NVLAP TESTING
NVLAP LAB CODE 600157-0

Test laboratory accredited according to ISO 17025

Report:	**Electromagnetic compatibility and Radio spectrum Matters**	Report no:	**19CH-00891.R12 ***
Product:	**XC Tracer Maxx (FLARM)**		
Applicant:	**XC Tracer GmbH, Junkerngasse 53, 3011 Bern, SWITZERLAND**		
Manufacturer:	**XC Tracer GmbH, Junkerngasse 53, 3011 Bern, SWITZERLAND**		
Model/Type reference:	**XC Tracer Maxx**	Serial no:	**Proto 1, Proto 2 and Proto4**
Trade mark:	**XC Tracer**	Date of tests:	**2020-01-10 to 2020-04-25**

* Replaces report 19CH-00891.R02

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 with modifications of EUT (Proto 4).

Test performed by	Report prepared by	Report controlled and approved by
B. Itzcovich, F. Wyler EMC Test Engineer	B. Itzcovich, F. Wyler EMC Test Engineer	T. Houriet EMC Test Engineer

Rossens, 2020-05-27 (Issue Date)

Main language : English

The present document results from tests on one specimen and does not prejudge 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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Contents

Foreword

According to XC Tracer GmbH, the «U-BLOX ANNA-B112» Radio Module which is included in the EUT has been tested by its manufacturer in accordance with the all relevant rules and standards. Therefore, tests have not been carried out with «U-BLOX ANNA-B112» wireless communication active. According to XC Tracer GmbH, this radio module is installed in accordance with the instructions of its manufacturer, and cannot transmit simultaneously with the 902 – 920 MHz transmitter (FLARM)

The Display of the device made problems to the GPS reception and adjustments were necessary. These are described in chapter 7.1 and are implemented in the Proto 4 device. Therefore the spurious measurements from 1 to 10 GHz for the carrier frequency of 915 MHz were repeated, to check the harmonics of the carrier. The setup choosen is adding noise floor on highest freqency (longer cables from antenna to the receiver outside the chamber). This also made an update of the report 19CH-00891.R02 necessary, which is now available here as 19CH-00891.R12.

1. Summary of test results

§	Test Type		Result
6	**Emission**		**CFR 47 Part 15**
6.1	Channel 20dB-bandwidth	CFR 47 § 15.247 (a)(1)	**204 kHz**
6.2	Carrier frequency separation	CFR 47 § 15.247 (a)(1)	**Pass (400 kHz)**
6.3	Number of hopping channels	CFR 47 § 15.247 (a)(1)(iii)	**Pass (n = 63)**
6.4	Time of occupancy (dwell time)	CFR 47 § 15.247 (a)(1)(iii)	**Pass**
6.5	Pseudorandom frequency hopping sequence and equal hopping frequency use	CFR 47 § 15.247 (a)(1)	**Pass** [1]
6.6	Antenna gain (& effective radiated power)	CFR 47 § 15.247 (b)(4)	**Pass (-2.3 dBi)**
6.7	Maximum output power (conducted)	CFR 47 § 15.247 (b)(1)	**Pass (15.4 dBm)**
6.8	Band-edge emission (conducted)	CFR 47 § 15.247 (d)	**Pass**
6.9	Spurious emissions – conducted (transmitter)	CFR 47 § 15.247 (d)	**Pass**
6.10	Spurious emissions – radiated (transmitter)	CFR 47 § 15.247 (d) CFR 47 § 15.209 (a) CFR 47 § 15.205	**Pass**
6.11	Radiated emission – receiver	CFR 47 § 15.109	**Pass**
6.12	Conducted emission	CFR 47 § 15.207	**Pass**
6	**Emission**		**CFR 47 Part 2**
6.13	Designation of emission	FCC 47 §2.201 FCC 47 §2.202	**200KFXD**

1. Declared by manufacturer

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

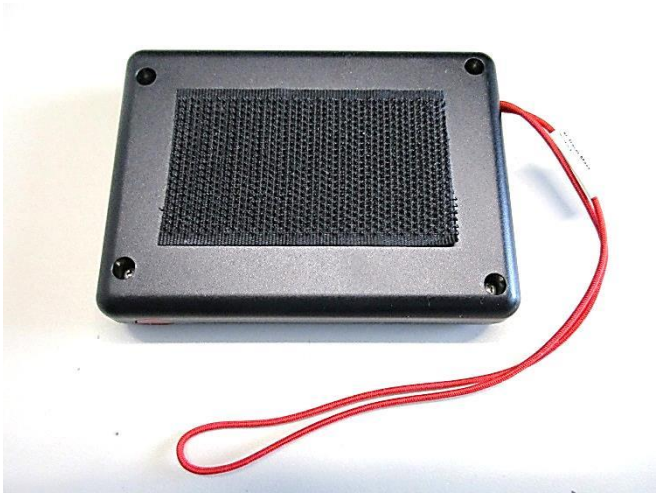
4.1 Identification*

Manufacturer name and address	XC Tracer GmbH Junkerngasse 53 3011 Bern SWITZERLAND
Production country	Switzerland
Brand name	XC Tracer
Product	XC Tracer Maxx (FLARM)
Product description	Flight measurement instrument for Paragliders & Hanggliders
Model number	XC Tracer Maxx
Serial no	Proto 1, Proto 2 and Proto4
Software version	Test software PowerFLARM 6.93beta, Build 7718b5673; Date 2019-12-17
FCC ID	2AVOQ01
Lowest Frequency considered	20 kHz (charge pump for LED driver)
Highest frequency considered	48 MHz (CPU) / 927.6 MHz (FLARM Transmitter carrier)
Supply	U = 3.7 VDC / I = 37 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)
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

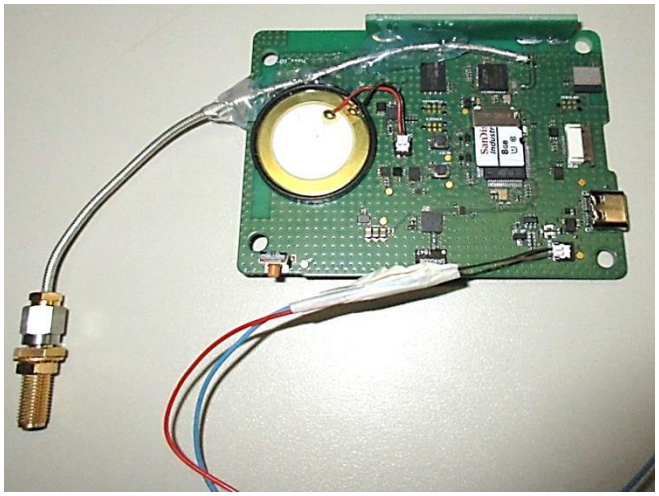
4.2 Pictures of the EUT

Front view



Rear view

Left view (with marking example and USB port)



Proto 2 with temporary supply & antenna connectors

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).

4.4 Transmitter characteristics (according to XC Tracer GmbH)

Method of frequency generation	☒ Crystal ☐ Synthesizer ☐ ……
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	15.4 dBm (at transmitter temporary RF output connector)
Variable carrier output	☒ Transmitter carrier output is not variable. RF output: P_{OUT} = 34.6 mW ☐ Transmitter carrier output is variable. Max. RF output: $P_{OUT\ MAX}$ = ….. mW Min. RF output: $P_{OUT\ MIN}$ = ….. 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

4.5 Receiver characteristics (according to XC Tracer GmbH)

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

4.6 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	2020-01-10 to 2020-04-25	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):

Messrs B. Itzcovich, 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

Power supply during tests if not stated otherwise in § 6 : 5 V_{DC} (USB)

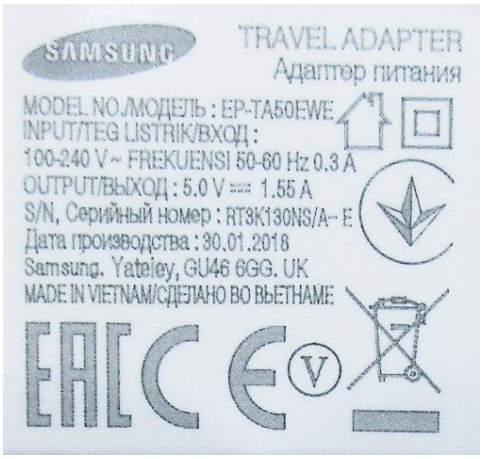
- Continuous hopping transmission of random data on three frequencies
- Normal operation: transmission of random data with hopping sequence
- Continuous reception on single frequency
- Continuous transmission of random data on one frequency, Duty 100%

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	SAMSUNG	EP-TA50EWE	Reference Eurofins	100 – 240 V_{AC} input, 5 V_{DC} output (USB). Used for tests in charging mode

AC – USB adaptor with cable



Marking on AC - USB adaptor

6. Test results

6.1 Channel 20dB-bandwidth

Introduction: Channel-bandwidth measured at -20 dBc.

Test site: ☐ SAC10 ☐ open test site

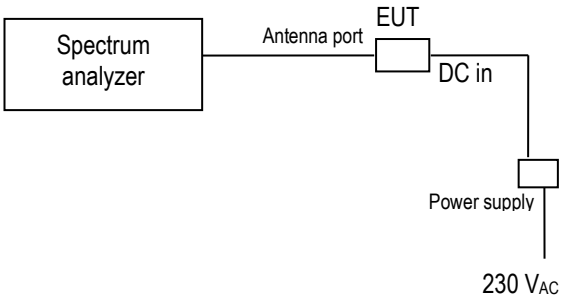
☐ SAC3 ☒ laboratory

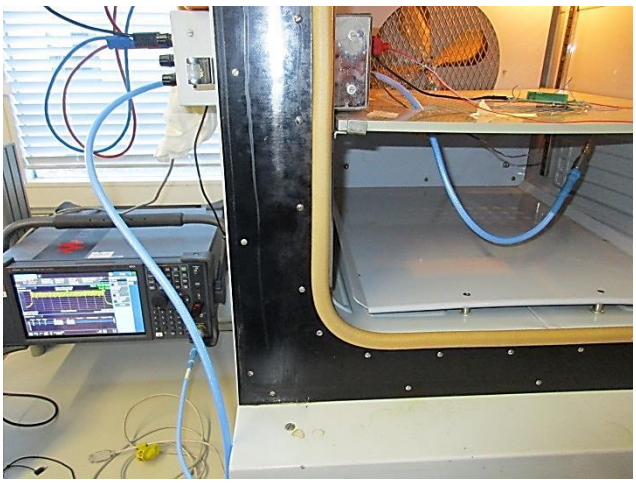
Meas. uncertainty: 9kHz – 3GHz: ± 1 dB
3GHz – 6.7GHz: ± 2.1 dB
6.7GHz – 13.2GHz: ± 2.6 dB
13.2GHz – 19GHz: ± 2.8 dB
19GHz – 26.5GHz: ± 3 dB

Method: Measurement on the temporary antenna connector

Limit: - - -

Test set-up:





