr [dBm]	Final [dBm]	Limit [dBm]	Remarks	Pass Yes	Pass No
903	23	---	-12.68	7.62	-4.96	8	---	☒ *	☐
915	23	---	-13.15	7.75	-5.40	8	---	☒ *	☐
927	23	---	-12.88	7.72	-5.15	8	---	☒ *	☐



* Comment:

In average no increase of the carrier frequency is visible.

Place and date of test:
Operator:

Rossens, 2022-09-21
F. Wyler

6.2.7 Spurious emissions, transmit mode – radiated**6.2.7.1 9 kHz to 30 MHz**Test site: ☒ SAC3 ☐ SAC10Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1 m (height of the equipment under test above floor)

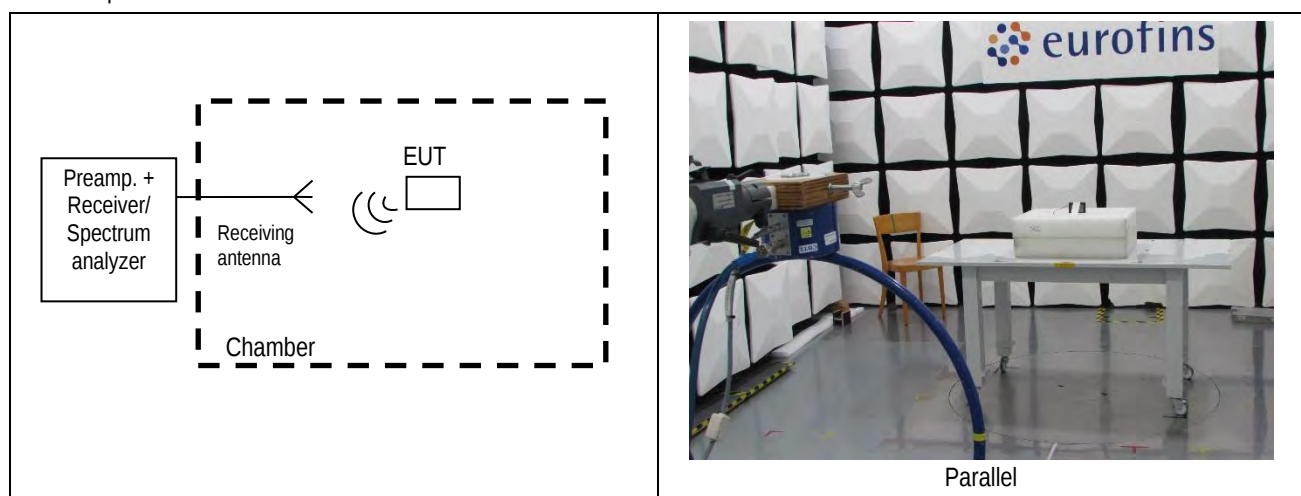
Meas. Uncertainty: ± 2.8 dB

Test method: The magnetic disturbance radiated by the equipment under test is measured using a spectrum analyzer and a wide band magnetic antenna. The antenna is placed at 1 m height, first in the direction of the apparatus under test, then at 90° to the apparatus and if required also horizontally. If possible the turning table is operated through 360° during the measurement. The recording is carried out taking into account the maximum value of the disturbance appearing during the functioning of the apparatus under test. The peak values are recorded continuously on a graph. The values exceeding the limits are re-measured using a measuring receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 25 °C Humidity: 46 % Pressure QFE: 938 hPa

Test set-up:



Remarks: Limit values expressed in dBμV/m and transformed to a measuring distance of 10 m (factor used = 40 dB/decade) if necessary
e.g.: for f = 10 MHz the limit is 30 μV/m at 30 m;

$$20 \log \left(\frac{30 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 40 \log \left(\frac{30 m}{3 m} \right) = 69.5 \frac{dB\mu V}{m} \text{ at } 3m$$

“Parallel” means measurement antenna axis towards EUT

Test equipment:

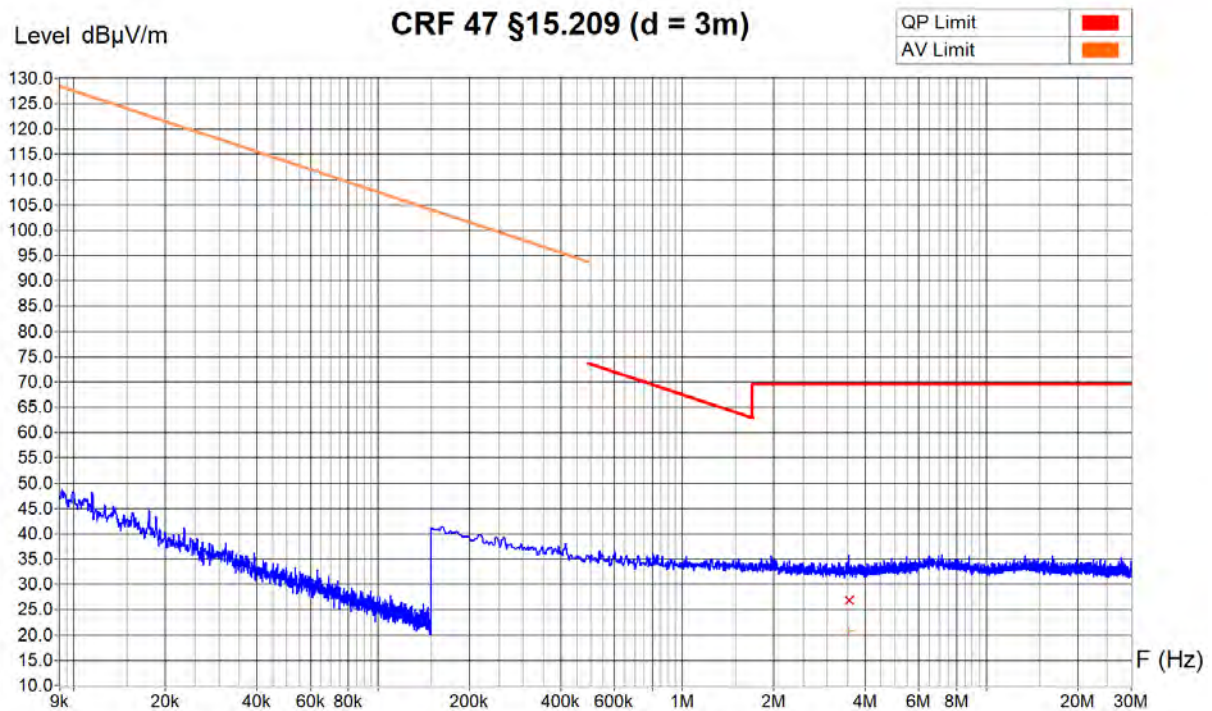
Spectrum analyser	☒ 21-07 ☐ 184454	☐ 25953
Receiver	☒ 21-07 ☐ 184454	☐ 25953
Preamplifier	☐ 14-27 ☐ 168520	
Antenna, (log-per)	☐ 168585 ☐ 26021	
Antenna, (H-Feld)	☒ 90-25	
Antenna, (Horn)	☐ 07-31	
Antenna, (Horn)	☐ 98-12	
Cables	☒ SAC3_1.0, 2.0, 3.0	☐ 49076/4 (1-18 GHz)
Software and Revision	☒ Vitam, Rev. 2_4_13	☐ RadiMation 2016.1.6

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement Type : Radiated Field
Polarisation : Parallel
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 903 MHz, modulated, Power setting 18 dBm
Remarks : None



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
3.54 MHz	35.6 dB μ V/m	26.8 dB μ V/m	20.7 dB μ V/m	42.7 dB

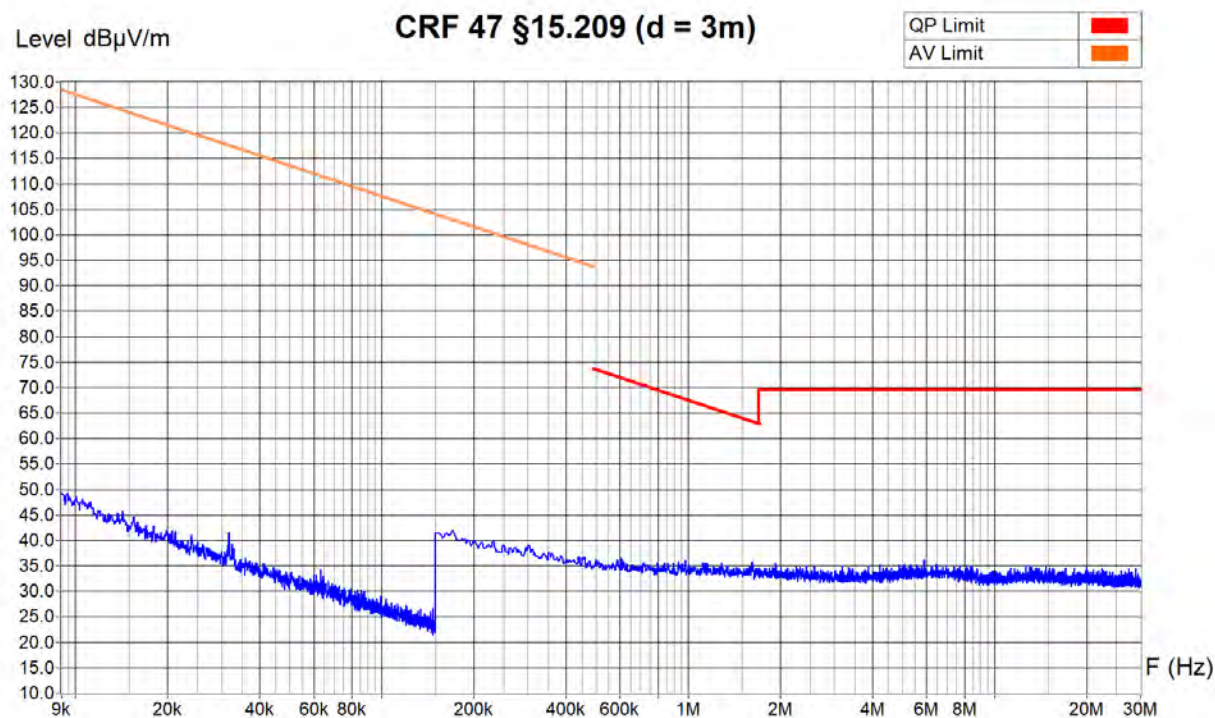
Sample calculation with all conversion and correction factors used				
Frequency [MHz]	Receiver QP value [dB μ V]	Cable att. corr. [dB]	Antenna factor corr. [dB]	QP field [dB μ V/m]
3.54	+6.3	+0.2	+20.3	= 26.8

Operator FWy
Date/Time: 2022-08-03 10:25
Filename:
ME1_TX903M_Par_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Parallel
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
 Set-Up : Chamber SAC3, See photos, Peak detector sweep
 Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
 Remarks : None



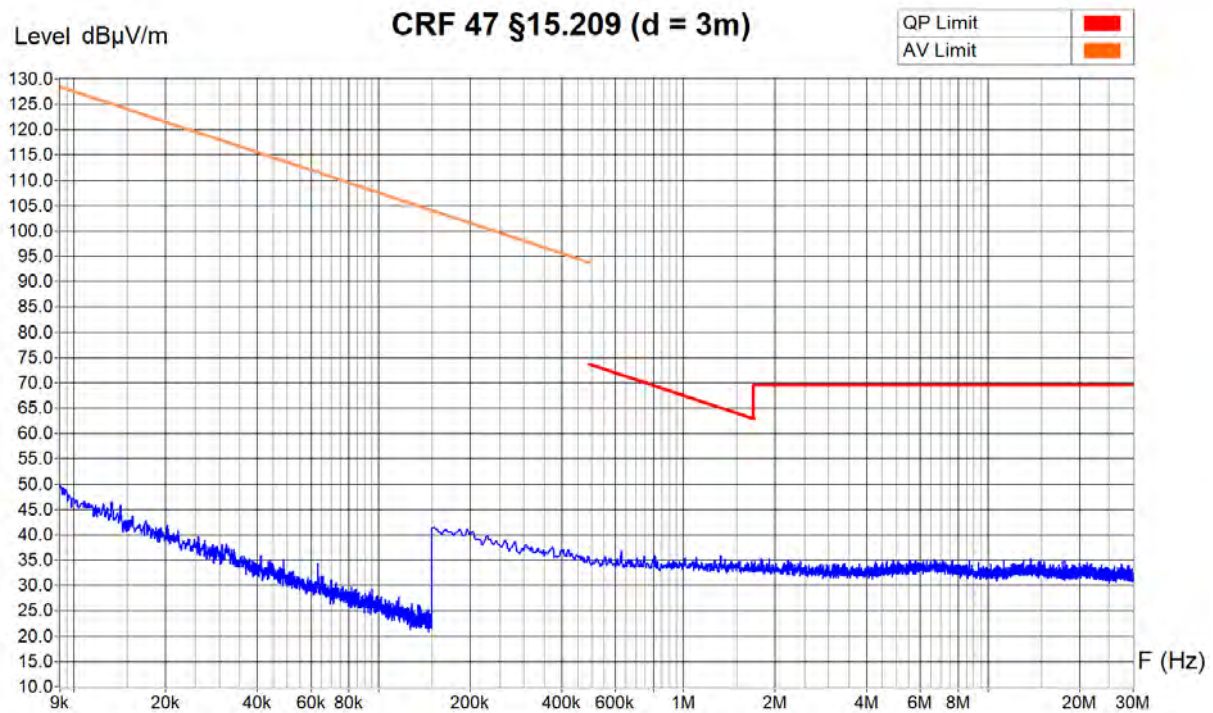
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator : FWy
 Date/Time : 2022-08-03 10:48
 Filename : ME2_TX915M_Par_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Parallel
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 927 MHz, modulated, Power setting 18 dBm
Remarks : None