Remarks: - - -

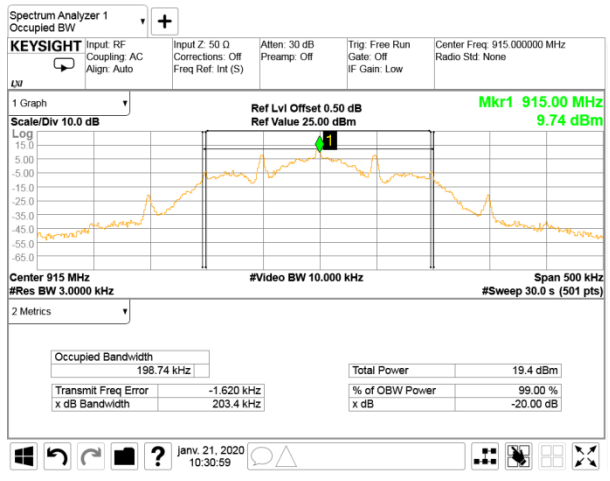
Test equipment:

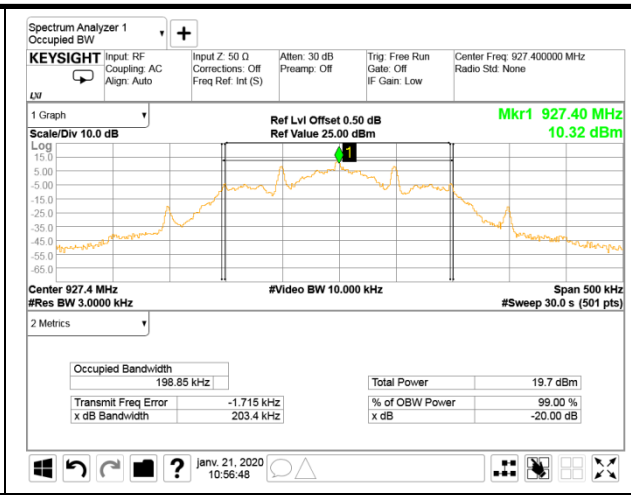
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☒ 99-07	☐ 04-31				
Cables	☒ 11-45					

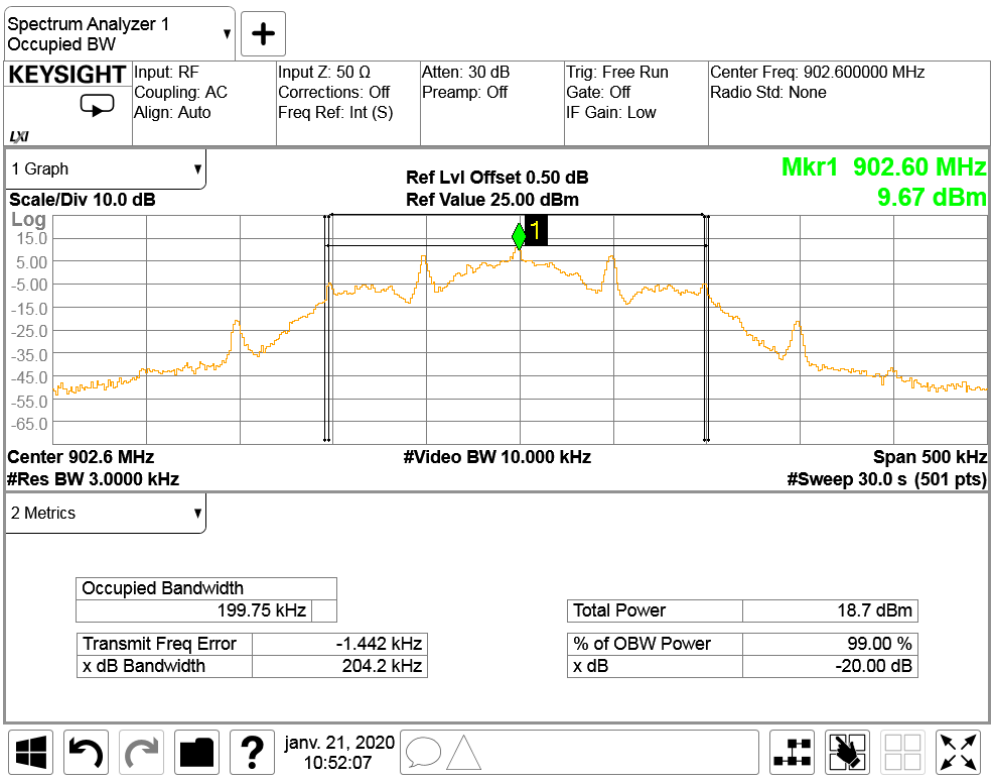
Results of the test

Applicant:	XC Tracer GmbH
EUT:	XC Tracer Maxx (FLARM) (Proto 2)
Operating mode:	TX, f = 902.6 / 915.0 / 927.4 MHz, modulated, power setting 16 dBm
Cables connected to the EUT:	USB, temporary supply & antenna cables
Remarks:	Measured on temporary antenna connector
Modifications:	☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Climatic conditions:	Temperature: 23 °C Humidity: 30 % Pressure QFE: 955 hPa

frequency [MHz]	20 dB bandwidth [kHz]	Remarks
902.6	204	- - -
915.0	203	- - -
927.4	203	- - -





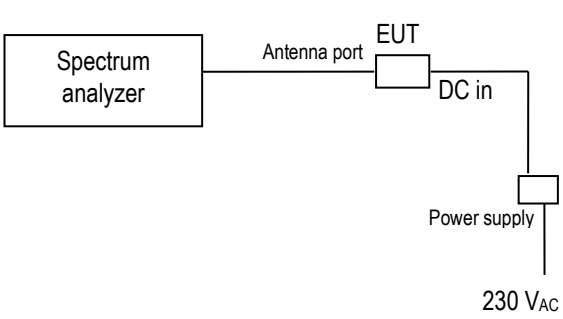


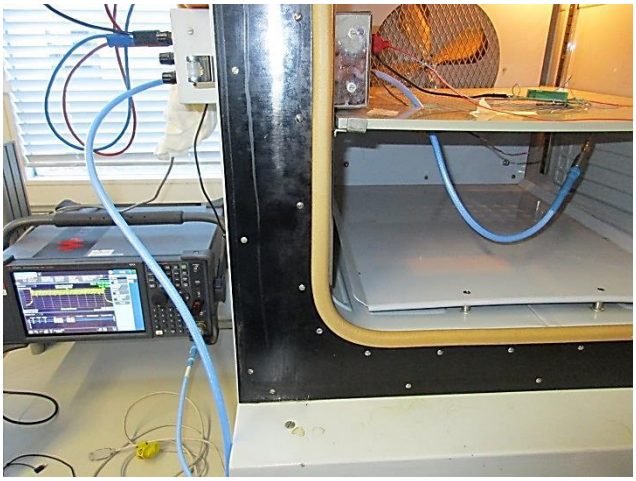
Place and date of test: Rossens, 2020-01-21
Operator: B. Itzcovich

6.2 Carrier frequency separation

Introduction:	Determination of the frequency separation of two adjacent channels.	
Test site:	☐ SAC10	☐ open test site
	☐ SAC3	☒ laboratory
Meas. uncertainty:	± 2.6 µHz/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:	- - -

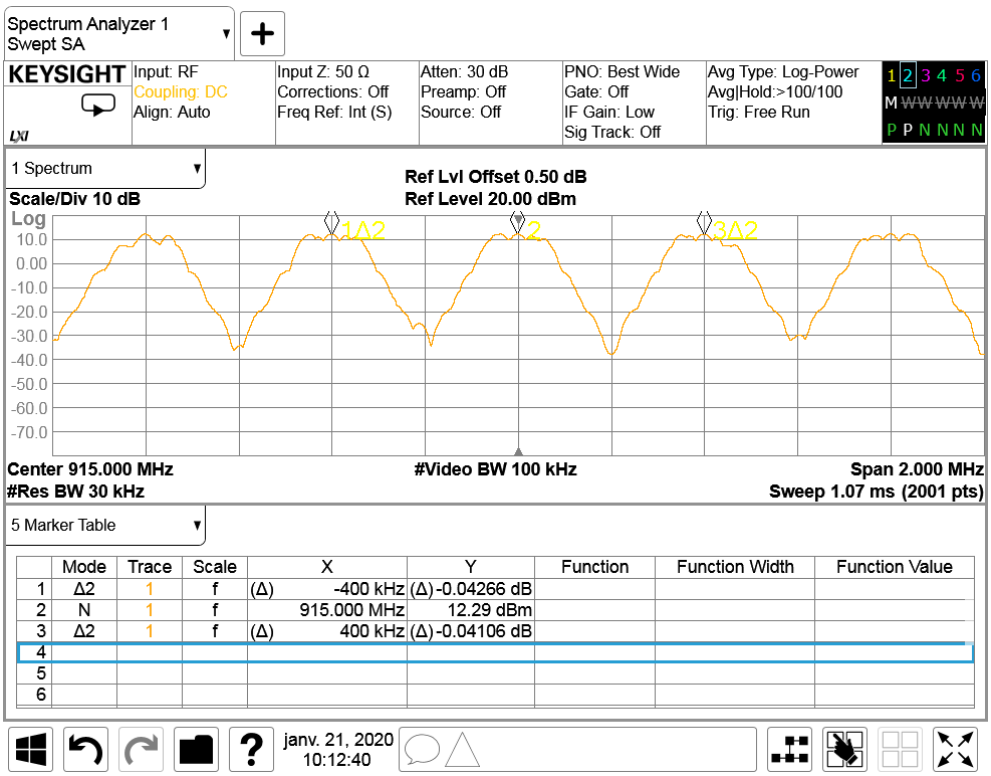
Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☒ 99-07	☐ 04-31				
Cables	☒ 11-45					

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

Results of the test

Applicant:	XC Tracer GmbH
EUT:	XC Tracer Maxx (FLARM) (Proto 2)
Cables connected to the EUT:	USB, temporary supply & antenna cables
Remarks:	Measured on temporary antenna connector
Modifications:	☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Climatic conditions:	Temperature: 23 °C Humidity: 30 % Pressure QFE: 955 hPa



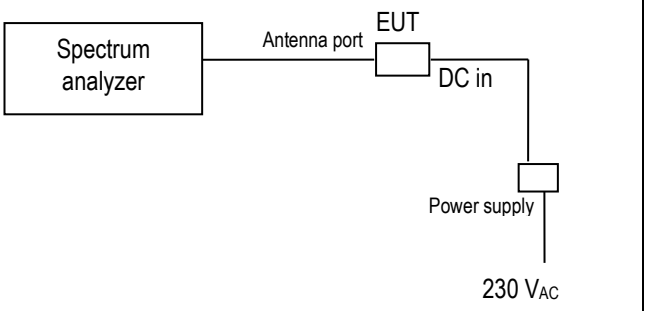
Carrier frequency separation = <u>400 kHz</u> > 204 kHz (see § 6.1)

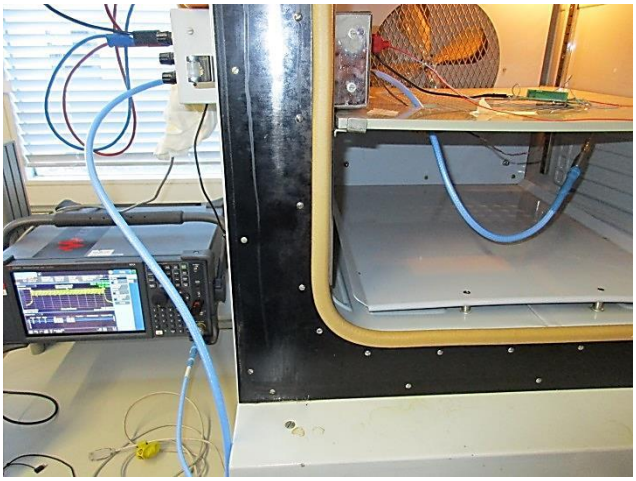
Place and date of test: Rossens, 2020-01-21
Operator: B. Itzcovich

6.3 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:	± 2.6 µHz/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:	- - -

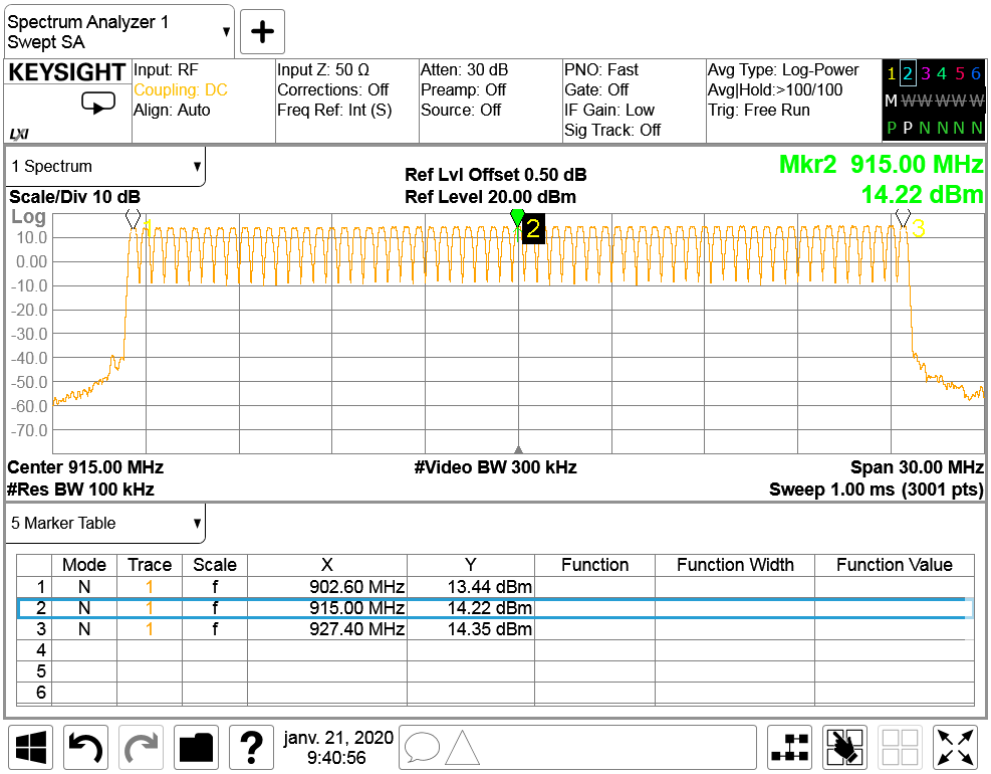
Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☒ 99-07	☐ 04-31				
Cables	☒ 11-45					

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

Results of the test

Applicant:	XC Tracer GmbH
EUT:	XC Tracer Maxx (FLARM) (Proto 2)
Operating mode:	Continuously hopping on all channels
Cables connected to the EUT:	USB, temporary supply & antenna cables
Remarks:	Measured on temporary antenna connector
Modifications:	☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Climatic conditions:	Temperature: 23 °C Humidity: 30 % Pressure QFE: 955 hPa



Number of hopping channels = 63 > 50

Place and date of test: Rossens, 2020-01-21
Operator: B. Itzcovich

6.4 Time of occupancy (dwell time)

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

Test site: ☐ SAC10 ☐ open test site

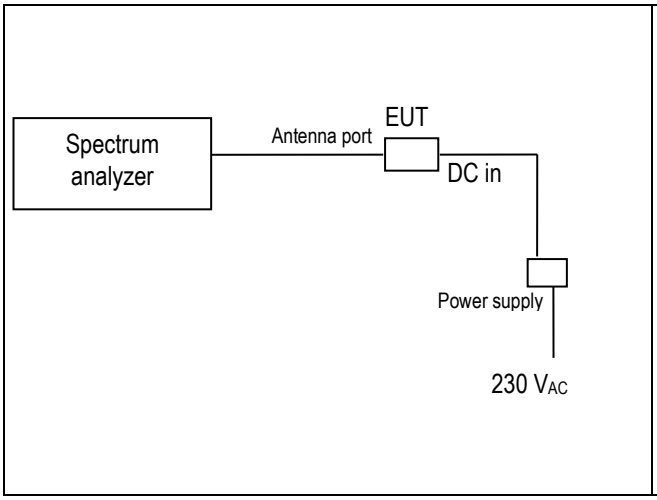
☐ SAC3 ☒ laboratory

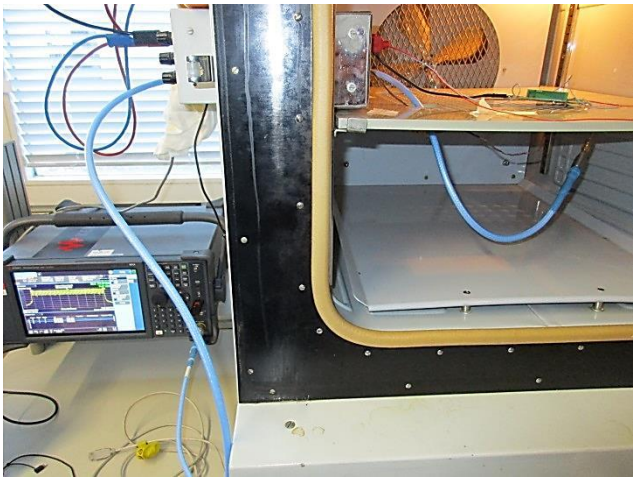
Meas. uncertainty: ± 2.6 µs/s

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				
Cables	☒ 11-45					

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

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx (FLARM) (Proto 2)

Operating mode: Continuously hopping on all channels

Cables connected to the EUT: USB and temporary antenna cables

Remarks: Measured on temporary antenna connector

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

Climatic conditions: Temperature: 23 °C Humidity: 45 % Pressure QFE: 953 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	5.17	0.635	3.28	400 ms in 20 s period	**Pass**
915.0	5.16	0.635	3.28	400 ms in 20 s period	**Pass**
927.4	5.16	0.635	3.28	400 ms in 20 s period	**Pass**

*Note: Two frequencies are used per second (declared by manufacturer), so in average, each frequency is used 2 x (20 s / 63 channels) in a 20 second period (also see § 6.5)

Example of pulse duration at frequency 915 MHz

Place and date of test: Rossens, 2020-01-21

Operator: B. Itzcovich

6.5 Pseudorandom frequency hopping sequence and equal hopping frequency use

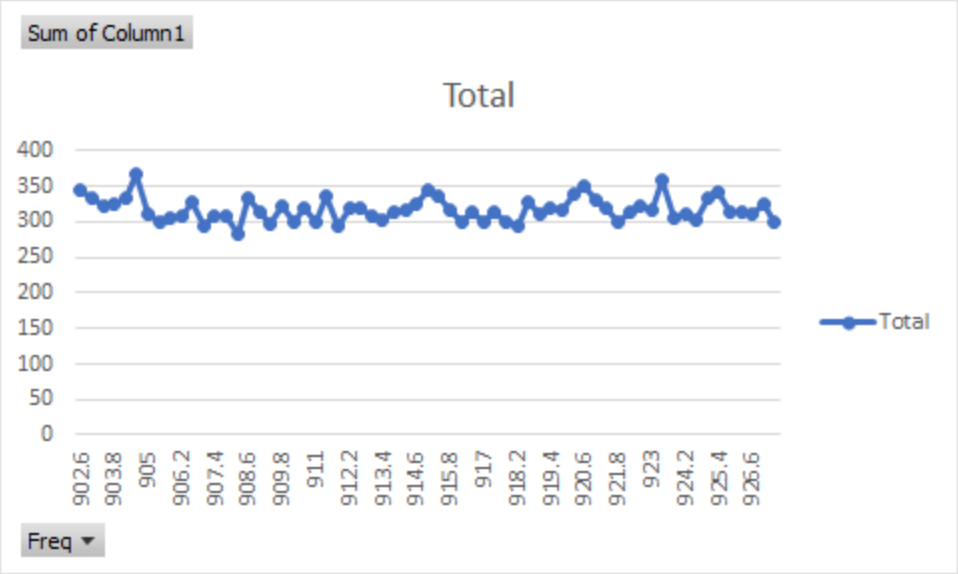
Declared by manufacturer:

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:

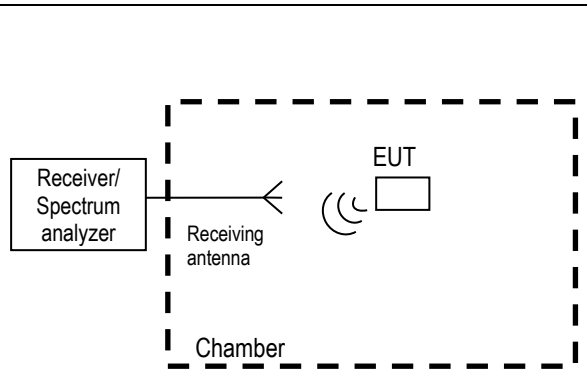


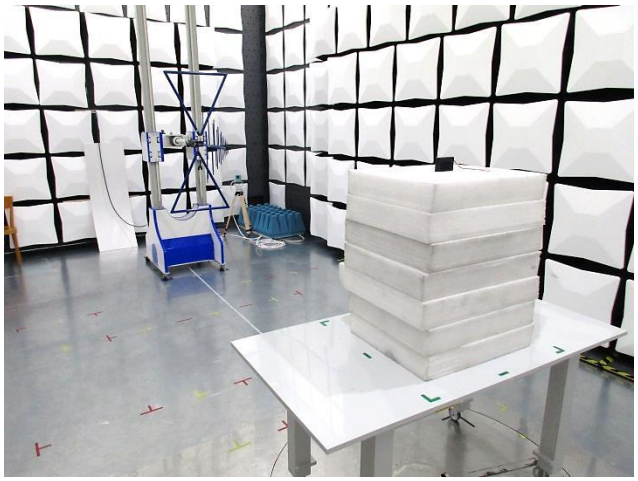
Since the frequency selection is pseudo-random based on the timestamp, and since every frequency slot is used for exactly one transmission, it is clear that on average you get uniform usage also.