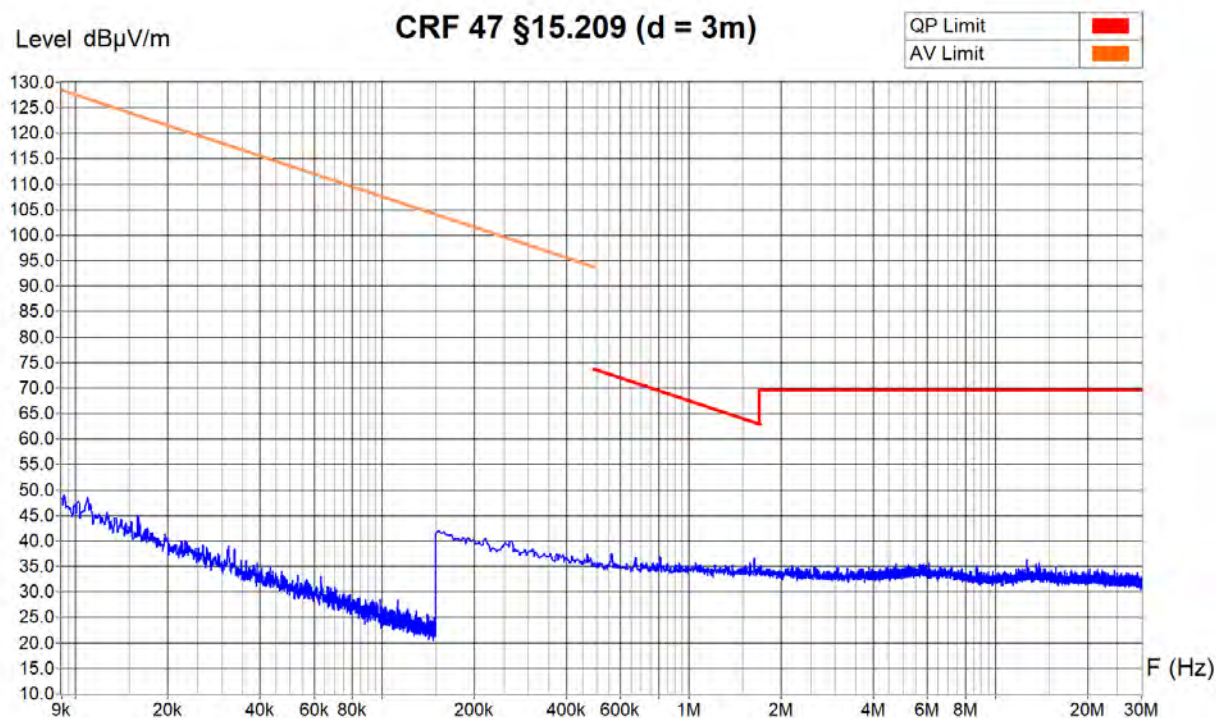
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator FWy
Date/Time: 2022-08-03 10:56
Filename:
ME3_TX927M_Par_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Perpendicular
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 903 MHz, modulated, Power setting 18 dBm
Remarks : None



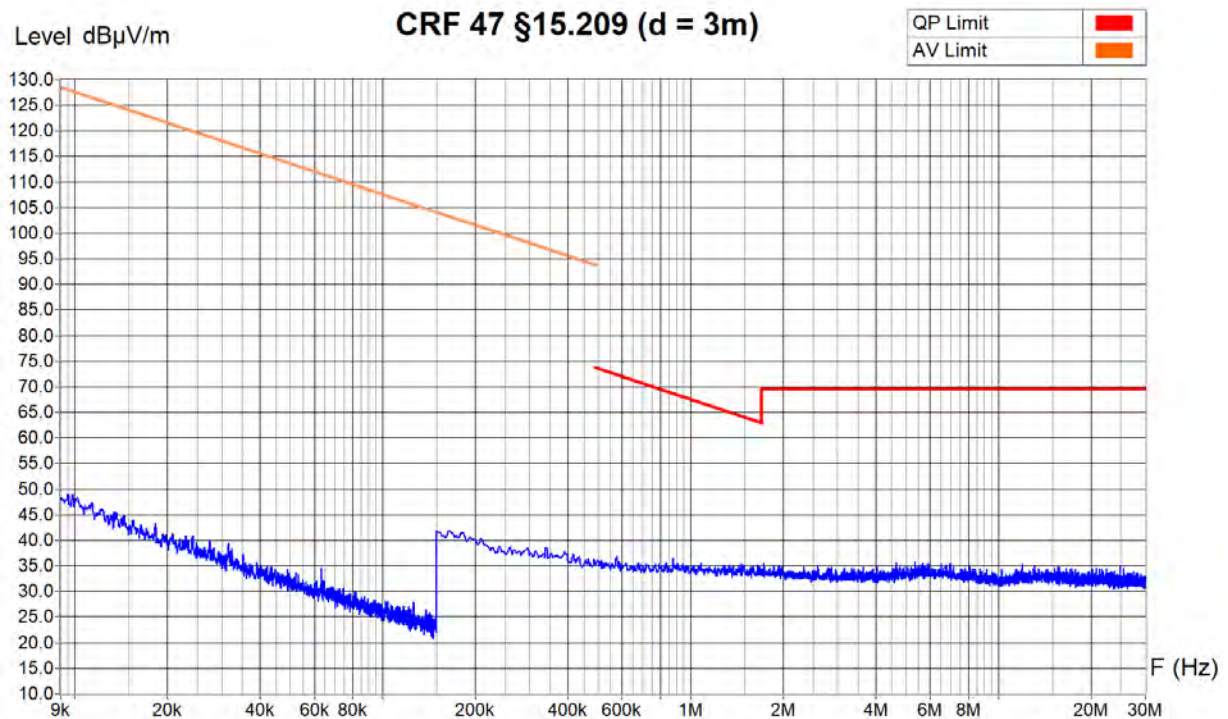
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: FWy
Date/Time: 2022-08-03 11:29
Filename:
ME4_TX903M_Per_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Perpendicular
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
Remarks : None



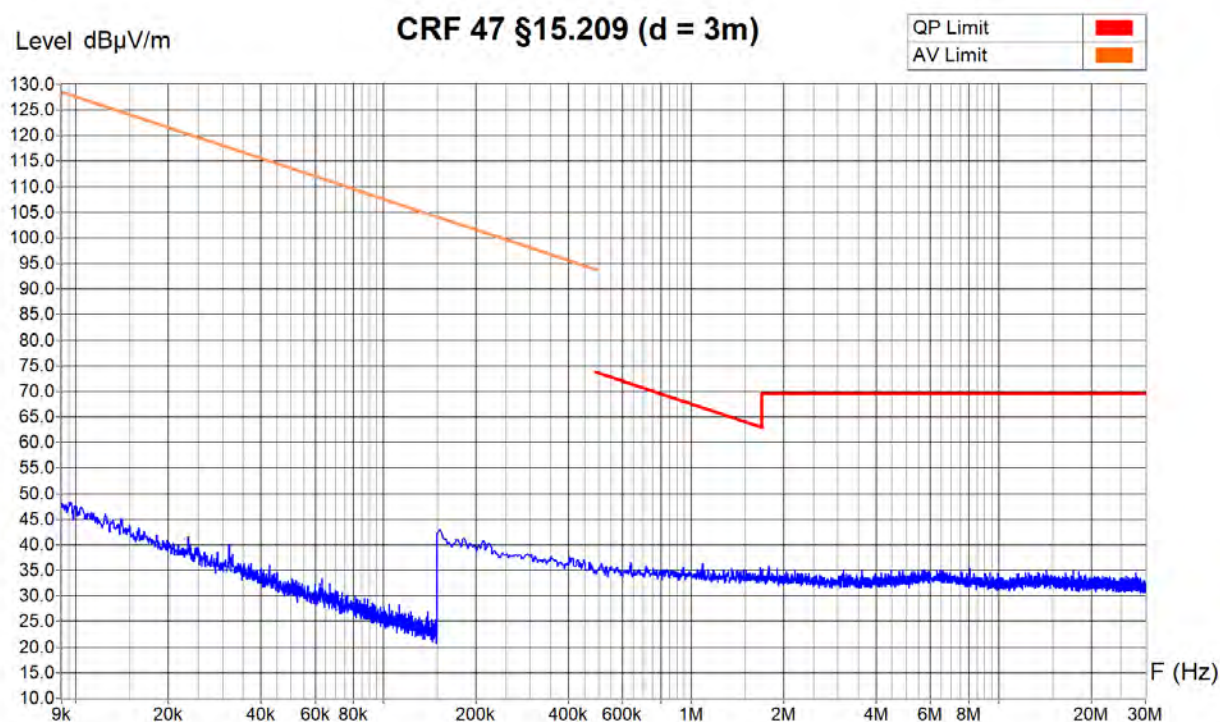
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: FWy
Date/Time: 2022-08-03 11:21
Filename:
ME5_TX915M_Per_FCC.png/.txt

Measurement Type : Radiated Field
 Polarisation : Perpendicular
 Table Angle : 0 - 360°
 Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8
 Set-Up : Chamber SAC3, See photos, Peak detector sweep
 Operating Conditions : TX, f = 927 MHz, modulated, Power setting 18 dBm
 Remarks : None



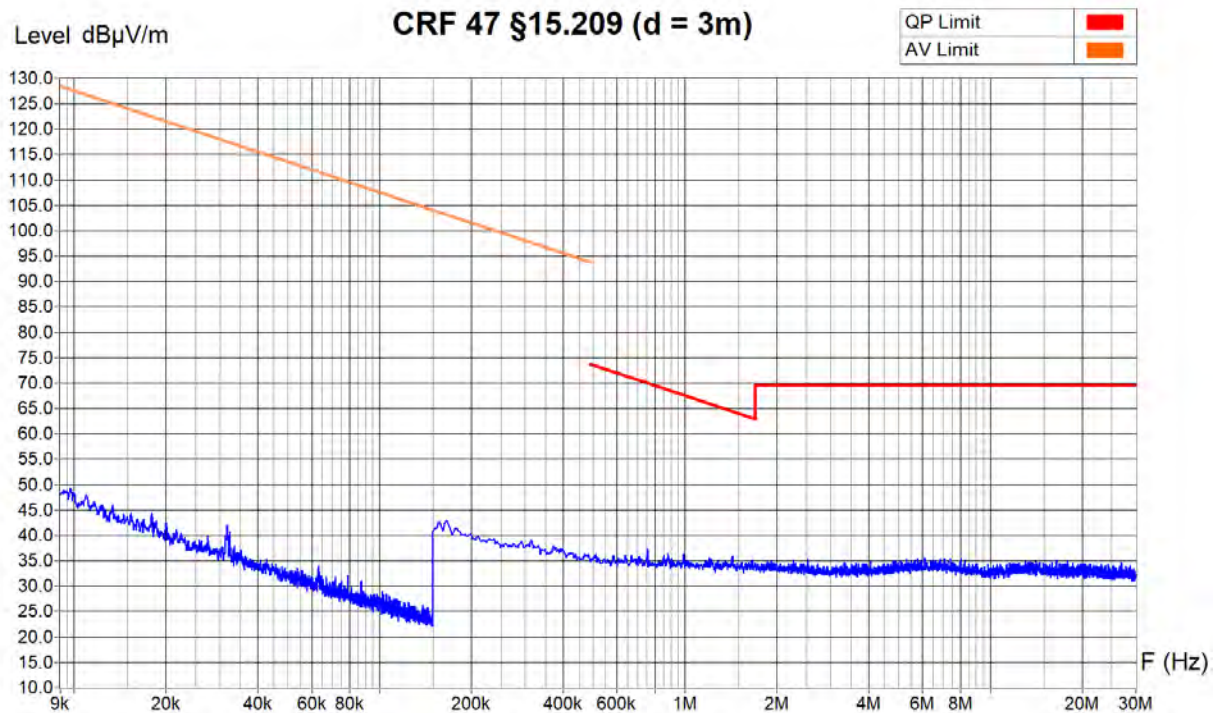
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: FWy
 Date/Time: 2022-08-03 11:03
 Filename:
 ME6_TX927M_Per_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8 & Ref Generator - nur 0°
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 903 MHz, modulated, Power setting 18 dBm
Remarks : None



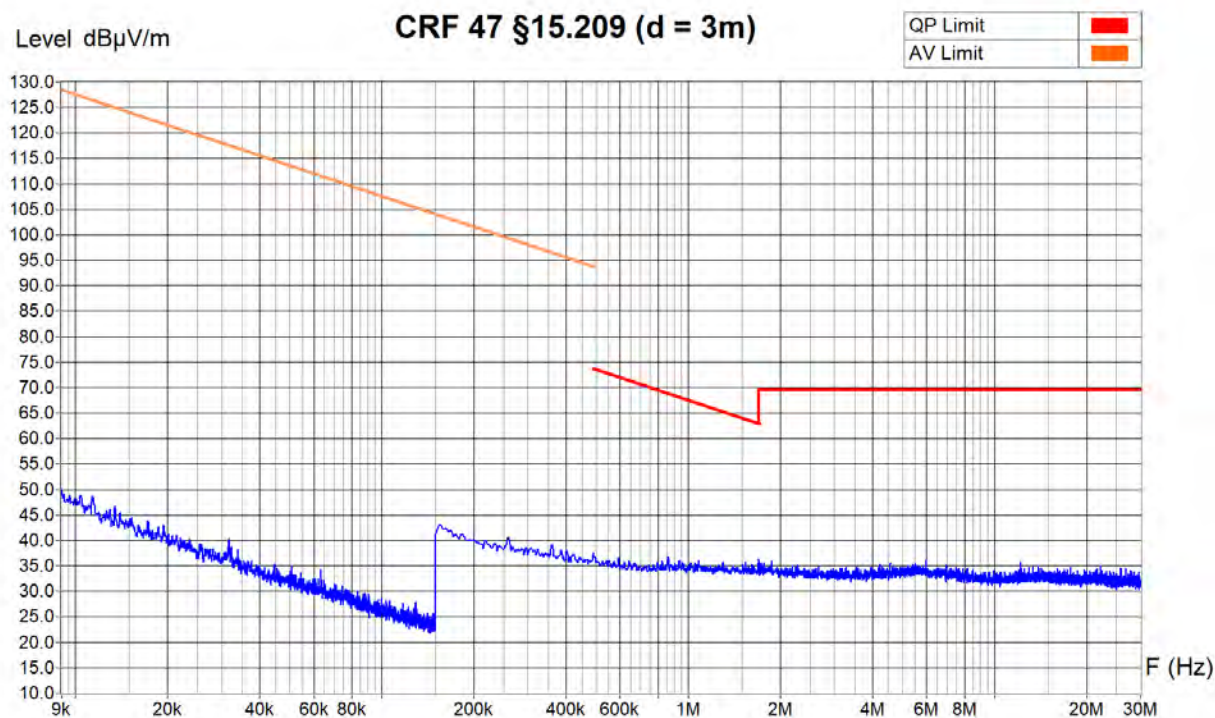
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: FWy
Date/Time: 2022-08-03 11:56
Filename:
ME7_TX903M_Hor_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8 & Ref Generator - nur 0°
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 915 MHz, modulated, Power setting 18 dBm
Remarks : None



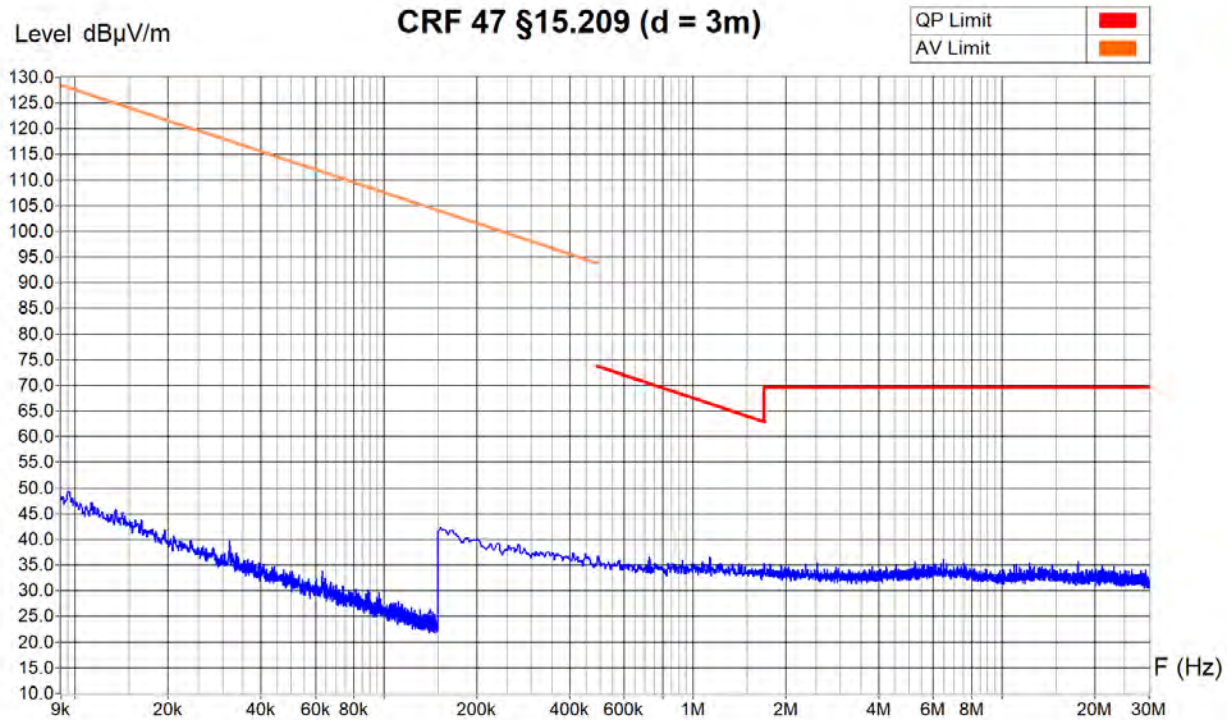
Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator : FWy
Date/Time : 2022-08-03 12:09
Filename : ME8_TX915M_Hor_FCC.png/.txt

Measurement Type : Radiated Field
Polarisation : Horizontal
Table Angle : 0 - 360°
Antenna Height : 1 m



Equipment Under Test : XC Tracer Maxx II, Nr. 2000C8 & Ref Generator - nur 0°
Set-Up : Chamber SAC3, See photos, Peak detector sweep
Operating Conditions : TX, f = 927 MHz, modulated, Power setting 18 dBm
Remarks : None



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	30 KHz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: FWy
Date/Time: 2022-08-03 12:17
Filename:
ME9_TX927M_Hor_FCC.png/.txt

6.2.7.2 30 MHz to 1 GHzTest site: ☐ SAC10 ☒ SAC3Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

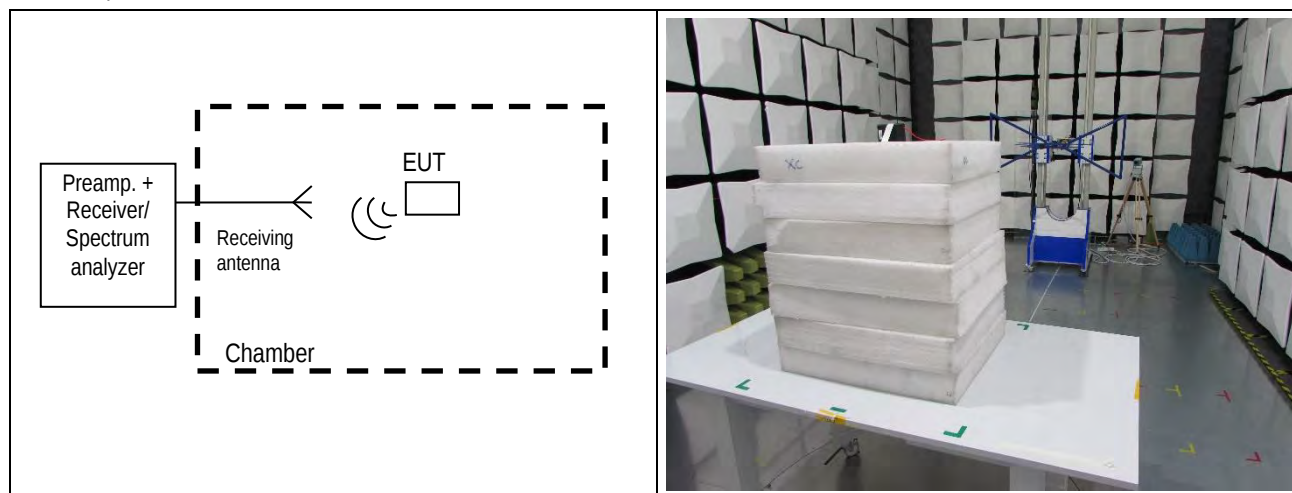
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 26 °C Humidity: 45 % Pressure QFE: 934 hPa (2022-07-28)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 3 m (factor used = 20 dB/decade) if necessary
e.g.: for f = 40 MHz the limit is 100 μ V/m at 3 m;

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

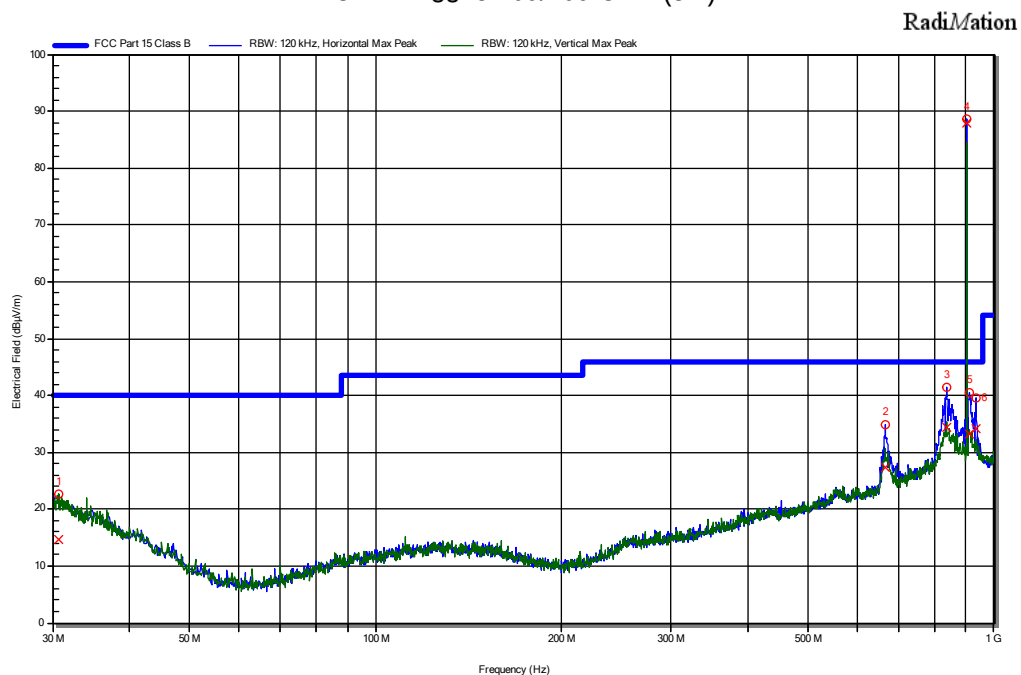
Test equipment:

Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☐ 05-56	☐ 21-07 internal	
Notch filter	☐ 04-19	☒ 04-21	☐ 19-11	☐ 13-14	
Antenna, (bi-con-log)	☒ 05-38	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D		
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE				
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14	☒ RadiMation 2020.1.8		

Result:	☒ pass	☐ fail	☐ not applicable	☐ not tested
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Measurement	RE 30 MHz to 1 GHz		Date and time	02.08.2022 17:28:43		Test ID	#16	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 8 step(s)		Distance	3 m	
Notes	ME16 (final TX LoRa 903 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 903 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;								
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)					
Equipment	Device Type Spectrum analyser Cable antenna -> preamp Cable antenna -> preamp Cable antenna -> preamp Antenna Turn table Antenna tower	ID 21-07 11-61 15-15 15-16 05-38 17-02 17-02	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweeptime: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 200 ms Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 0 s / 0 s					

CRF 47 §§15.209/109 Cl. B (3m)



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	30.708 MHz	22.8 dBµV/m	14.7 dBµV/m	-25.3 dB	315 °	1 m	Vertical	Pass
2	665.939 MHz	34.9 dBµV/m	27.2 dBµV/m	-18.8 dB	180 °	2 m	Horizontal	Pass
3	837.749 MHz	41.4 dBµV/m	34.5 dBµV/m	-11.5 dB	180 °	3 m	Horizontal	Pass
4 *	902.881 MHz	88.5 dBµV/m	87.9 dBµV/m	-11.9 dB	180 °	1 m	Horizontal	Pass
5	912.672 MHz	40.4 dBµV/m	33.2 dBµV/m	-12.8 dB	180 °	1 m	Horizontal	Pass
6	934.977 MHz	39.6 dBµV/m	34.1 dBµV/m	-11.9 dB	180 °	1 m	Horizontal	Pass

* This is the carrier of the radio service

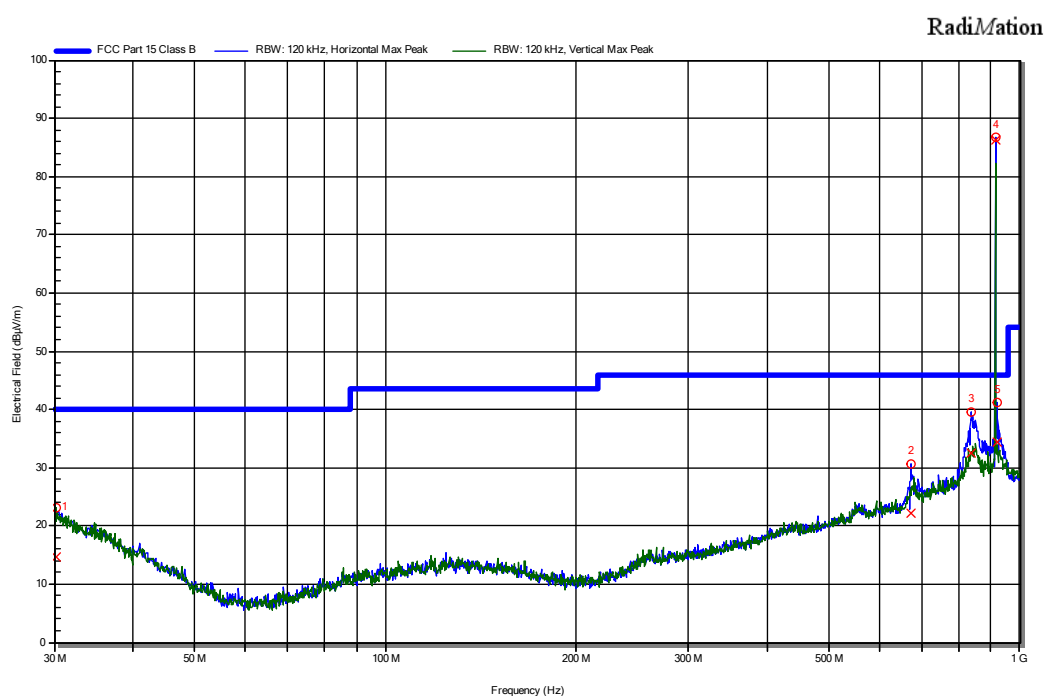
Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver QP Value [dBµV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	QP field [dBµV/m]
837.75	+9.8	+2.3	0.0	+22.4	= 34.5

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

Measurement	RE 30 MHz to 1 GHz		Date and time	02.08.2022 17:58:48		Test ID	#17	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 8 step(s)		Distance	3 m	
Notes	ME17 (final TX LoRa 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;								
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)					
Equipment	Device Type ID Cable antenna -> preamp 15-16 Antenna 05-38 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-15 Turn table 17-02 Antenna tower 17-02 Spectrum analyser 21-07		Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 200 ms Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 0 s / 0 s					

CRF 47 §§15.209/109 Cl. B (3m)



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	30.24 MHz	23.1 dBμV/m	14.8 dBμV/m	-25.2 dB	315 °	1 m	Vertical	Pass
2	673.557 MHz	30.7 dBμV/m	22.2 dBμV/m	-23.8 dB	180 °	2 m	Horizontal	Pass
3	839.866 MHz	39.5 dBμV/m	32.5 dBμV/m	-13.5 dB	180 °	2 m	Horizontal	Pass
4 *	914.91 MHz	86.8 dBμV/m	86.2 dBμV/m	40.2 dB	180 °	1 m	Horizontal	Pass
5	920.553 MHz	41.3 dBμV/m	34.5 dBμV/m	-11.5 dB	180 °	1 m	Horizontal	Pass

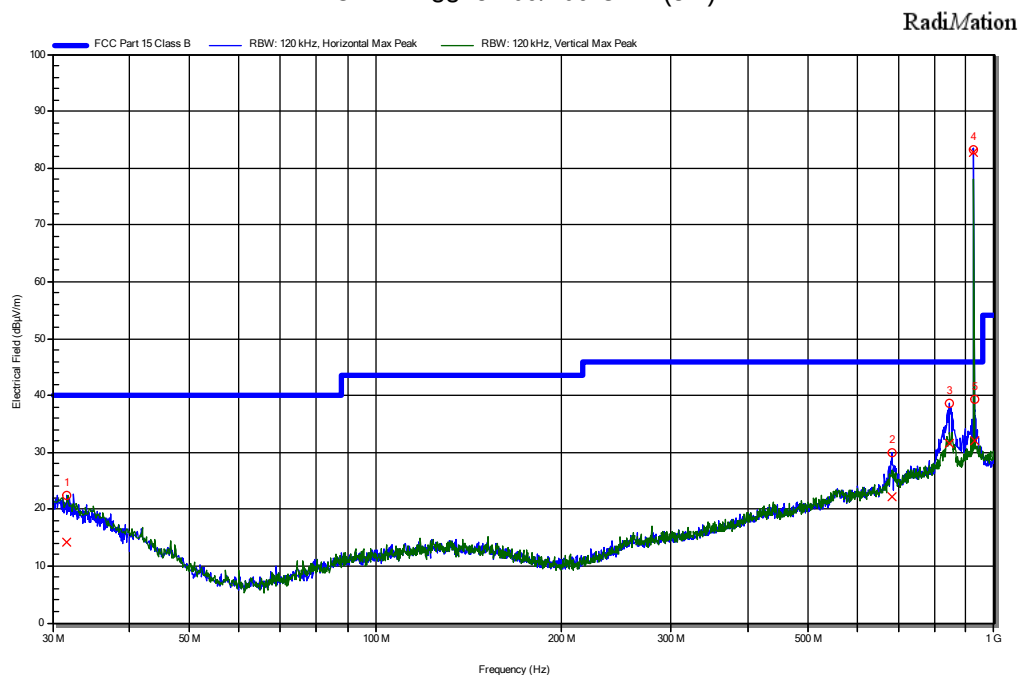
* This is the carrier of the radio service