6.6 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:	± 1.3 dB (f < 300 MHz) / ± 1.6 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 analyzer	☒ 16-03	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☐ 18-01
Receiver	☐ 85-04	☐ 90-43	☐ 94-35	☐ 04-29		
Preamplifier	☐ 11-29	☐ 95-86	☐ 05-56	☐ 05-59	☐ 05-62	☐ 05-87
Antenna (bilog)	☐ 94-03	☒ 05-38				
HF-wattmeter	☐ 95-97	☐ 01-15	☐ 01-17	☐ 03-07	☒ 03-12	☐ 05-20
Thermocouple detector	☒ 09-04	☐ 05-74	☐ 05-88	☐ 07-03	☐ 10-27	☐ 03-14
Substitution antenna	☒ 89-01	☐ 00-52	☐ 84-04			
Oscilloscope	☐ 90-14	☐ 93-85	☐ 93-86	☐ 01-20	☐ 04-06	☐ 04-50
Multimeter	☐ 03-22	☐ 04-47	☐ 04-104	☐ 04-105	☐ 06-51	☐ 06-52
Frequency generator	☒ 13-16	☐ 00-42	☐ 03-39	☐ 07-02	☐ 04-89	☐ 05-78
Cables	☒ SAC3_RE_5m_2.0/3.0		☐ 06-01	☒ 10-51	☐ SMK	
Attenuator 10dB	☐ 11-36					

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

Results of the test

Applicant: XC Tracer GmbH

EUT: XC Tracer Maxx (FLARM) (Proto 1 and 2)

Operating mode: TX, f = 902 / 915 / 928 MHz, modulated, setting 16 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: 30 % Pressure QFE: 938 hPa

	Measurement with EUT		Power at substitution ant.		Meas. with subst. ant.	Parameters of substitution ant.		Result			Polarisation
f [MHz]	U [dBuV]	preamp [dB]	P [dBm]	factor [dB]	U [dBuV]	gain [dB]	att. Cable [dB]	corr. [dB]	P ERP [dBm]	P ERP [W]	
902	80.9	0.0	10.0	-10	74.2	0	0	-74.20	6.70	4.68 mW	Vertical
902	89.0	0.0	10.0	-10	77.4	0	0	-77.40	11.60	14.45 mW	Horizontal
915	81.1	0.0	10.0	-10	73.9	0	0	-73.90	7.20	5.25 mW	Vertical
915	88.3	0.0	10.0	-10	76.4	0	0	-76.40	11.90	15.49 mW	Horizontal
928	81.3	0.0	10.0	-10	72.4	0	0	-72.40	8.90	7.76 mW	Vertical
928	88.7	0.0	10.0	-10	75.7	0	0	-75.70	13.00	19.95 mW	Horizontal

The antenna gain is the difference (in dB) of the radiated ERP power and the conducted power of § 6.7 :

frequency [MHz]	Conducted power [dBm]	Radiated power ERP [dBm]	Antenna gain [dBi]	Remarks
902	13.92	11.60	-2.32	- - -
915	14.65	11.90	-2.75	- - -
928	15.39	13.00	-2.39	- - -

Place and date of test: Rossens, 2020-01-13 and -22
Operator: B. Itzcovich

6.7 Maximum output power (conducted)

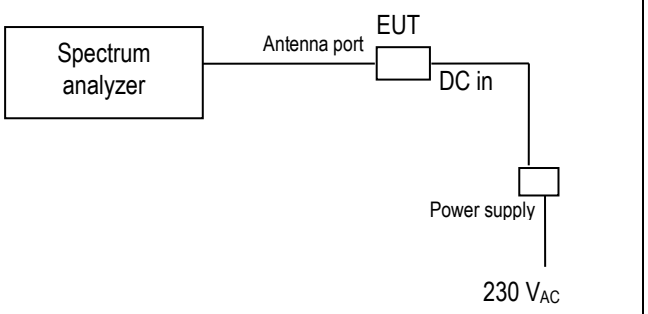
Test site:	☐ SAC10	☐ open test site
	☐ SAC3	☒ laboratory

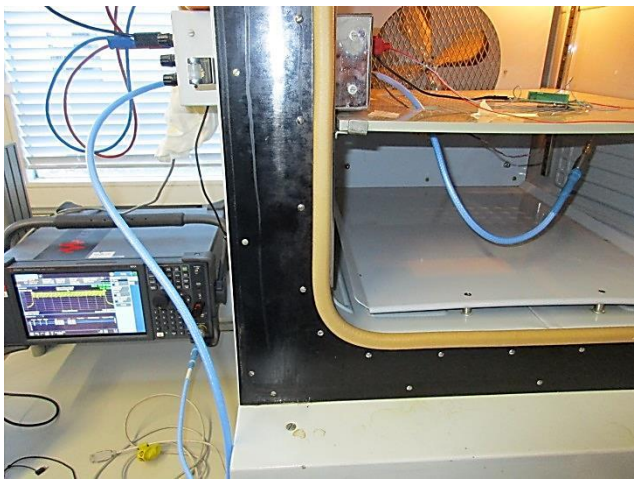
Meas. uncertainty:
9kHz – 3GHz: ± 1 dB
3GHz – 6.7GHz: ± 2.1 dB
6.7GHz – 13.2GHz: ± 2.6 dB
13.2GHz – 19GHz: ± 2.8 dB
19GHz – 26.5GHz: ± 3 dB

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:

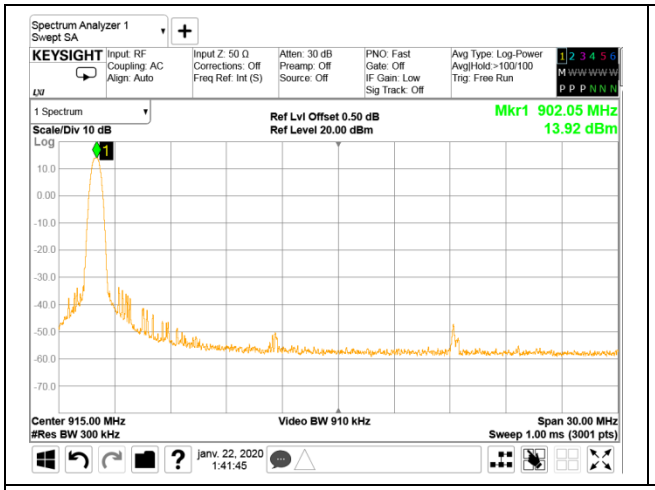
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☒ 99-07	☐ 04-31				
Cables	☒ 11-45					

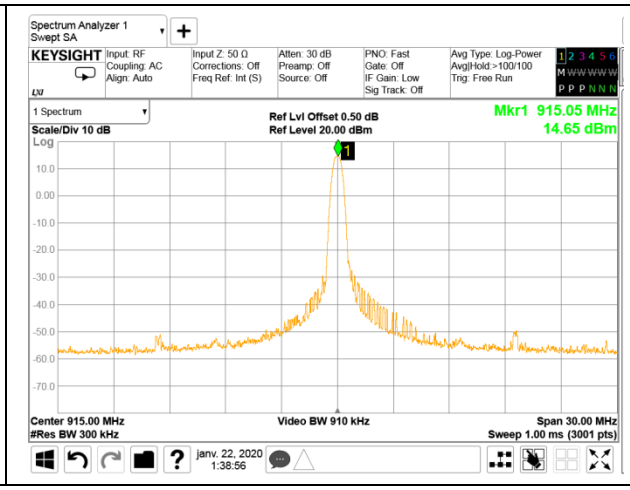
Result:	**☒ pass**	**☐ fail**	**☐ not applicable**	**☐ not tested**

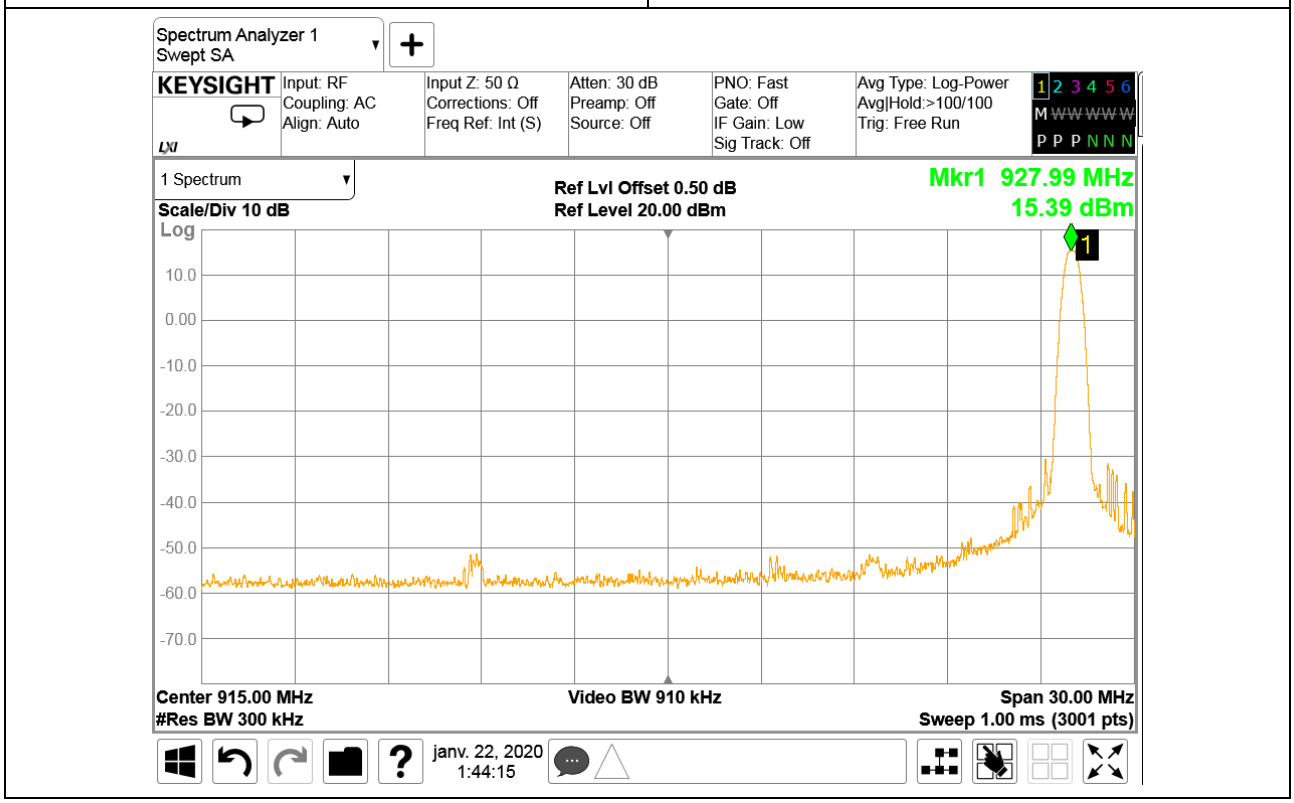
Results of the test

Applicant:	XC Tracer GmbH
EUT:	XC Tracer Maxx (FLARM) (Proto 2)
Operating mode:	TX, f = 902 / 915 / 928 MHz, modulated, power setting 16 dBm
Cables connected to the EUT:	USB, temporary supply & antenna cables
Remarks:	Measured on temporary antenna connector RBW = 300 kHz, VBW = 910 kHz; Peak detector
Modifications:	☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Climatic conditions:	Temperature: 24 °C Humidity: 30 % Pressure QFE: 947 hPa

frequency [MHz]	Temp [°C]	U [V]	P [dBm]	Limit [dBm]	Remarks	Pass Yes	Pass No
902	23	3.7	13.92	21	- - -	☒	☐
915	23	3.7	14.65	21	- - -	☒	☐
928	23	3.7	15.39	21	Maximum conducted emission	☒	☐







Place and date of test: Rossens, 2020-01-22
Operator: B. Itzcovich

6.8 Band-edge emission (conducted)

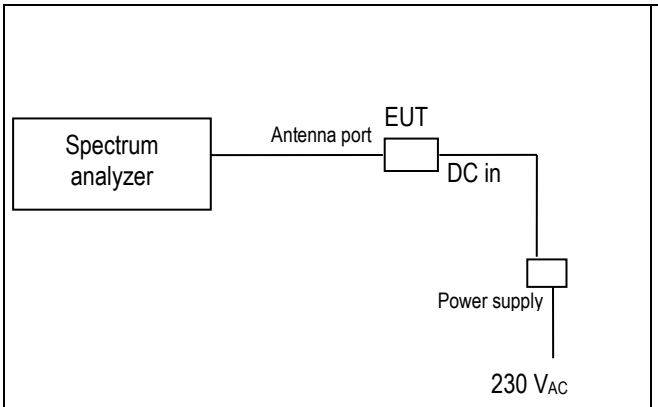
Test site:	☐ SAC10	☐ open test site
	☐ SAC3	☒ laboratory

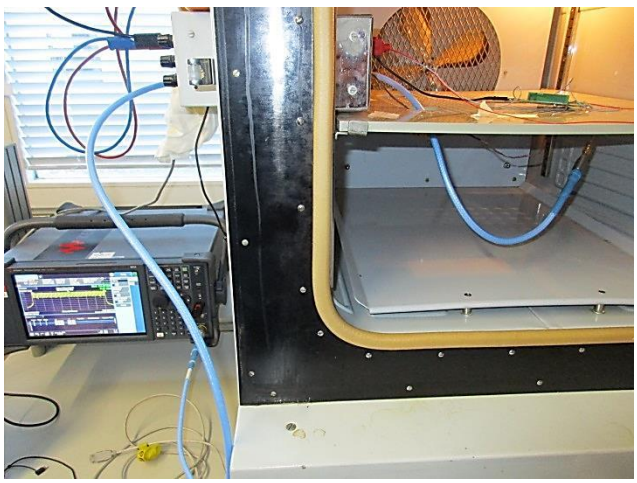
Meas. uncertainty:
9kHz – 3GHz: ± 1 dB
3GHz – 6.7GHz: ± 2.1 dB
6.7GHz – 13.2GHz: ± 2.6 dB
13.2GHz – 19GHz: ± 2.8 dB
19GHz – 26.5GHz: ± 3 dB

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				
Cables	☒ 11-45					

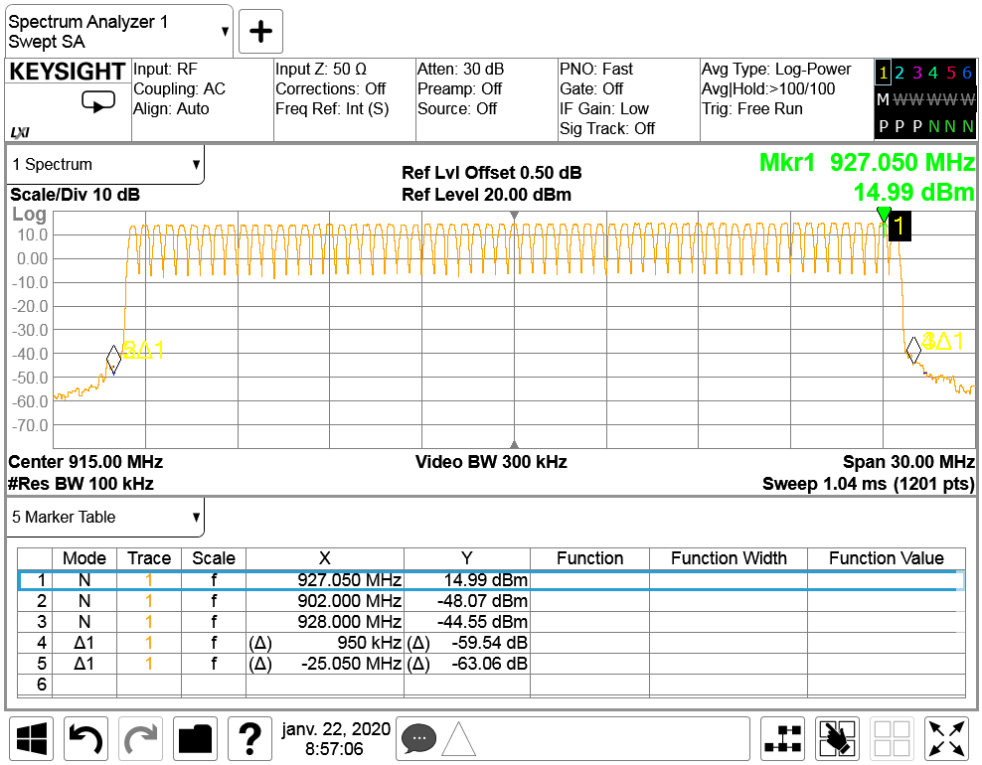
Result:	**☒ pass**	**☐ fail**	**☐ not applicable**	**☐ not tested**

Results of the test

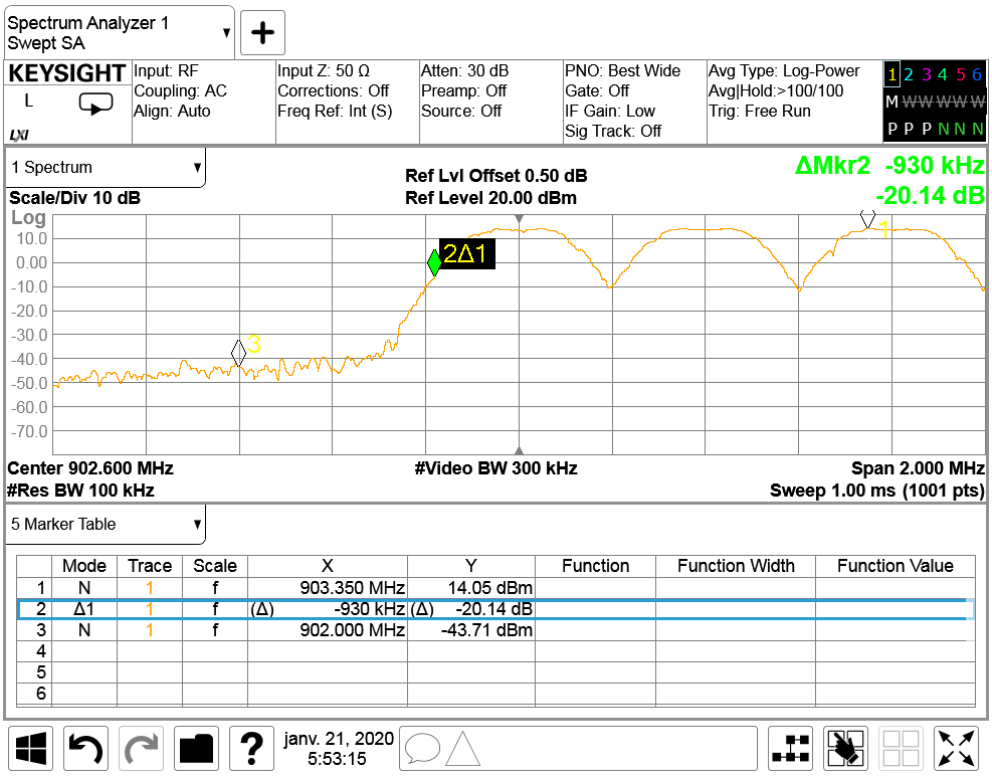
Applicant:	XC Tracer GmbH
EUT:	XC Tracer Maxx (FLARM) (Proto 2)
Operating mode:	TX, modulated, Power setting 16 dBm. See results hereafter
Cables connected to the EUT:	USB, temporary supply & antenna cables
Remarks:	Measured on temporary antenna connector
Modifications:	☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Climatic conditions:	Temperature: 23 – 24 °C Humidity: 30 % Pressure QFE: 947 – 952 hPa