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

Measurement	RE 30 MHz to 1 GHz		Date and time	03.08.2022 09:18:20		Test ID	#19	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Fail
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 8 step(s)		Distance	3 m	
Notes	ME19 (final TX LoRa 927 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 9927 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;								
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)					
Equipment	Device Type ID Spectrum analyser 21-07 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-15 Cable antenna -> preamp 15-16 Antenna 05-38 Turn table 17-02 Antenna tower 17-02		Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 200 ms Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 0 s / 0 s					

CRF 47 §§15.209/109 Cl. B (3m)



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	31.678 MHz	22.4 dBμV/m	14.1 dBμV/m	40 dBμV/m	-25.9 dB	135 °	3 m	Horizontal	Pass
2	684.018 MHz	30 dBμV/m	22.2 dBμV/m	46 dBμV/m	-23.8 dB	0 °	2 m	Horizontal	Pass
3	847.113 MHz	38.5 dBμV/m	31.6 dBμV/m	46 dBμV/m	-14.4 dB	0 °	3 m	Horizontal	Pass
4 *	927.04 MHz	83.3 dBμV/m	82.8 dBμV/m	46 dBμV/m	36.8 dB	180 °	1 m	Horizontal	Pass
5	929.459 MHz	39.3 dBμV/m	32.1 dBμV/m	46 dBμV/m	-13.9 dB	180 °	1 m	Horizontal	Pass

* This is the carrier of the radio service

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

6.2.7.3 1 GHz to 2.5 GHz (FCC / industry Canada)

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. Uncertainty: ± 4.7 dB

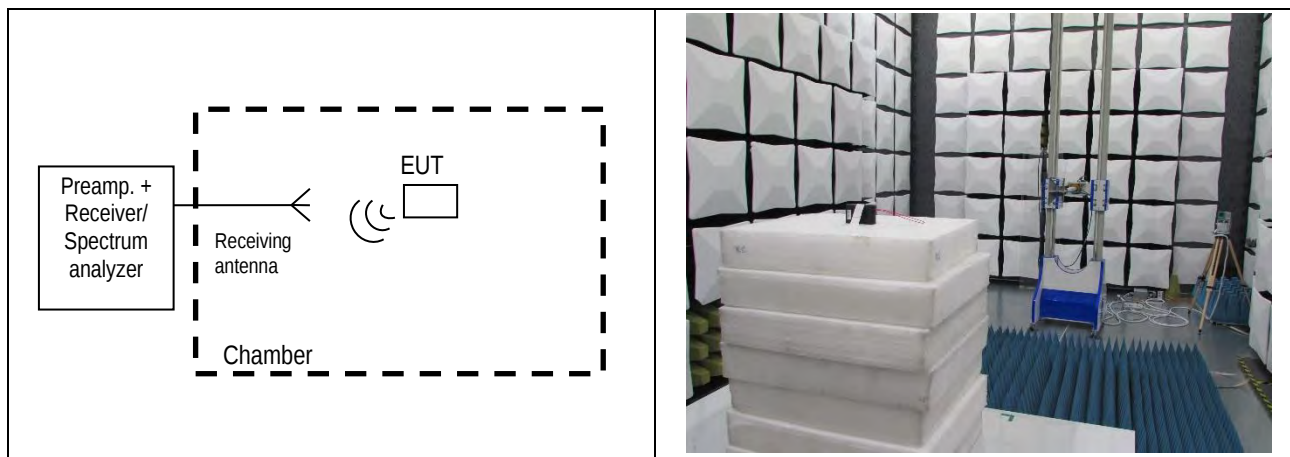
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Comment: Proto 1 has no modifications, Proto 4 with modifications Level 1

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 919 hPa (2022-04-22)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

- Average measurements determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(dB) = 20\log(\Delta) = 20 \log (20/500) = -27.96$ dB

Test equipment:

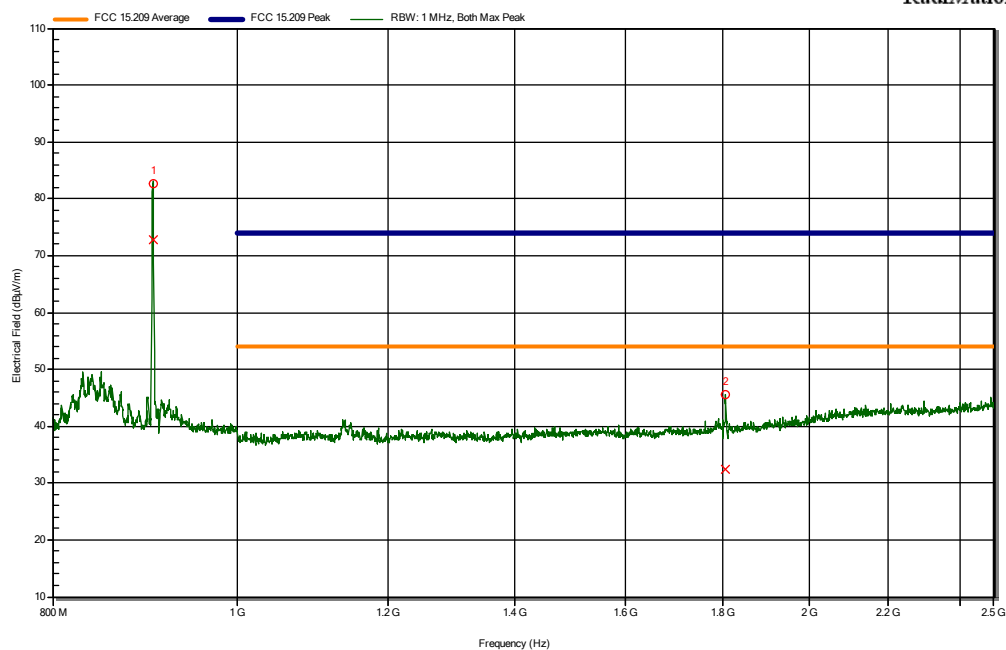
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☐ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☒ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 800 MHz to 2.5 GHz			Date and time	02.08.2022 13:15:10	Test ID	#12	Operator	F. Wyler
EUT	XC Tracer Maxx II							Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)	Distance	3 m		
Notes	ME 12 (final TX LoRa 903 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 903 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;								
Test Place	ROS-SAC3			Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type ID Antenna tower 17-02 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-16 Spectrum analyser 21-07 Cable preamp -> analyser 15-15 Antenna 22-07 Turn table 17-02	Settings			Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1 *	903 MHz	82.7 dBµV/m		72.8 dBµV/m		0 degrees	4 m	Horizontal	
2	1.806 GHz	45.7 dBµV/m	-28.3 dB	32.5 dBµV/m	-21.5 dB	157 degrees	1 m	Horizontal	Pass

Carrier of the radio service

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver Peak Value [dBµV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	Peak field [dBµV/m]
1.806 GHz	+17.3	+3.4	+0.0	+25.0	= 45.7

Place and date of test:

Rossens, 2022-08-02

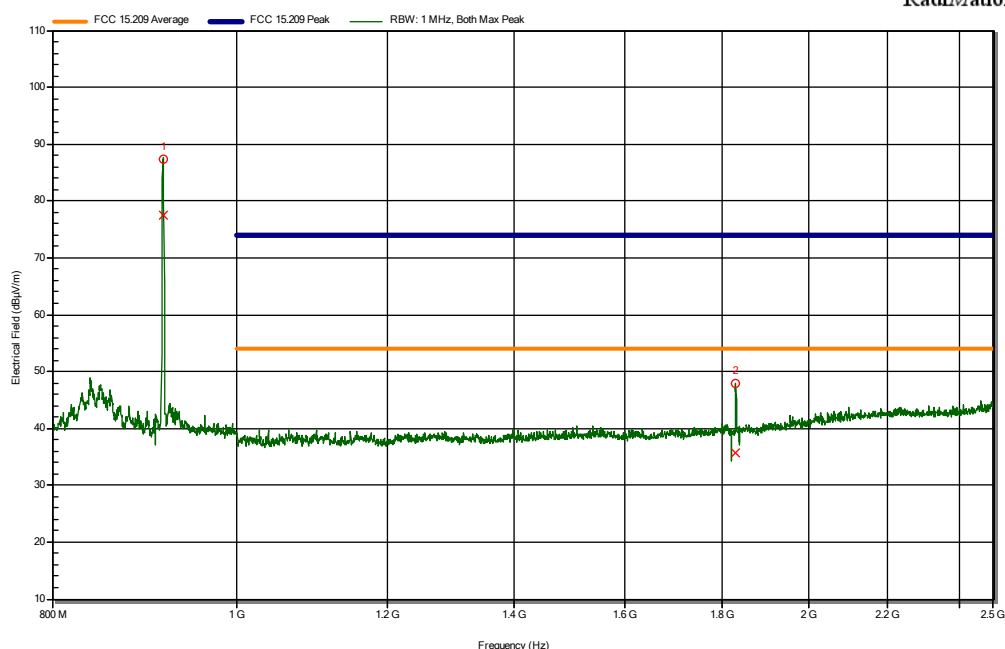
Operator:

F. Wyler

Measurement	RE 800 MHz to 2.5 GHz		Date and time	02.08.2022 12:35:18	Test ID	#11	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)		Distance	3 m
Notes	ME 11 (final TX LoRa 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type ID Antenna tower 17-02 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-16 Spectrum analyser 21-07 Cable preamp -> analyser 15-15 Antenna 22-07 Turn table 17-02		Settings	Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	915.006 MHz	87.3 dBµV/m		77.5 dBµV/m		180 degrees	1 m	Horizontal	
2	1.83 GHz	47.9 dBµV/m	-26.1 dB	35.7 dBµV/m	-18.3 dB	157 degrees	1 m	Horizontal	Pass

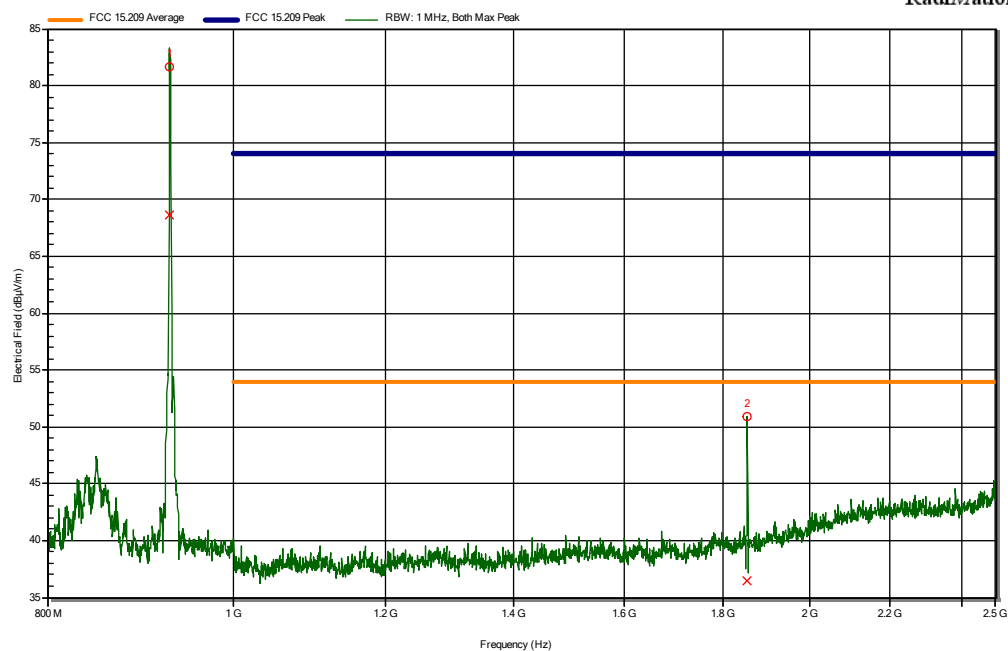
Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

Measurement	RE 800 MHz to 2.5 GHz		Date and time	28.07.2022 11:36:24	Test ID	#2	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 degrees to 360 degrees, 16 step(s)		Distance	3 m
Notes	ME 2 (final TX LoRa 927 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 927 MHz, Power Setting 18 dBm; Modifications: None Remarks: Notch 04-21 in front of Receiver;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D PRE INT SAC3)				
Equipment	Device Type ID Spectrum analyser 21-07 Cable preamp -> analyser 15-15 Cable antenna -> preamp 11-61 Cable antenna -> preamp 15-16 Antenna 22-07 Turn table 17-02 Antenna tower 17-02		Settings	Band(s): 800 MHz - 2.5 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

CFR 47 §§ 15.209/109 Cl B (d = 3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1 *	927.023 MHz	81.6 dBμV/m			68.6 dBμV/m		180 degrees	1 m	Horizontal	
2	1.854 GHz	50.9 dBμV/m	74 dBμV/m	-23.1 dB	36.5 dBμV/m	-17.5 dB	157 degrees	2 m	Horizontal	Pass

* Carrier of the radio service

Place and date of test:
Operator:

Rossens, 2022-07-28
F. Wyler

6.2.7.4 2.5 GHz to 10 GHz (FCC / industry Canada)