Conclusion: Pass

f = 902.0 MHz and 928.0 MHz, hopping

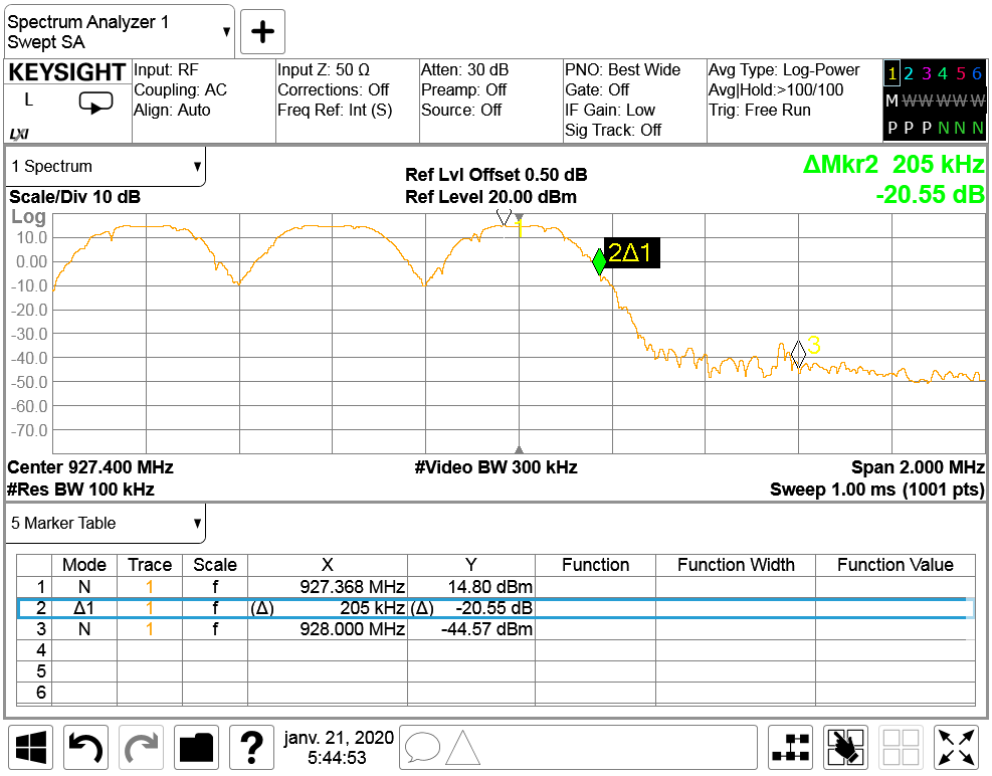


f = 902.0 MHz, hopping



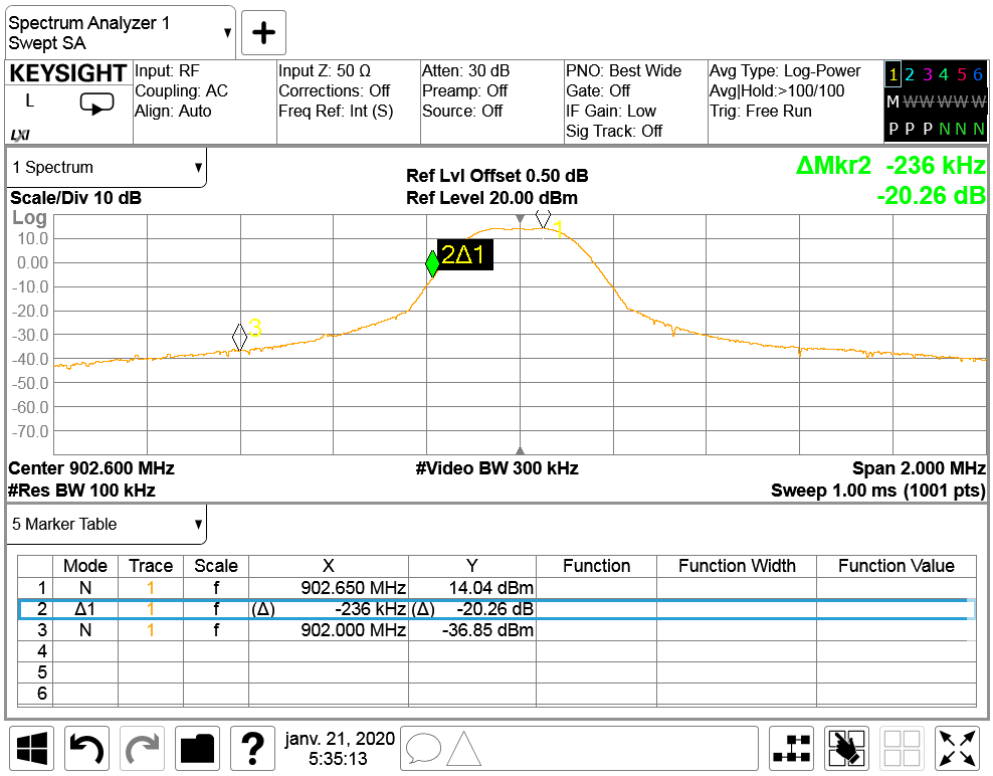
	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	903.350 MHz	14.05 dBm			
2	Δ1	1	f	(Δ) -930 kHz	(Δ) -20.14 dB			
3	N	1	f	902.000 MHz	-43.71 dBm			
4								
5								
6								

f = 928.0 MHz, hopping



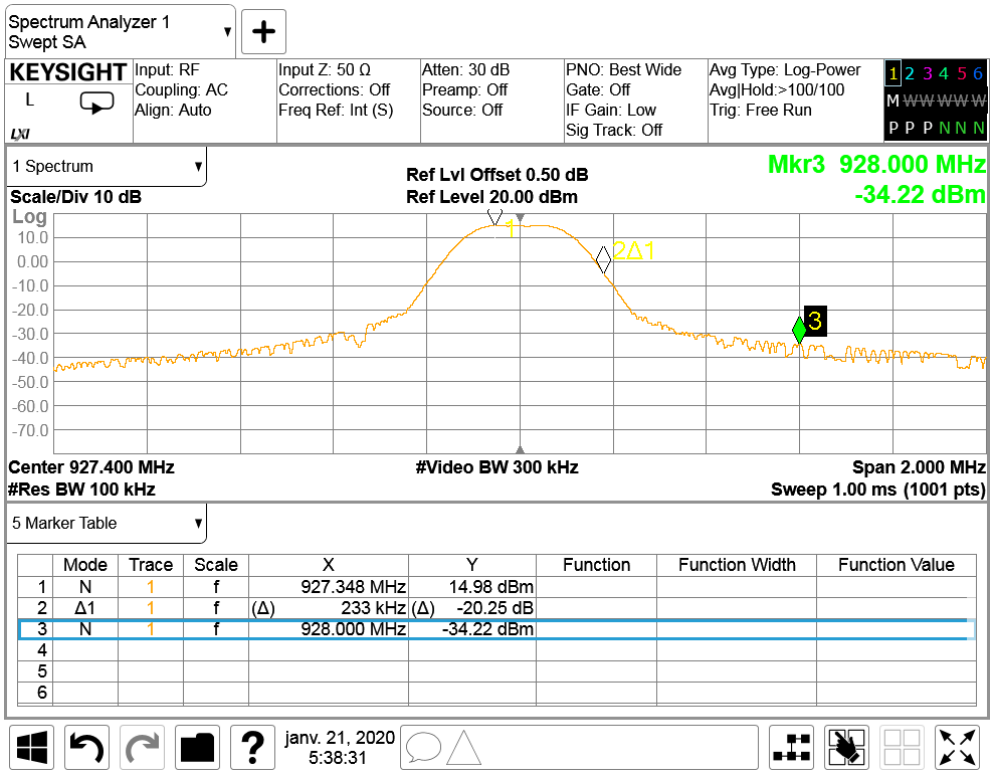
	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	927.368 MHz	14.80 dBm			
2	Δ1	1	f	(Δ) 205 kHz	(Δ) -20.55 dB			
3	N	1	f	928.000 MHz	-44.57 dBm			
4								
5								
6								

f = 902.6 MHz, non hopping



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	902.650 MHz	14.04 dBm			
2	Δ1	1	f	(Δ) -236 kHz	(Δ) -20.26 dB			
3	N	1	f	902.000 MHz	-36.85 dBm			
4								
5								
6								

f = 902.6 MHz and 927.4 MHz, non hopping



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	927.348 MHz	14.98 dBm			
2	Δ1	1	f	(Δ) 233 kHz	(Δ) -20.25 dB			
3	N	1	f	928.000 MHz	-34.22 dBm			
4								
5								
6								

Place and date of test: Rossens, 2020-01-21 and -22
Operator: B. Itzcovich

6.9 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

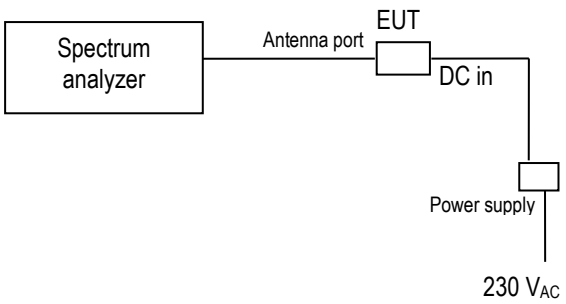
Test method: Measurement of the conducted power on the antenna connector or a test fixture.

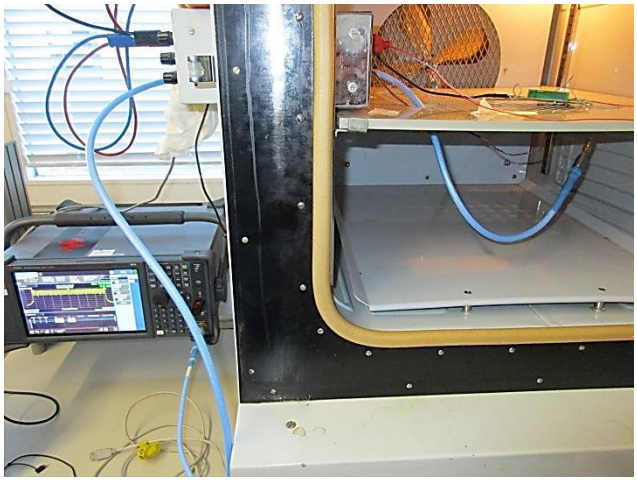
Requirement: In any 100 kHz bandwidth outside the frequency band, the radio frequency power shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

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

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 945 hPa

Test set-up:





Remarks:	Emissions near band-edges are checked under § 6.8

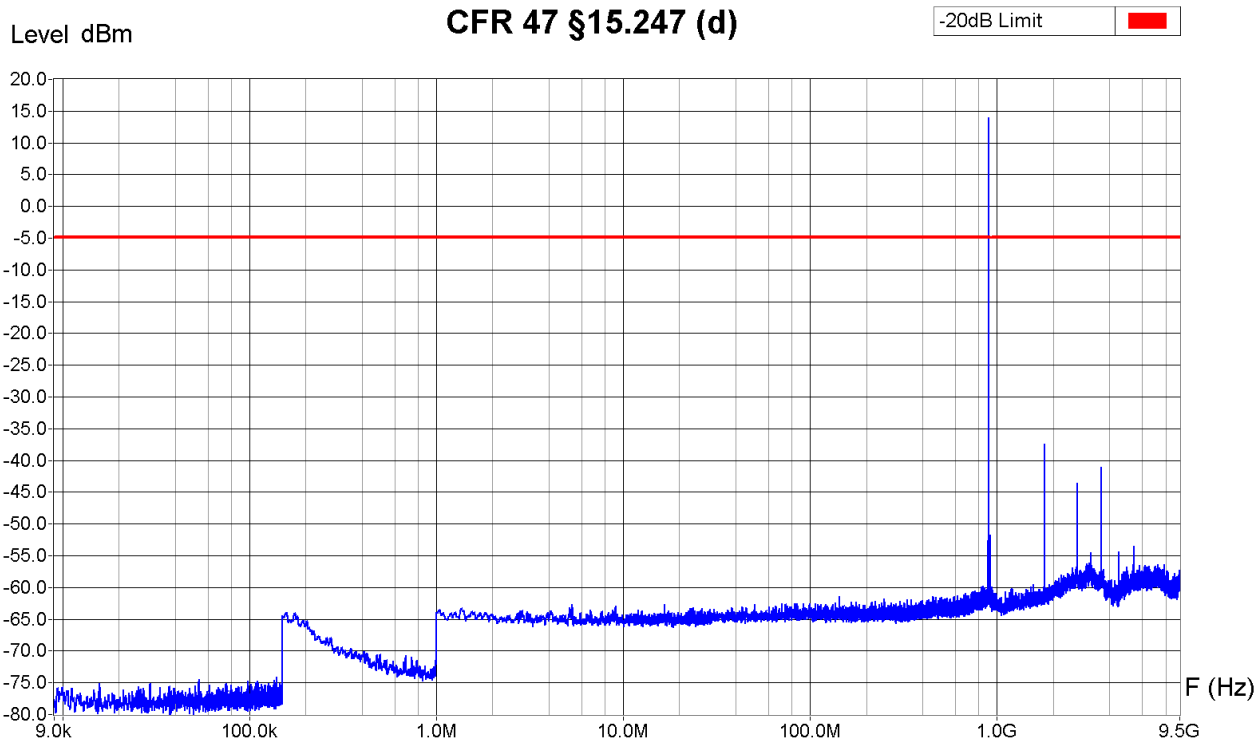
Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Power supply	☒ 99-07	☐ 04-31				
Cables	☒ 11-45					

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

Measurement Type :	Power Interference
Port :	Temporary antenna connector
Clamp position :	-

Equipment Under Test :	XC Tracer Maxx, Proto 2 (MY)
Set-Up :	See photos
Operating Conditions :	TX, f = 902.6 MHz, modulated, Power setting 16 dBm
Remarks :	Highest RFpower in the 100 kHz bandwidth within 902-928MHz band is 15.1 dBm Peak detector sweep