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. Uncertainty: ± 4.7 dB

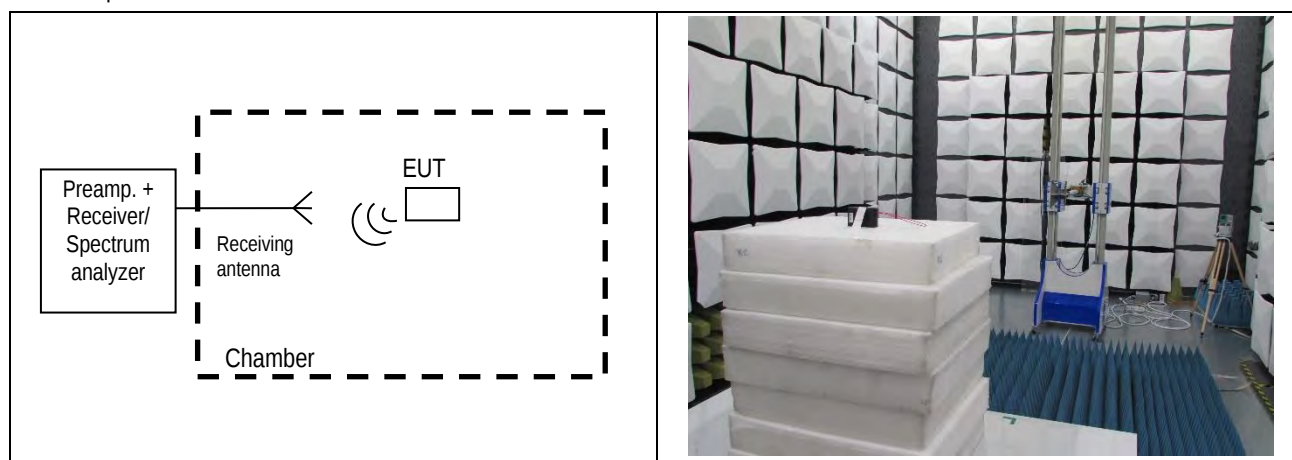
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Comment: Proto 1 has no modifications, Proto 4 with modifications Level 1

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 919 hPa (2022-04-22)

Test set-up:



Remarks: - Limit values expressed in dBμV/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 μV/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

- Average measurements determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(dB) = 20\log(\Delta) = 20 \log (20/500) = -27.96$ dB

Test equipment:

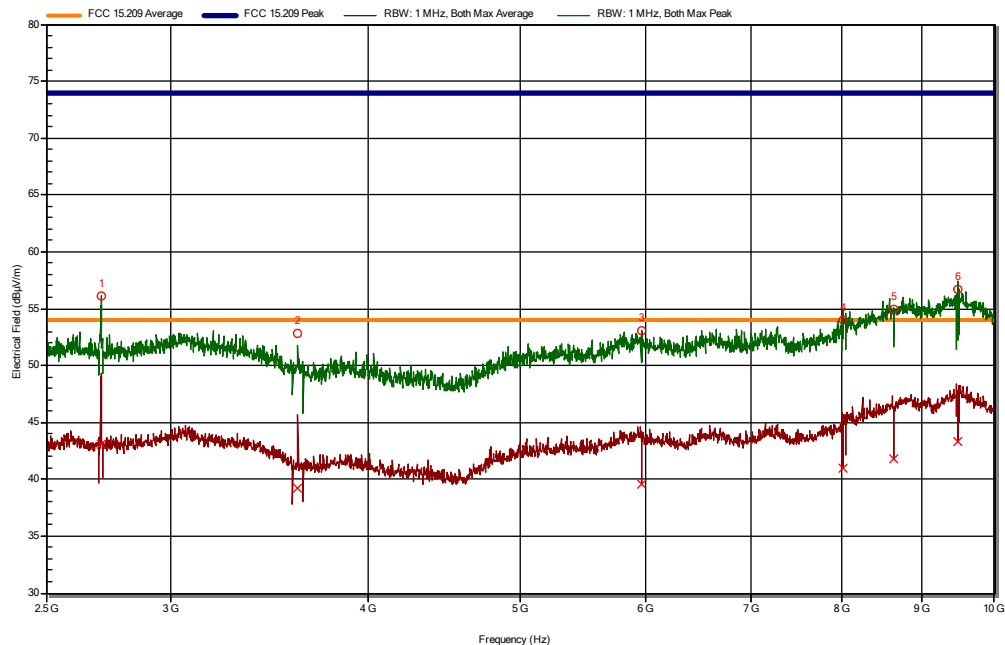
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☐ 14-27	☐ 184451	☒ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☒ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 2.5 GHz to 10 GHz		Date and time	02.08.2022 10:06:43	Test ID	#9	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)		Distance	3 m
Notes	ME 9 (final TX LoRa 903 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 903 MHz, Power Setting 18 dBm; Modifications: None Remarks: Preamplifier 05-56;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Turn table Spectrum analyser Cable antenna -> preamp Antenna Pre amplifier Cable preamp -> analyser	ID 17-02 11-61 17-02 21-07 15-16 22-07 15-15	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

CRF 47 §§15.209/109 Cl. B (3m)

RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	2.709 GHz	56.1 dBμV/m	-17.9 dB	43.1 dBμV/m	-10.9 dB	135 °	1 m	Vertical	Pass
2	3.612 GHz	52.9 dBμV/m	-21.1 dB	39.3 dBμV/m	-14.7 dB	202 °	2 m	Horizontal	Pass
3	5.968 GHz	53 dBμV/m	-21.0 dB	39.5 dBμV/m	-14.5 dB	135 °	1 m	Horizontal	Pass
4	8.013 GHz	54 dBμV/m	-20.0 dB	40.9 dBμV/m	-13.1 dB	315 °	1 m	Horizontal	Pass
5	8.628 GHz	55 dBμV/m	-19.0 dB	41.8 dBμV/m	-12.2 dB	270 °	1 m	Horizontal	Pass
6	9.474 GHz	56.7 dBμV/m	-17.3 dB	43.3 dBμV/m	-10.7 dB	157 °	3 m	Horizontal	Pass

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver Peak Value [dBμV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	Peak field [dBμV/m]
2.709GHz	+52.6	+4.2	-28.8	+28.1	= 56.1

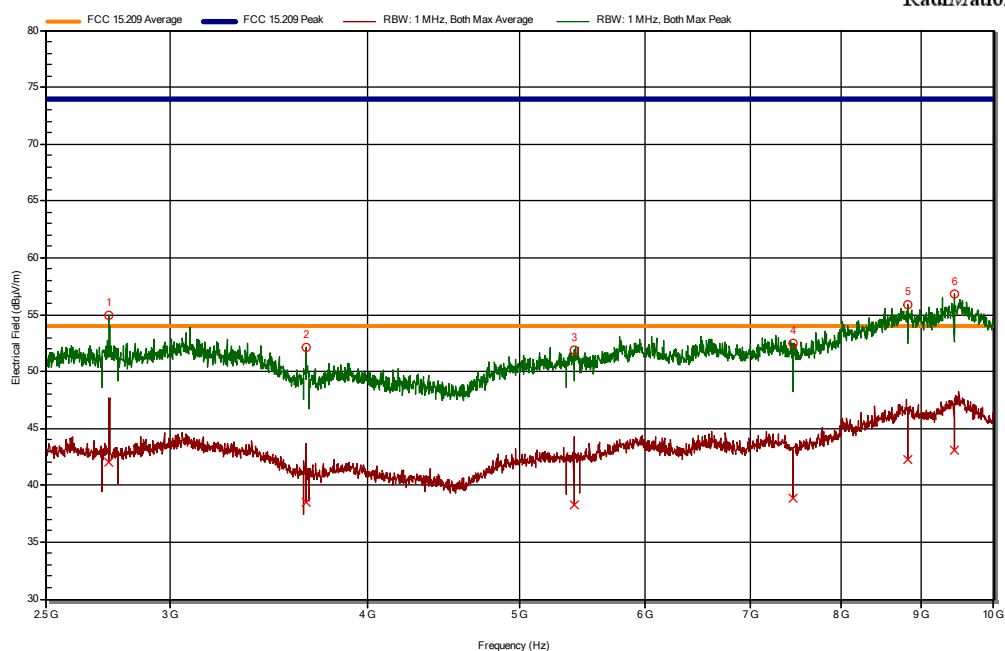
Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

Measurement	RE 2.5 GHz to 10 GHz		Date and time	28.07.2022 17:14:16	Test ID	#8	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)		Distance	3 m
Notes	ME 8 (final TX LoRa 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 915 MHz, Power Setting 18 dBm; Modifications: None Remarks: Preamplifier 05-56;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Turn table Spectrum analyser Cable antenna -> preamp Antenna Pre amplifier Cable preamp -> analyser	ID 17-02 11-61 17-02 21-07 15-16 22-07 15-15	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

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RadiMation



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	2.745 GHz	54.9 dBµV/m	-19.1 dB	42.1 dBµV/m	-11.9 dB	135 °	2 m	Vertical	Pass
2	3.66 GHz	52.2 dBµV/m	-21.8 dB	38.5 dBµV/m	-15.5 dB	112 °	2 m	Vertical	Pass
3	5.411 GHz	51.8 dBµV/m	-22.2 dB	38.3 dBµV/m	-15.7 dB	0 °	2 m	Horizontal	Pass
4	7.457 GHz	52.4 dBµV/m	-21.6 dB	38.9 dBµV/m	-15.1 dB	292 °	4 m	Vertical	Pass
5	8.818 GHz	55.9 dBµV/m	-18.1 dB	42.3 dBµV/m	-11.7 dB	0 °	2 m	Horizontal	Pass
6	9.434 GHz	56.9 dBµV/m	-17.1 dB	43.1 dBµV/m	-10.9 dB	292 °	2 m	Vertical	Pass

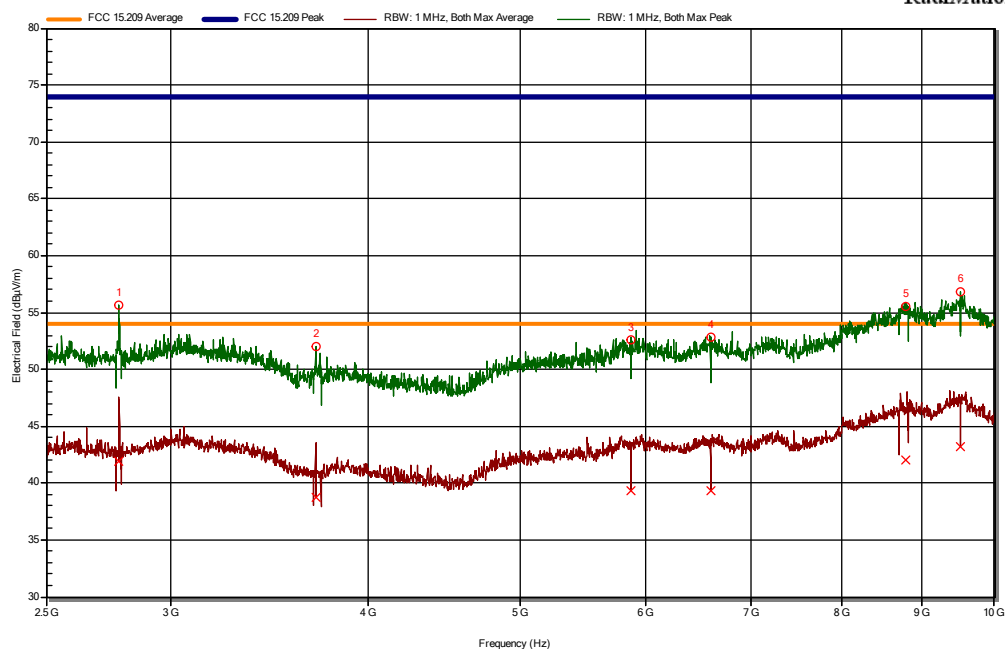
Place and date of test:
Operator:

Rossens, 2022-07-28
F. Wyler

Measurement	RE 2.5 GHz to 10 GHz		Date and time	02.08.2022 11:44:10	Test ID	#10	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)		Distance	3 m
Notes	ME 10 (final TX LoRa 927 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: TX modulated 927 MHz, Power Setting 18 dBm; Modifications: None Remarks: Preamplifier 05-56;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Turn table Spectrum analyser Cable antenna -> preamp Antenna Pre amplifier Cable preamp -> analyser	ID 17-02 11-61 17-02 21-07 15-16 22-07 15-15	Settings	Band(s): 2.5 GHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweeptime: 100 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				

CRF 47 §§15.209/109 Cl. B (3m)

Radiation



Detected peaks

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	2.781 GHz	55.7 dBμV/m	74 dBμV/m	-18.3 dB	41.9 dBμV/m	-12.1 dB	135 °	1 m	Vertical	Pass
2	3.708 GHz	52.1 dBμV/m	74 dBμV/m	-21.9 dB	38.7 dBμV/m	-15.3 dB	202 °	1 m	Horizontal	Pass
3	5.882 GHz	52.6 dBμV/m	74 dBμV/m	-21.4 dB	39.3 dBμV/m	-14.7 dB	90 °	1 m	Horizontal	Pass
4	6.603 GHz	52.8 dBμV/m	74 dBμV/m	-21.2 dB	39.3 dBμV/m	-14.7 dB	112 °	1 m	Vertical	Pass
5	8.789 GHz	55.5 dBμV/m	74 dBμV/m	-18.5 dB	42.1 dBμV/m	-11.9 dB	247 °	2 m	Vertical	Pass
6	9.516 GHz	56.9 dBμV/m	74 dBμV/m	-17.1 dB	43.1 dBμV/m	-10.9 dB	247 °	1 m	Vertical	Pass

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

6.2.8 Spurious emissions, receive mode – radiated**6.2.8.1 30 MHz to 1 GHz**Test site: ☐ SAC10 ☒ SAC3Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

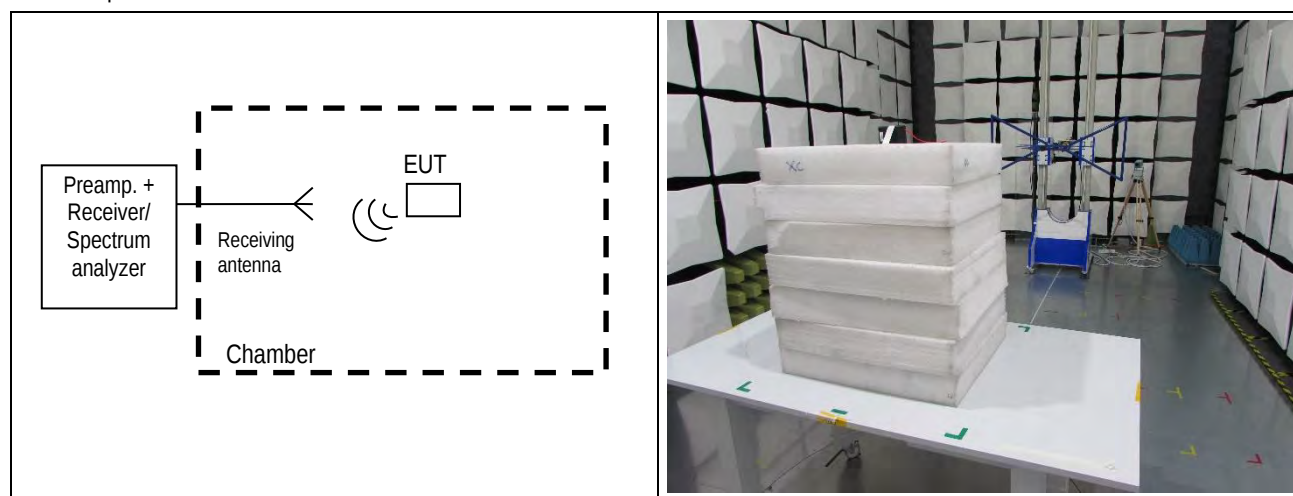
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit are re-measured manually using a receiver.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 26 °C Humidity: 45 % Pressure QFE: 934 hPa (2022-07-28)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 3 m (factor used = 20 dB/decade) if necessary
e.g.: for f = 40 MHz the limit is 100 μ V/m at 3 m;

$$20 \log \left(\frac{100 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 40 \frac{dB\mu V}{m} \text{ at } 3m$$

Test equipment:

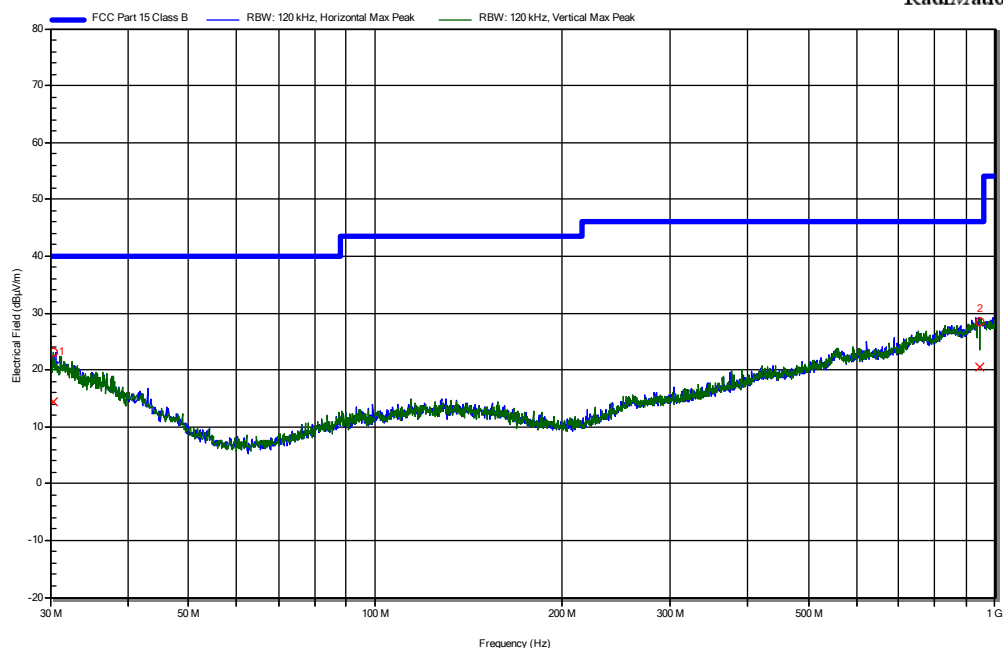
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☒ 14-27	☐ 184451	☐ 05-56	☐ 21-07 internal	
Notch filter	☐ 04-19	☐ 04-21	☐ 19-11	☐ 13-14	
Antenna, (bi-con-log)	☒ 05-38	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D		
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE				
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14	☒ RadiMation 2020.1.8		

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 30 MHz to 1 GHz		Date and time	02.08.2022 16:48:27	Test ID	#15	Operator	F.Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 8 step(s)		Distance	3 m
Notes	ME15 (final RX LoRa 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: RX 915 MHz; Modifications: None Remarks: None;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 30M-1G ESW26 CBL SAC3)				
Equipment	Device Type Antenna tower Cable antenna -> preamp Cable antenna -> preamp Spectrum analyser Cable antenna -> preamp Antenna Turn table	ID 17-02 15-15 15-16 21-07 11-61 05-38 17-02	Settings	Band(s): 30 MHz - 1 GHz, Reference Level: 80 dBµV RBW: 120 kHz, VBW: 300 kHz, Sweep time: 200 ms, Number of Sweeps: 20 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 20 dB, Measure time: 200 ms Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 0 s / 0 s				

CRF 47 §§15.209/109 Cl. B (3m)

Radiation



Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Angle	Height	Polarization	Status
1	30.33 MHz	23 dBμV/m	14.4 dBμV/m	40 dBμV/m	-25.6 dB	315 °	1 m	Vertical	Pass
2	942.889 MHz	28.4 dBμV/m	20.4 dBμV/m	46 dBμV/m	-25.6 dB	315 °	3 m	Vertical	Pass

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Receiver QP Value [dBμV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	QP field [dBμV/m]
942.89	+2.1	+2.5	0.0	+23.8	= 28.4

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

6.2.8.2 1 GHz to 10 GHz (FCC / industry Canada)

Test site: ☒ SAC3 ☐ SAC10

Distance: ☐ 1 m ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 1.5 m (height of the equipment under test above floor)

Meas. Uncertainty: ± 4.7 dB

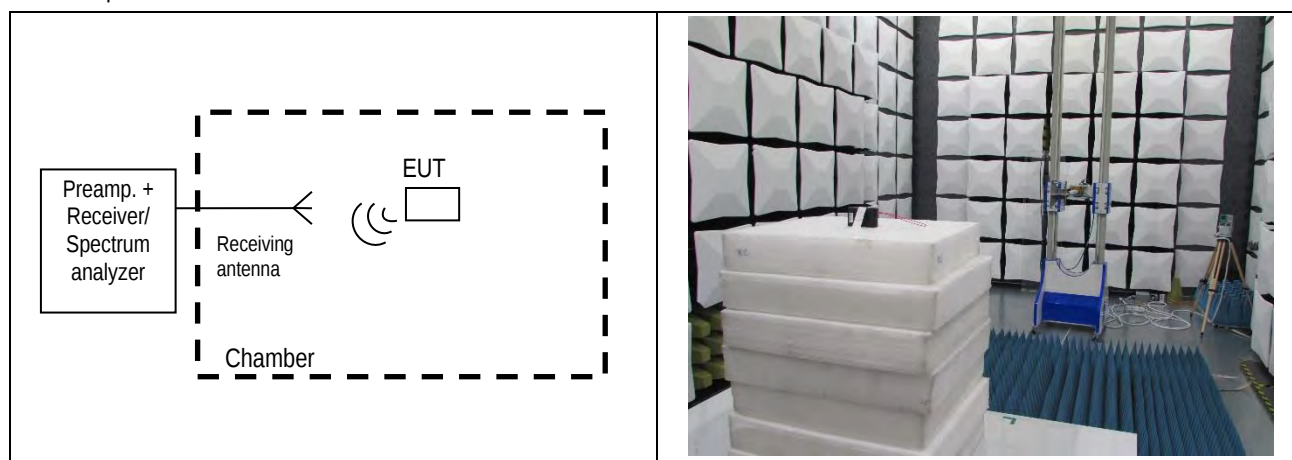
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value (peak) of all the disturbances appearing while the apparatus is under test.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Comment: Proto 1 has no modifications, Proto 4 with modifications Level 1

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 919 hPa (2022-04-22)

Test set-up:



Remarks: - Limit values expressed in dB μ V/m and transformed to a measuring distance of 1m (factor used = 20 dB/decade) if necessary. E.g.: for f = 1 GHz the limit is 500 μ V/m at 3 m;

$$20 \log \left(\frac{500 \frac{\mu V}{m}}{1 \frac{\mu V}{m}} \right) + 20 \log \left(\frac{3m}{3m} \right) = 54 \frac{dB\mu V}{m} \text{ at } 3m$$

- Average measurements determined from the peak field strength after correcting for the worst-case duty cycle according to § 4.1.4.2.4 of ANSI C63.10:2013. Correction factor: $\delta(dB) = 20\log(\Delta) = 20 \log (20/500) = -27.96$ dB

Test equipment:

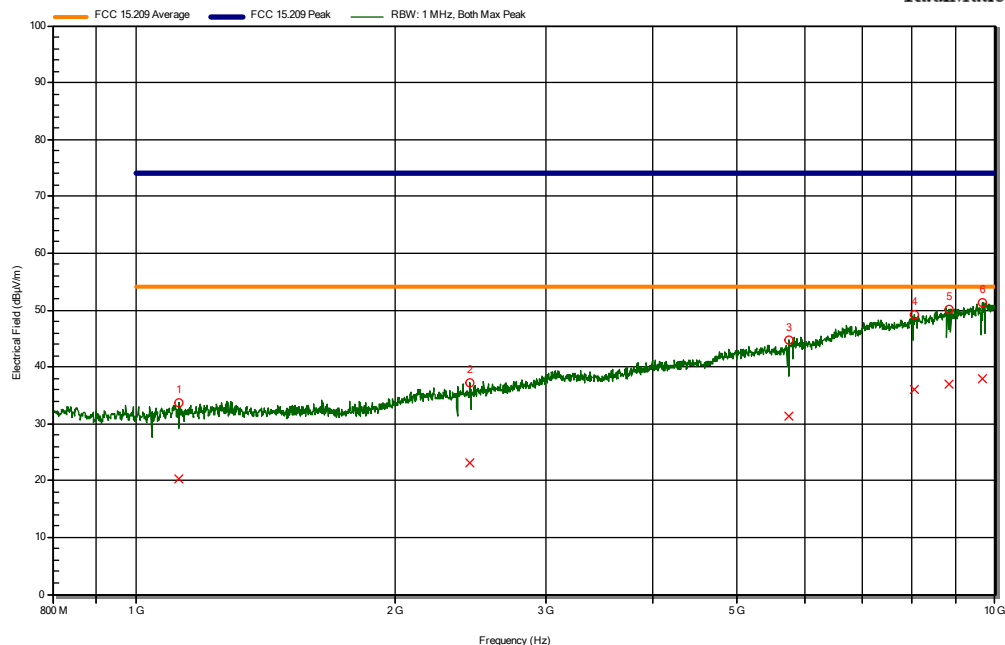
Spectrum analyser	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Receiver	☐ 16-03	☐ 168593	☐ 10-70	☐ 19-09	☒ 21-07
Preamplifier	☒ 14-27	☐ 184451	☒ 05-56	☐ 11-29	
Notch filter	☐ 04-19	☐ 04-21	☐ 19-11	☐ 13-14	
Antenna (log-per)	☐ 96-08	☐ 94-03	☐ 13-06		
Antenna (horn)	☒ 22-07	☐ 168554	☐ 90-24	☐ 09-27	
Antenna, (bi-con-log)	☐ 181955	☐ 19-15			
Decoupling clamps	☐ 94-49	☐ 16-02A	☐ 16-02D	☐ 15651	☐ 15652 ☐ 15653
	☐ 17904	☐ 17908	☐ 25781		
Cables	☒ SAC3_RE	☐ SAC5_RE	☐ SAC10_RE (18-01, 06-01)		
Software and Revision	☐ Vitam, Rev. 2.4.13	☐ Vitam, Rev. 2.4.14		☒ RadiMation 2020.1.8	

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	RE 800 MHz to 10 GHz		Date and time	02.08.2022 15:19:31	Test ID	#14	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Antenna Height	1 m to 4 m, 4 step(s)	Polarization	Both	Table Angle	0 ° to 360 °, 16 step(s)		Distance	3 m
Notes	ME14 (final RX LoRa 915 MHz) EUT:XC Tracer Maxx II Nr 2000C8; Cables connected: --- Operating mode: RX 915 MHz; Modifications: None Remarks: Preamplifier 14-27;							
Test Place	ROS-SAC3		Software	Radimation 2020.1.8 (RE 1-6G ESW26 Schwarzbeck 9120D SAC3)				
Equipment	Device Type	ID	Settings	Band(s): 800 MHz - 10 GHz, Reference Level: 90 dBµV RBW: 1 MHz, VBW: 3 MHz, Sweep time: 100 ms, Number of Sweeps: 10 Step freq: Fixed step count: 8001 steps per Band, Attenuator: 0.0 dB, Internal preamp: 0 dB, Measure time: 2 s Final Measurement/Observation Time: PK 1 s / 5 s, QP 1 s / 5 s, AVG 1 s / 5 s				
	Cable antenna -> preamp	11-61						
	Turn table	17-02						
	Antenna	22-07						
	Pre amplifier	14-27						
	Antenna tower	17-02						
	Spectrum analyser	21-07						
	Cable antenna -> preamp	15-16						
	Cable preamp -> analyser	15-15						

CRF 47 §§15.209/109 Cl. B (3m)

Radimation



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Angle	Height	Polarization	Status
1	1.123 GHz	33.7 dBµV/m	-40.3 dB	20.4 dBµV/m	-33.6 dB	157 °	3 m	Vertical	Pass
2	2.443 GHz	37.3 dBµV/m	-36.7 dB	23.2 dBµV/m	-30.8 dB	292 °	3 m	Horizontal	Pass
3	5.757 GHz	44.8 dBµV/m	-29.2 dB	31.3 dBµV/m	-22.7 dB	22 °	2 m	Vertical	Pass
4	8.043 GHz	49.2 dBµV/m	-24.8 dB	36.1 dBµV/m	-17.9 dB	247 °	3 m	Horizontal	Pass
5	8.833 GHz	50.2 dBµV/m	-23.8 dB	36.9 dBµV/m	-17.1 dB	22 °	3 m	Horizontal	Pass
6	9.66 GHz	51.3 dBµV/m	-22.7 dB	38 dBµV/m	-16.0 dB	292 °	3 m	Horizontal	Pass

Sample calculation with all conversion and correction factors used

Frequency [MHz]	Receiver Peak Value [dBµV]	Cable att. Corr. [dB]	Preamp. Gain Corr. [dB]	Antenna factor Corr. [dB]	Peak field [dBµV/m]
2.443GHz	+44.8	+4.0	-38.9	+27.4	= 37.3

Place and date of test:
Operator:

Rossens, 2022-08-02
F. Wyler

6.3 Conducted emission – Interference voltage

Test site: ☐ SAC10 ☐ shielded room
☒ SAC3 ☐ laboratory

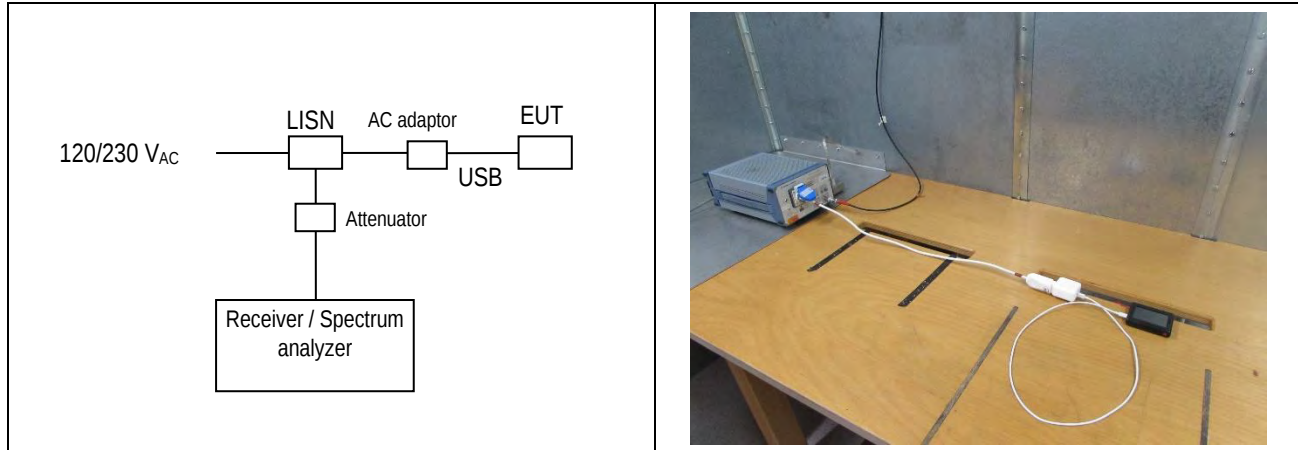
Meas. Uncertainty: ± 3.6 dB

Measuring method: The conducted disturbance is measured using a spectrum analyzer and a line impedance substitution network (LISN). The measurement of the voltage against the earth is carried out successively. The peak values are recorded continuously on the graph. The values that exceed the limit are re-measured with a measuring receiver.