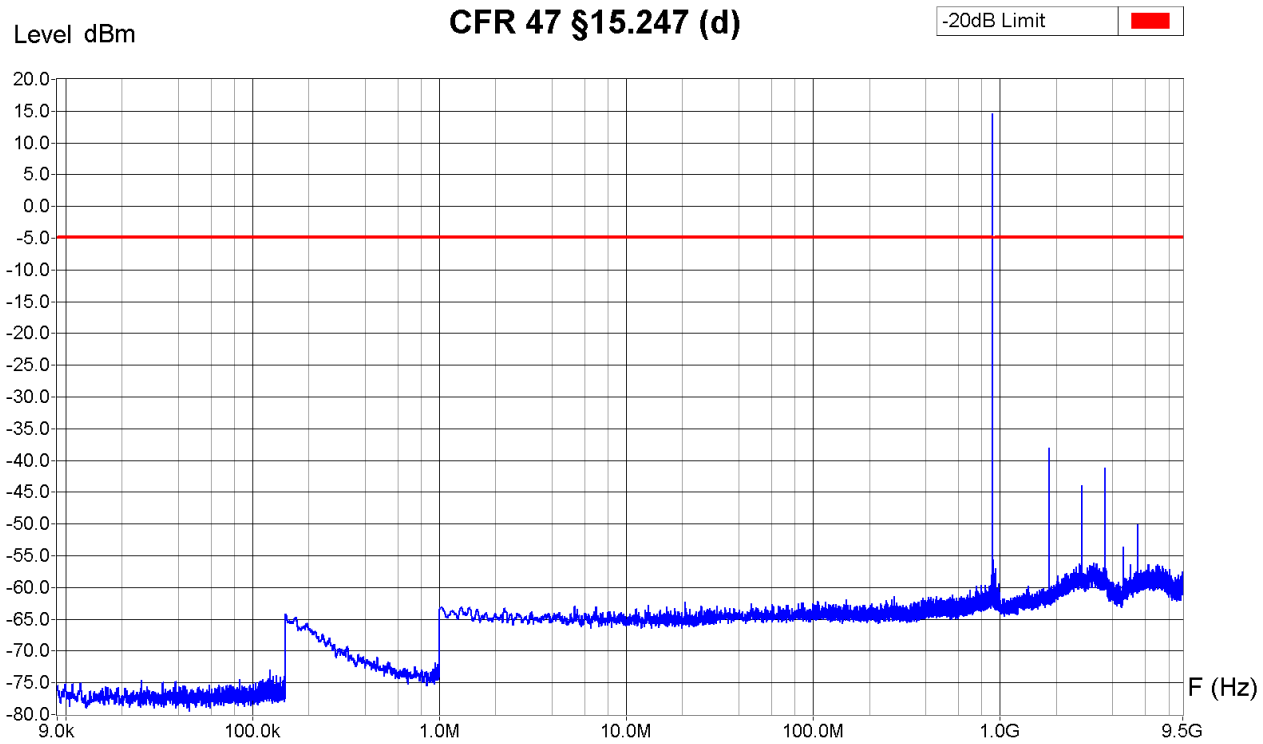


Zone	9 KHz - 150 KHz	150 KHz - 1 MHz	1 MHz - 30 MHz	30 MHz - 1 GHz	1 GHz - 9.50 GHz
Video Bandwidth	300 KHz	300 KHz	300 KHz	300 KHz	300 KHz
Resol Bandwidth	200 Hz	9 KHz	100 KHz	100 KHz	100 KHz

Operator: B. Itzcovich
Date/Time: 23.01.2020 11:25
Filename: 118_CP_9k-9G5_cond_902M6.png/.txt

Measurement Type :	Power Interference
Port :	Temporary antenna connector
Clamp position :	-

Equipment Under Test :	XC Tracer Maxx, Proto 2 (MY)
Set-Up :	See photos
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	Highest RFpower in the 100 kHz bandwidth within 902-928MHz band is 15.1 dBm Peak detector sweep

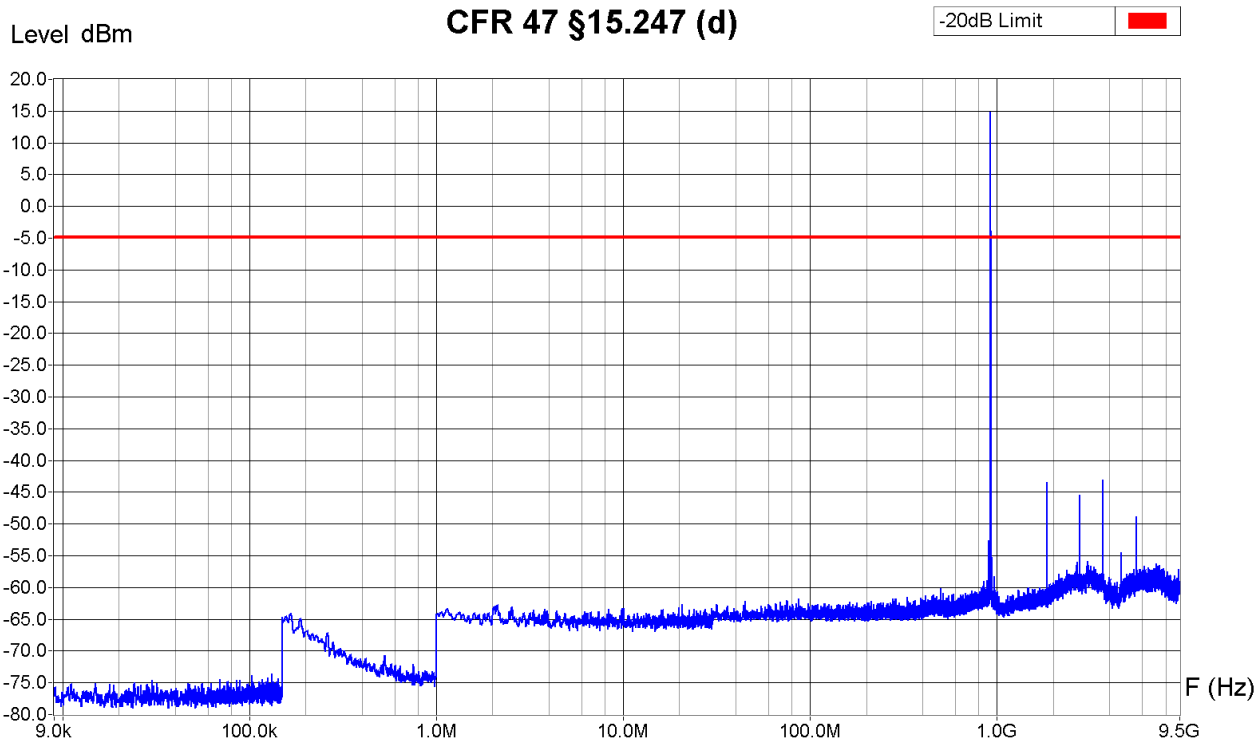


Zone	9 KHz - 150 KHz	150 KHz - 1 MHz	1 MHz - 30 MHz	30 MHz - 1 GHz	1 GHz - 9.50 GHz
Video Bandwidth	300 KHz	300 KHz	300 KHz	300 KHz	300 KHz
Resol Bandwidth	200 Hz	9 KHz	100 KHz	100 KHz	100 KHz

Operator: B. Itzcovich
Date/Time: 23.01.2020 11:15
Filename: 119_CP_9k-9G5_cond_915M0.png/.txt

Measurement Type :	Power Interference
Port :	Temporary antenna connector
Clamp position :	-

Equipment Under Test :	XC Tracer Maxx, Proto 2 (MY)
Set-Up :	See photos
Operating Conditions :	TX, f = 927.4 MHz, modulated, Power setting 16 dBm
Remarks :	Highest RFpower in the 100 kHz bandwidth within 902-928MHz band is 15.1 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

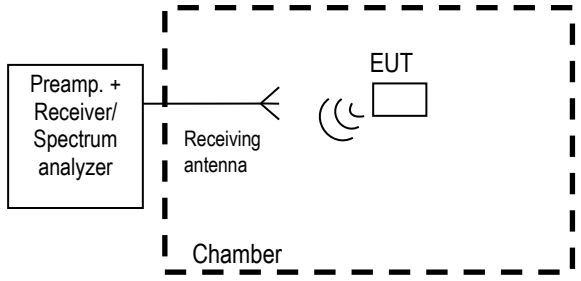
Operator: B. Itzcovich
Date/Time: 23.01.2020 11:01
Filename: 120_CP_9k-9G5_cond_927M4.png/.txt

6.10 Spurious emissions, transmit mode – radiated

6.10.1 9 kHz to 30 MHz

Test site:	☐ SAC10		☐ open test site
	☒ SAC3		☐ .....
Distance:	☒ 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: 30 %	Pressure QFE: 942 hPa

Test set-up:



Parallel

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;

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

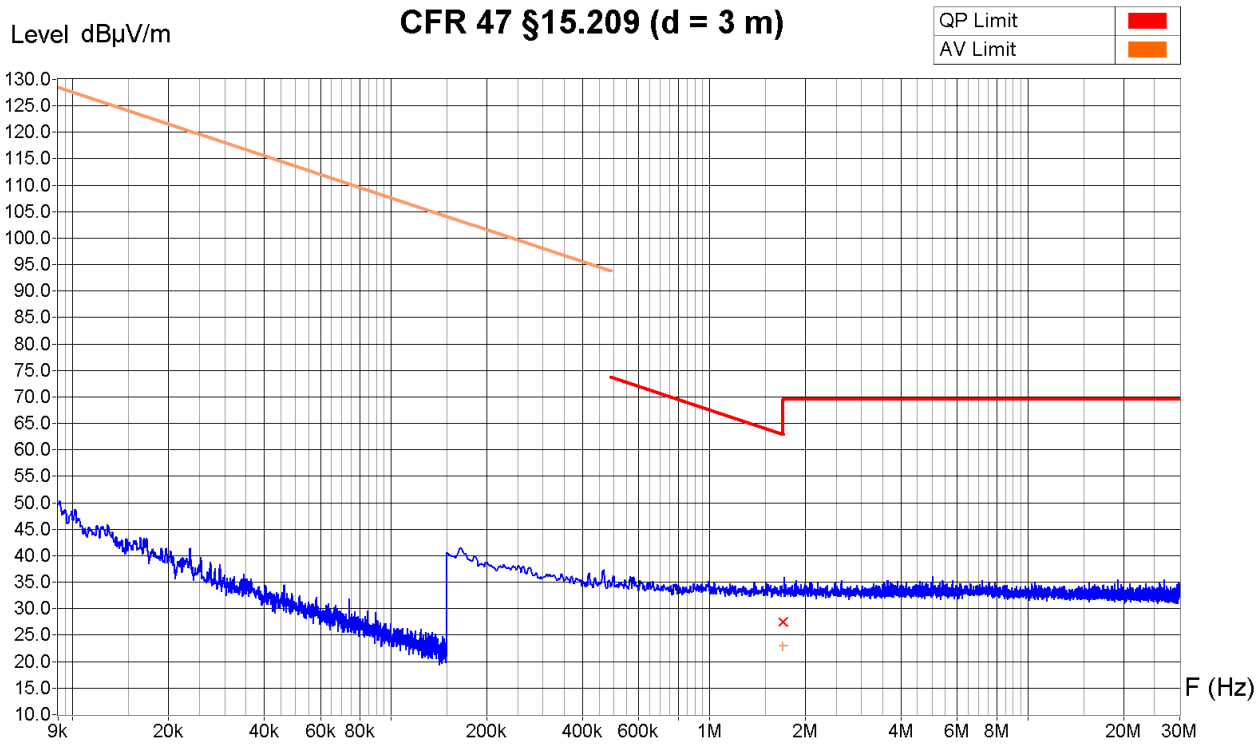
"Parallel" means measurement antenna axis towards EUT