Modifications: ☒ None ☐ 1 ☐ 2

Climatic conditions: Temperature: 24 °C Humidity: 32 % Pressure QFE: 935 hPa

Test set-up:



Remarks: Tested in charging mode only because EUT is not intended to transmit when USB cable is connected

Test equipment:

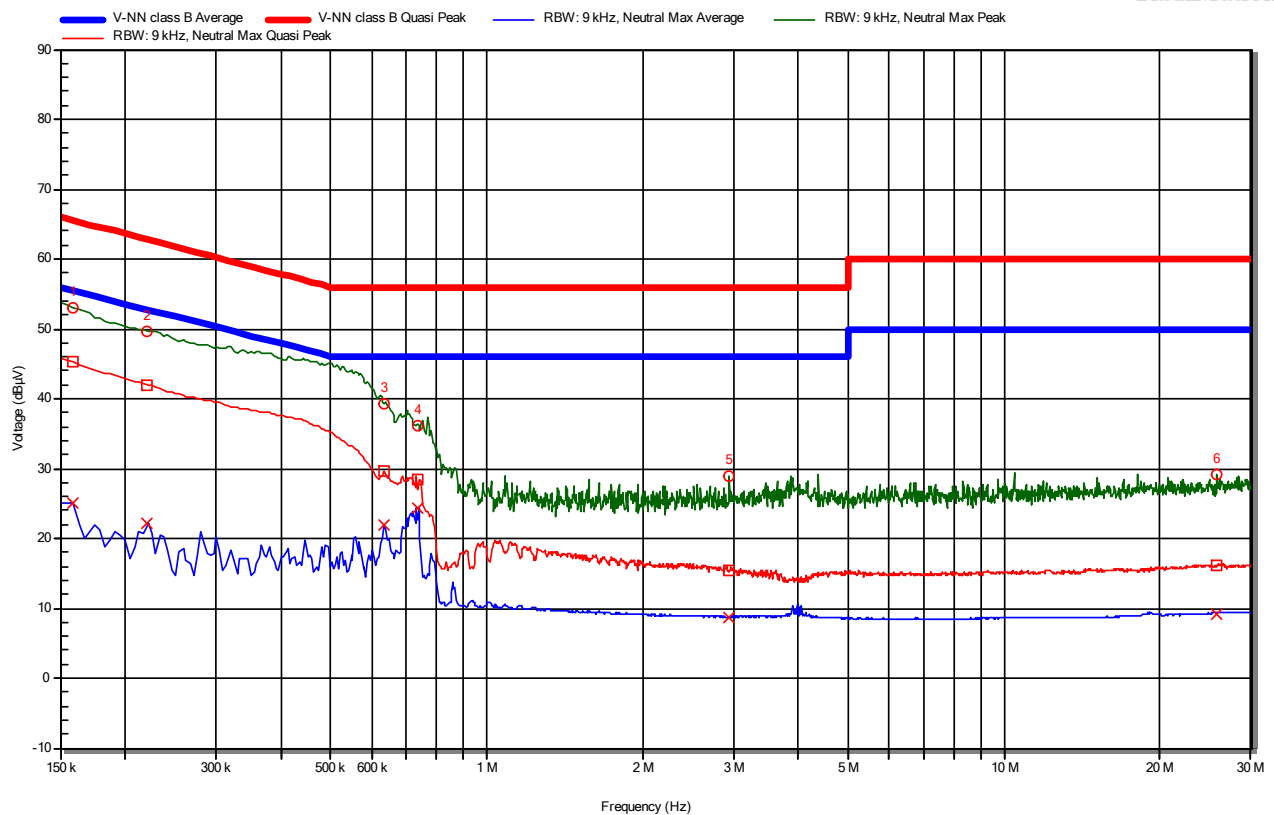
Spectrum analyser	☐ 10-70	☐ 16-03	☒ 19-09	☐ 21-07
Receiver	☐ 10-70	☐ 16-03	☒ 19-09	☐ 21-07
LISN (=VNNB) 1ph	☐ 00-43	☐ 15-08	☒ 10540	☐ 182186
Protection 10 dB	☐ 91-44	☐ 95-36	☒ 20-05B	
Cables	☒ FAR_CE	☐ 06-00	☐ 18-09	
AC Source	☒ 11-50			
Software and Revision	☒ RadiMation 2020.1.8			

Result: ☒ pass ☐ fail ☐ not applicable ☐ not tested

Measurement	CE 150 kHz to 30 MHz		Date and time	13.04.2022 16:58:44	Test ID	#2	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Notes	ME2; EUT: XC Tracer Maxx II Nr 2000C8; Measured Interface: Power 120 VAC 60 Hz N Setup / CDN: Table-top / V-LISN 10540 (N) Cables connected: --- Operating mode: Charging; Modifications: None; Remarks: None							
Test Place	ROS-FAR		Software	Radimation 2020.1.8 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment	Device Type Cable preamp -> analyser Spectrum analyser Cable antenna -> preamp LISN	ID FAR_CE 19-09 20-05C 10540	Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 80 dBµV RBW: 9 kHz, VBW: Auto [120 kHz], Number of Sweeps: 1 Step freq: Linear: 4.5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

CFR 47 §15.107 / CISPR 22 / EN 55032 Cl. B

RadiMation



Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	158.344 kHz	53 dBµV	25 dBµV	-30.59 dB	45.3 dBµV	-20.29 dB	Pass
2	220.922 kHz	49.7 dBµV	22.1 dBµV	-30.68 dB	42 dBµV	-20.76 dB	Pass
3	633.938 kHz	39.3 dBµV	22 dBµV	-23.97 dB	29.7 dBµV	-26.29 dB	Pass
4	738.234 kHz	36.2 dBµV	24.3 dBµV	-21.68 dB	28.5 dBµV	-27.5 dB	Pass
5	2.941 MHz	29 dBµV	8.8 dBµV	-37.23 dB	15.5 dBµV	-40.49 dB	Pass
6	25.715 MHz	29.2 dBµV	9.2 dBµV	-40.79 dB	16 dBµV	-43.97 dB	Pass

Sample calculation with all conversion and correction factors used					
Frequency [kHz]	Receiver QP Value [dBµV]	Cable att. Corr. [dB]	Attenuator Corr. [dB]	LISN Corr [dB]	QP voltage [dBµV]
158.34	35.1	+0.1	10.0	0.1	= 45.3

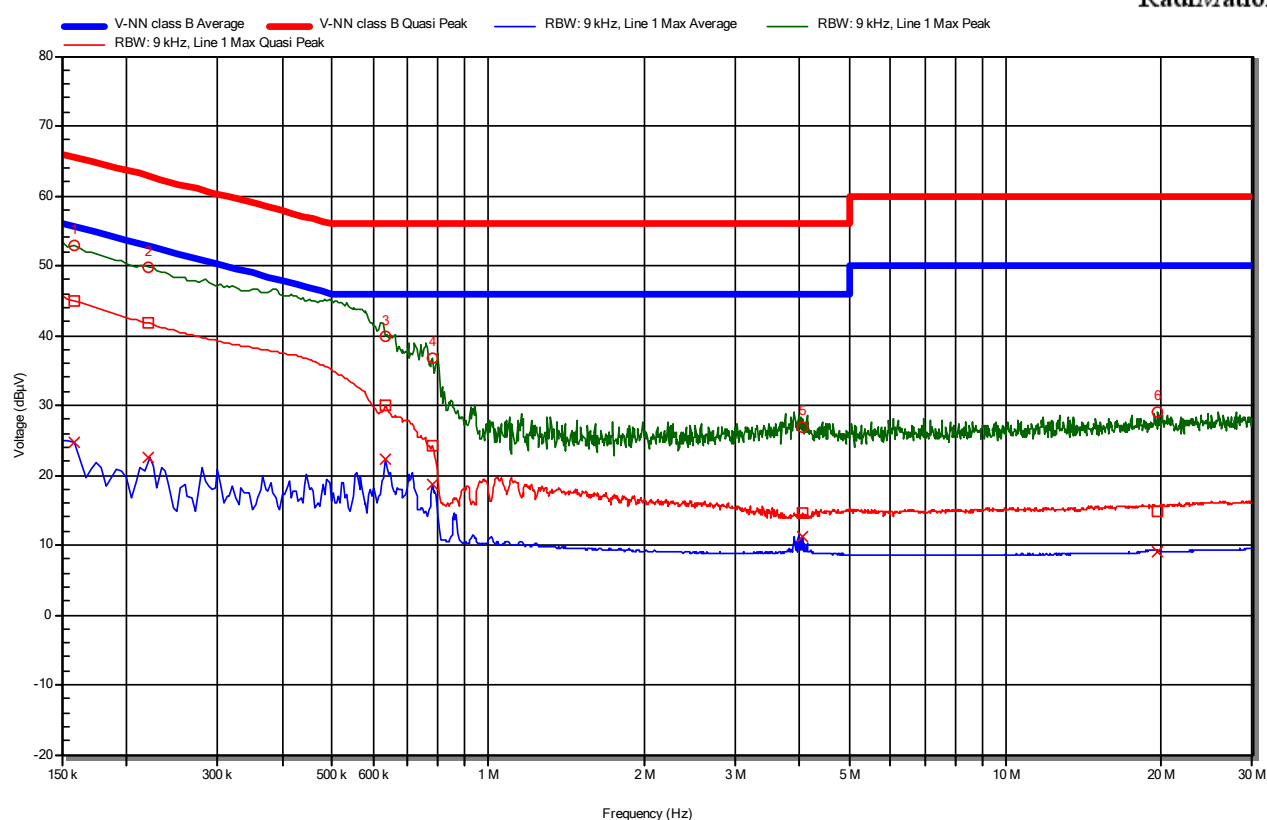
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	CE 150 kHz to 30 MHz	Date and time	13.04.2022 17:00:31	Test ID	#3	Operator	F. Wyler
EUT	XC Tracer Maxx II					Verdict	Pass
Notes	ME3 EUT: XC Tracer Maxx II Nr 2000C8; Measured Interface: Power 120 VAC 60 Hz L1 Setup / CDN: Table-top / V-LISN 10540 (L1) Cables connected: --- Operating mode: Charging; Modifications: None; Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2020.1.8 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment	Device Type Spectrum analyser Cable antenna -> preamp Cable preamp -> analyser LISN	ID 19-09 20-05C FAR_CE 10540	Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 80 dBµV RBW: 9 kHz, VBW: Auto [120 kHz], Number of Sweeps: 1 Step freq: Linear: 4.5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s			

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RadiMation



Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	158.344 kHz	53 dBµV	24.7 dBµV	-30.82 dB	45 dBµV	-20.5 dB	Pass
2	220.922 kHz	49.7 dBµV	22.5 dBµV	-30.26 dB	41.7 dBµV	-21.09 dB	Pass
3	633.938 kHz	39.9 dBµV	22.3 dBµV	-23.73 dB	29.9 dBµV	-26.1 dB	Pass
4	779.953 kHz	36.8 dBµV	18.6 dBµV	-27.38 dB	24.2 dBµV	-31.8 dB	Pass
5	4.047 MHz	26.8 dBµV	11.3 dBµV	-34.69 dB	14.5 dBµV	-41.47 dB	Pass
6	19.679 MHz	29 dBµV	9 dBµV	-41.04 dB	14.9 dBµV	-45.12 dB	Pass

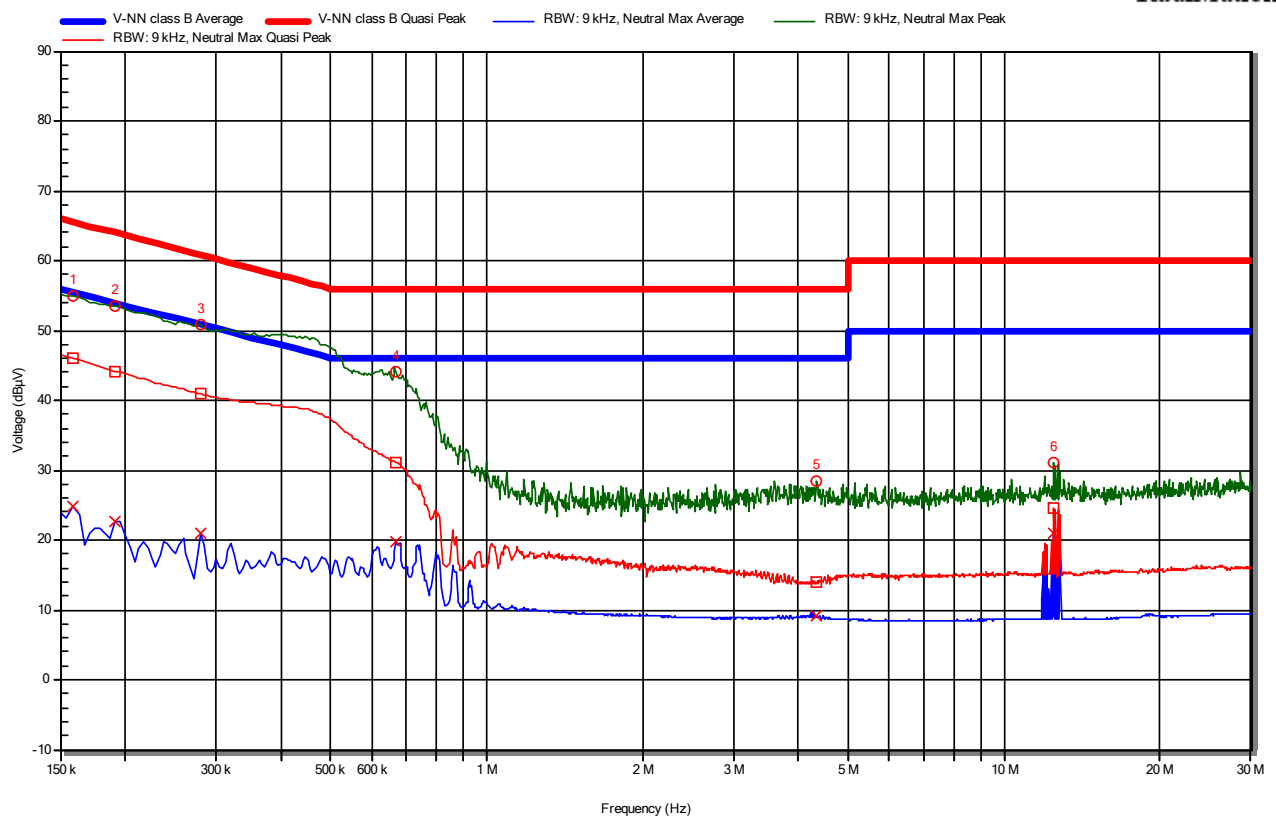
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	CE 150 kHz to 30 MHz		Date and time	13.04.2022 17:04:08	Test ID	#4	Operator	F. Wyler
EUT	XC Tracer Maxx II						Verdict	Pass
Notes	ME4 EUT: XC Tracer Maxx II Nr 2000C8; Measured Interface: Power 230 VAC 50 Hz N Setup / CDN: Table-top / V-LISN 10540 (N) Cables connected: --- Operating mode: Charging; Modifications: None; Remarks: None							
Test Place	ROS-FAR		Software	Radimation 2020.1.8 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment	Device Type Spectrum analyser Cable antenna -> preamp Cable preamp -> analyser LISN	ID 19-09 20-05C FAR_CE 10540	Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 80 dBµV RBW: 9 kHz, VBW: Auto [120 kHz], Number of Sweeps: 1 Step freq: Linear: 4.5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s				

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RadiMation



Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	158.344 kHz	55 dBµV	24.7 dBµV	-30.83 dB	46.1 dBµV	-19.48 dB	Pass
2	191.719 kHz	53.4 dBµV	22.7 dBµV	-31.27 dB	44.2 dBµV	-19.79 dB	Pass
3	279.328 kHz	50.8 dBµV	21 dBµV	-29.87 dB	40.9 dBµV	-19.91 dB	Pass
4	667.313 kHz	44 dBµV	19.7 dBµV	-26.27 dB	31.1 dBµV	-24.93 dB	Pass
5	4.339 MHz	28.5 dBµV	9.2 dBµV	-36.76 dB	14.1 dBµV	-41.94 dB	Pass
6	12.44 MHz	31 dBµV	21 dBµV	-29.04 dB	24.6 dBµV	-35.39 dB	Pass

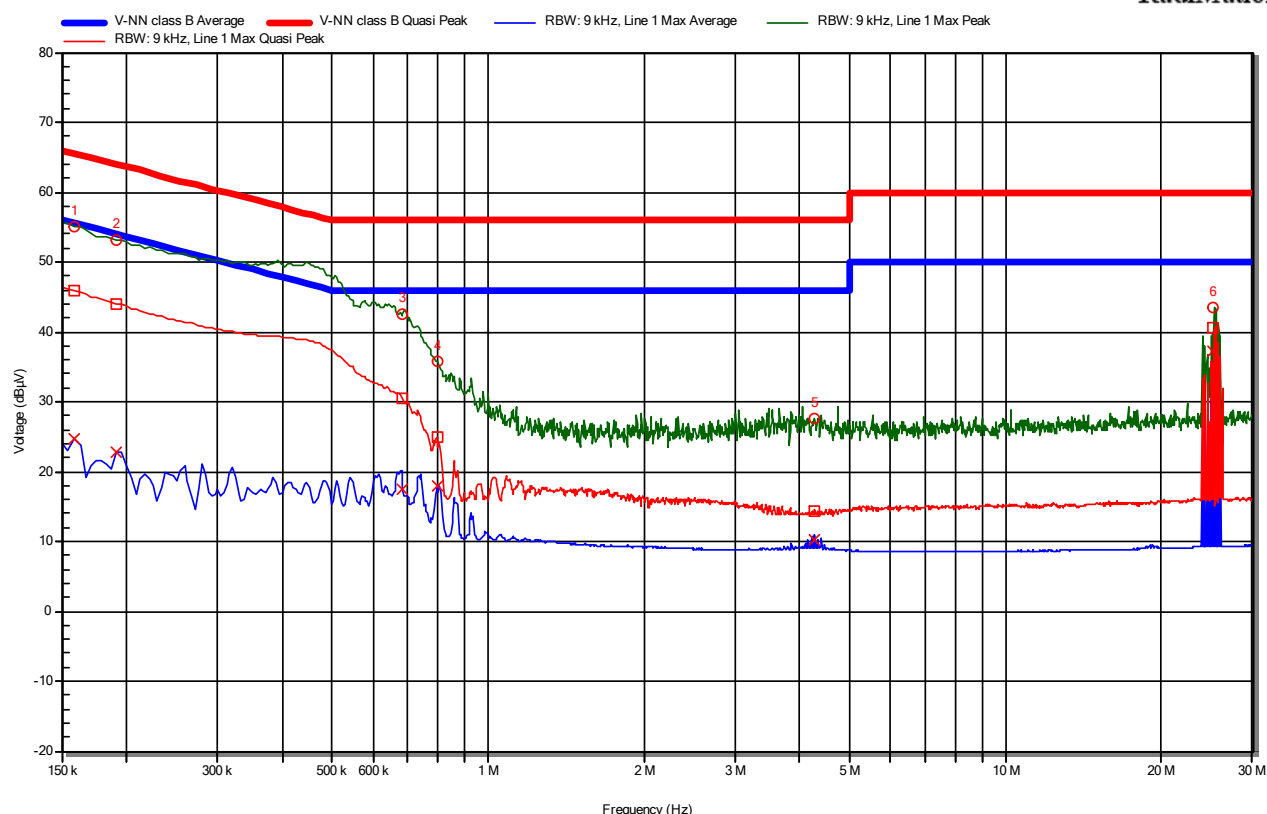
Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

Measurement	CE 150 kHz to 30 MHz	Date and time	13.04.2022 17:06:36	Test ID	#5	Operator	F. Wyler
EUT	XC Tracer Maxx II					Verdict	Pass
Notes	ME5 EUT: XC Tracer Maxx II Nr 2000C8; Measured Interface: Power 230 VAC 50 Hz L1 Setup / CDN: Table-top / V-LISN 10540 (L1) Cables connected: --- Operating mode: Charging; Modifications: None; Remarks: None						
Test Place	ROS-FAR	Software	Radimation 2020.1.8 (FAR CE 150k-30M Std Class B V-AMN TDEMIX)				
Equipment	Device Type Spectrum analyser Cable antenna -> preamp Cable preamp -> analyser LISN	ID 19-09 20-05C FAR_CE 10540	Settings	Band(s): 150 kHz - 30 MHz, Reference Level: 80 dBµV RBW: 9 kHz, VBW: Auto [120 kHz], Number of Sweeps: 1 Step freq: Linear: 4.5 kHz steps, Attenuator: 10 dB, Internal preamp: 0 dB, Measure time: 10 s Final Measurement/Observation Time: PK 1 s / 10 s, QP 1 s / 10 s, AVG 1 s / 10 s			

CFR 47 §15.107 / CISPR 22 / EN 55032 Cl. B

RadiMation



Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	158.344 kHz	55.1 dB μ V	24.8 dB μ V	-30.73 dB	45.8 dB μ V	-19.72 dB	Pass
2	191.719 kHz	53.2 dB μ V	22.8 dB μ V	-31.16 dB	44 dB μ V	-19.98 dB	Pass
3	684 kHz	42.6 dB μ V	17.6 dB μ V	-28.43 dB	30.4 dB μ V	-25.63 dB	Pass
4	796.641 kHz	35.8 dB μ V	18 dB μ V	-27.96 dB	25 dB μ V	-31 dB	Pass
5	4.28 MHz	27.5 dB μ V	10.2 dB μ V	-35.75 dB	14.3 dB μ V	-41.7 dB	Pass
6	25.21 MHz	43.5 dB μ V	37.1 dB μ V	-12.88 dB	40.7 dB μ V	-19.34 dB	Pass

Place and date of test:
Operator:

Rossens, 2022-04-13
F. Wyler

6.4 Designation of emission

Standard: United States: 47 CFR "Code of Federal Regulations" – Telecommunication
☒ FCC Part 2, Subpart C: Emission: §2.201 and §2.202

Introduction: A system of designating emission, modulation and transmission characteristics shall be employed.

(a) Emissions are designated according to their classification and their necessary bandwidth.

(b) A minimum of three symbols are used to describe the basic characteristics of radio waves.

(c) Four symbols are used to describe the necessary bandwidth.

Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Necessary bandwidth: For a given class of emission, the minimum value of the occupied bandwidth sufficient to ensure the transmission of information at the rate and with the quality required for the system employed, under specified conditions.

$B_n = 200 \text{ kHz}$ (occupied bandwidth)

Basic characteristics: FXD F : frequency modulation
 X : Cases not otherwise covered
 D : data transmission

Designation of emission: 200KFXD



Place and date of test:
 Operator:

Rossens, 2022-05-11
 F. Wyler

7. Appendix

7.1 Test equipment

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Disturbance voltage – 9 kHz (150 kHz) to 30 MHz					
Faraday					
Time-domain EMI Analyzer	TDEMI X6	2019-09	Gauss	2022-01-07	2023-01-07
LISN	ESH3-Z5	10540	Rohde & Schwarz	2021-05-19	2022-05-18
Coaxial cable	RG223U	2019-120	Huber+Suhner	2021-10-11	2023-04-11
Coaxial cable	RG223U	2019-121	Huber+Suhner	2021-10-11	2023-04-11
Coaxial cable	RG223U	2019-122	Huber+Suhner	2021-10-11	2023-04-11
Attenuator	6920.01.A	2020-05b	Huber+Suhner	2021-05-18 2023-02-06	2022-05-18 2024-08-06
Source 110V / 230 VAC	61511	2011-50	Chroma	2022-02-08	2023-08-08
Software	RadiMation 2020.1.8			No Cal.	No Cal.

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: conducted measurements - 9 KHz to 1000 MHz					
RF Labo					
Signal Analyzer	N9020B MXA	2018-01	Keysight	2021-04-15	2023-04-15
Attenuator; 10 dB / DC - 6 GHz	8491B 10 dB	2011-36	Huber+Suhner	2021-05-17	2024-05-17
Cable Sucoflex 18 GHz	Sucoflex 104A	2019-131	Huber+Suhner	2021-10-21	2023-04-21
Software	RadiMation 2020.1.8			No Cal	No Cal

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Radiated disturbances – 9 kHz to 30 MHz (Optional measurement)					
SAC3					
EMI Test Receiver	ESW26	2021-07	Rohde & Schwarz	2021-04-23 2022-10-06	2022-04-23 2023-10-06
Magnetic field antenna 10 kHz - 30 MHz	HLA6120	1990-25	Chase	2021-02-15	2022-08-15
Coax Cable	Sucoflex 104A	2015-16	Huber+Suhner	2021-10-14	2023-10-14
Cable Sucoflex 18 GHz	SF106PA	2011-61	Huber & Suhner	2021-10-14	2023-10-14
Coax Cable	Sucoflex 104A	2015-15	Huber+Suhner	2021-10-14	2023-10-14
Software	RadiMation 2020.1.8			No Cal	No Cal

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Radiated disturbances - 30 MHz to 1000 MHz					
SAC3					
EMI Test Receiver	ESW26	2021-07	Rohde & Schwarz	2021-04-23 2022-10-06	2022-04-23 2023-10-06
Bilog 30 MHz - 1 GHz / 300 W	CBL6111C	2005-38	Chase	2018-11-01	2022-11-01
Coax Cable	Sucoflex 104A	2015-16	Huber+Suhner	2021-10-14	2023-10-14
Cable Sucoflex 18 GHz	SF106PA	2011-61	Huber & Suhner	2021-10-14	2023-10-14
Coax Cable	Sucoflex 104A	2015-15	Huber+Suhner	2021-10-14	2023-10-14
Adjustable resonant cavity notch filter	900 MHz	2004-21	Montena EMC	2021-05-27	2022-11-27
Source 110V / 230 VAC	61511	2011-50	Chroma	2022-02-08	2023-08-08
Software	RadiMation 2020.1.8			No Cal.	No Cal.

Equipment	Type	Inventory no.	Manufacturer	Last calibration date	Calibration due date
Test stand: Radiated disturbances - 1000 MHz to 10000 MHz					
SAC3					
EMI Test Receiver	ESW26	2021-07	Rohde & Schwarz	2021-04-23 2022-10-06	2022-04-23 2023-10-06
Horn Antenna 1 - 18 GHz / 200W	BBHA 9120 D	2022-07	Schwarzbeck	2022-02-09	2023-08-09
Adjustable resonant cavity notch filter	900 MHz	2004-21	Montena EMC	2021-05-27	2022-11-27
Preamplifier	AWT 18236	2005-56	Avantek	2020-01-08 2023-02-09	2022-01-08 2026-02-09
Preamplifier	AFS42-00101800-25-S-42	2014-27	MITEQ	2021-05-28	2022-11-28
Coax Cable	Sucoflex 104A	2015-16	Huber+Suhner	2021-10-14	2023-10-14
Cable Sucoflex 18 GHz	SF106PA	2011-61	Huber & Suhner	2021-10-14	2023-10-14
Coax Cable	Sucoflex 104A	2015-15	Huber+Suhner	2021-10-14	2023-10-14
Dipole Antenna	UHAP – 10dB	1989-01	Schwarzbeck	Mechanical Antenna: check before use	
Software	RadiMation 2020.1.8			No Cal	No Cal

Remark: The test equipment, for which no calibration date is defined, is controlled during the test by another calibrated equipment. E.g. the output of a power supply or variable transformer is verified by a calibrated multimeter.