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 16-03
Receiver	☐ 85-04	☐ 90-43	☐ 94-35	☒ 16-03		
Preamplifier	☐ 90-01	☐ 95-86	☐ 05-56	☐ 05-59	☐ 05-62	
Antenna (type: magnetic)	☒ 90-25	☐ 90-28	☐ 99-32	☐ 04-79		
Cables	☒ SAC3_RE_5m_1.0/3.0		☐ 06-236			
Software and Revision	☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

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, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

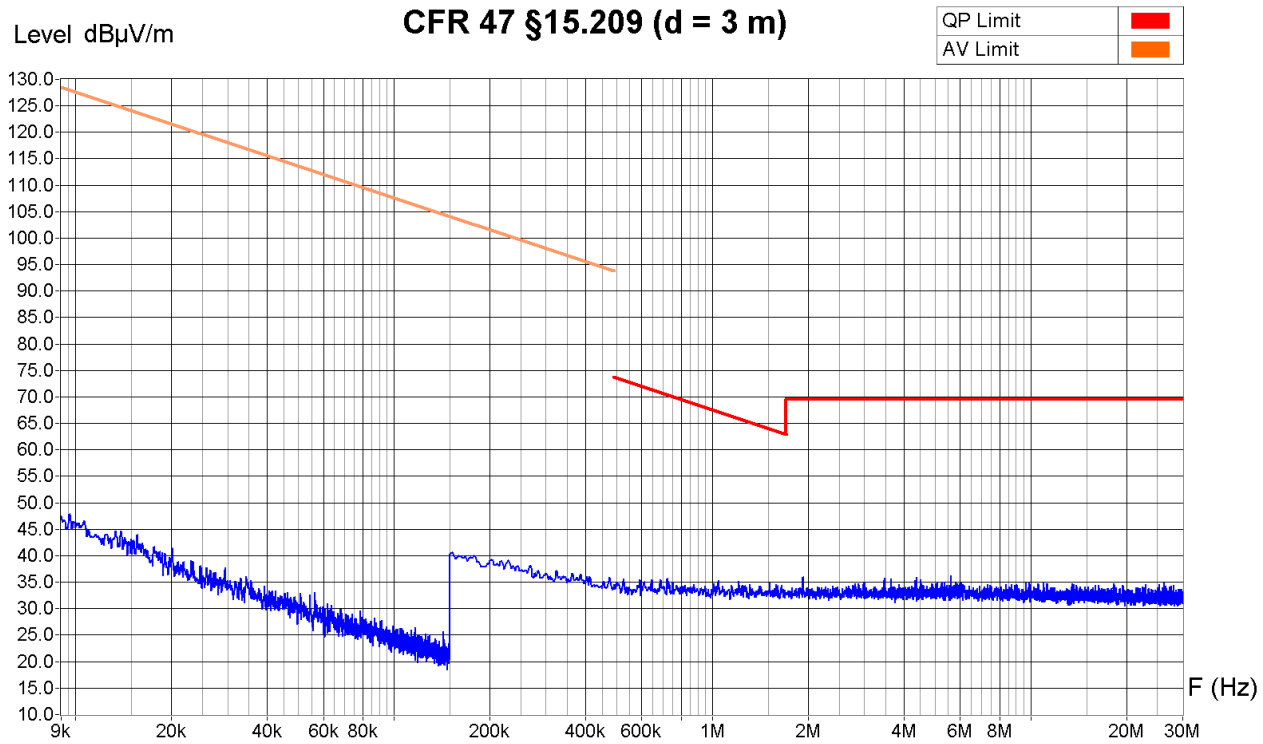
Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
1.70 MHz	35.7 dBµV/m	27.5 dBµV/m	23.0 dBµV/m	35.5 dB

Sample calculation with all conversion and correction factors used				
Frequency [MHz]	Receiver QP value [dBµV]	Cable att. corr. [dB]	Antenna factor corr. [dB]	QP field [dBµV/m]
1.700	7.2	+0.0	+20.3	= 27.5

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:23
Filename: 121_REH_9k-30M_TX902M_Par_FCC.png/.txt

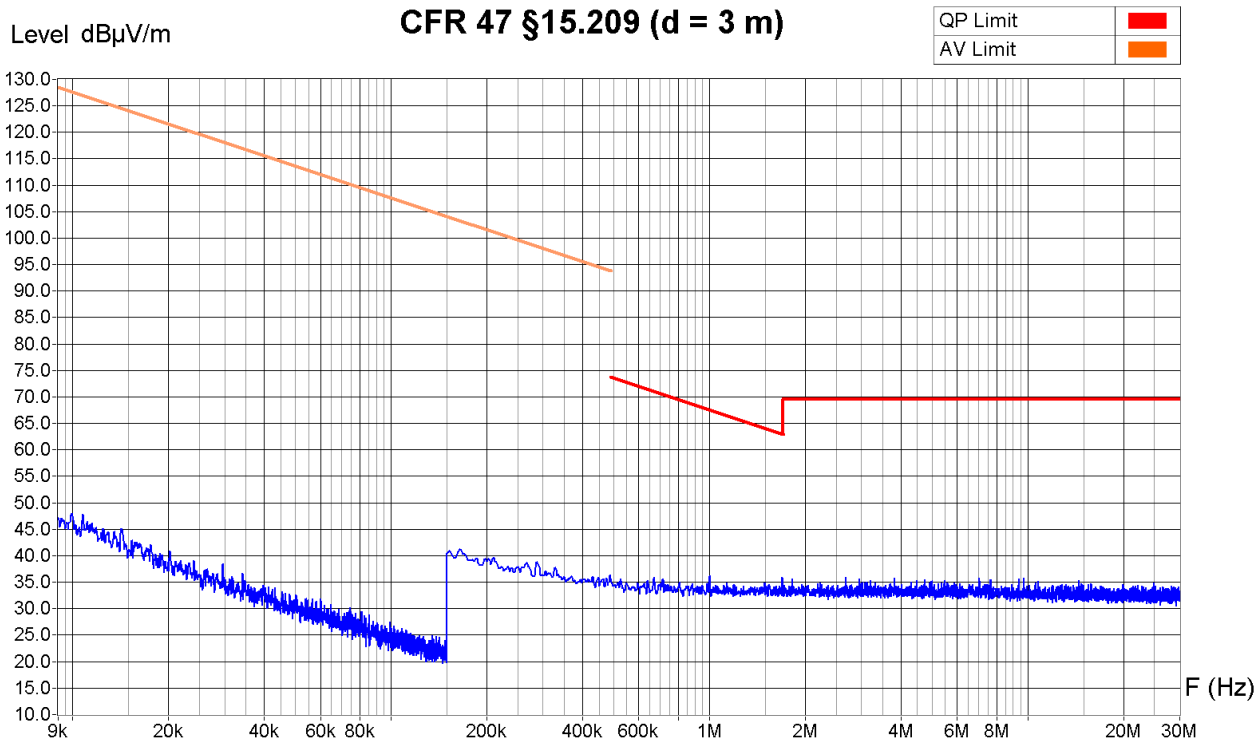
Measurement Type :	Radiated Field
Polarisation :	Parallel
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:38
Filename: 122_REH_9k-30M_TX915M_Par_FCC.png/.txt

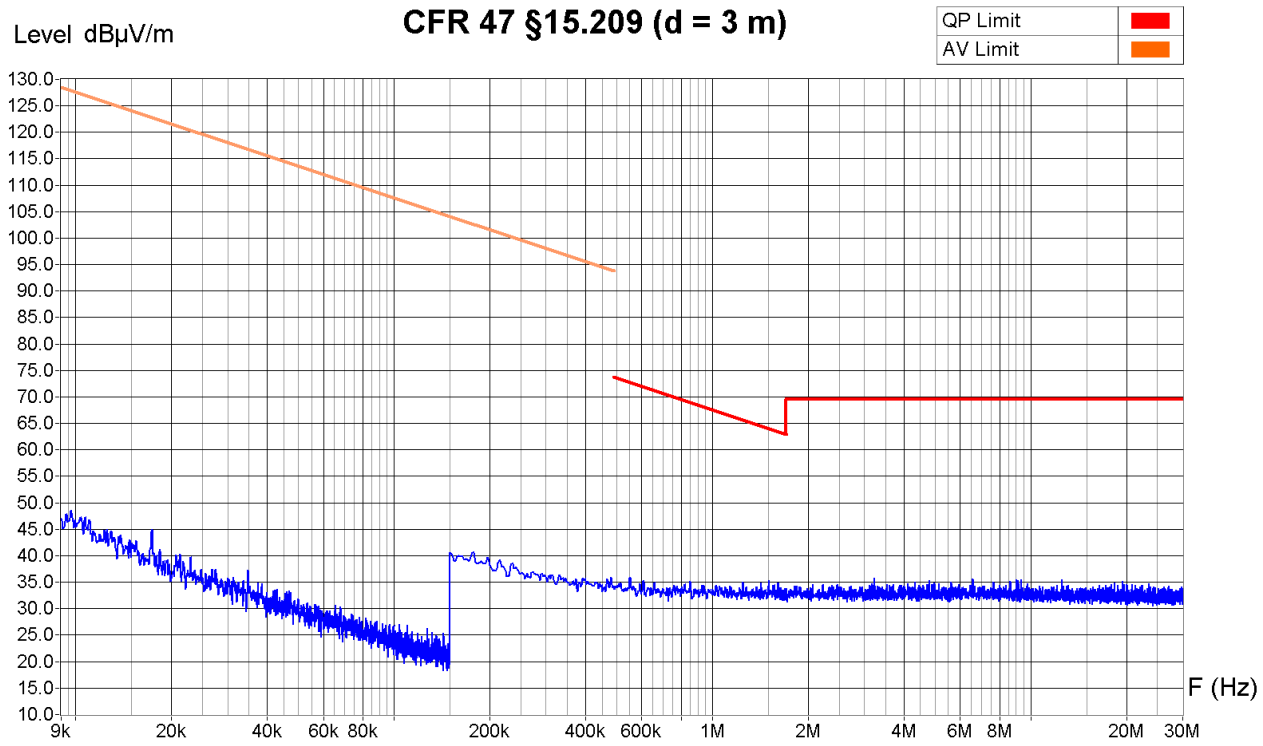
Measurement Type :	Radiated Field
Polarisation :	Parallel
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:43
Filename: 123_REH_9k-30M_TX928M_Par_FCC.png/.txt

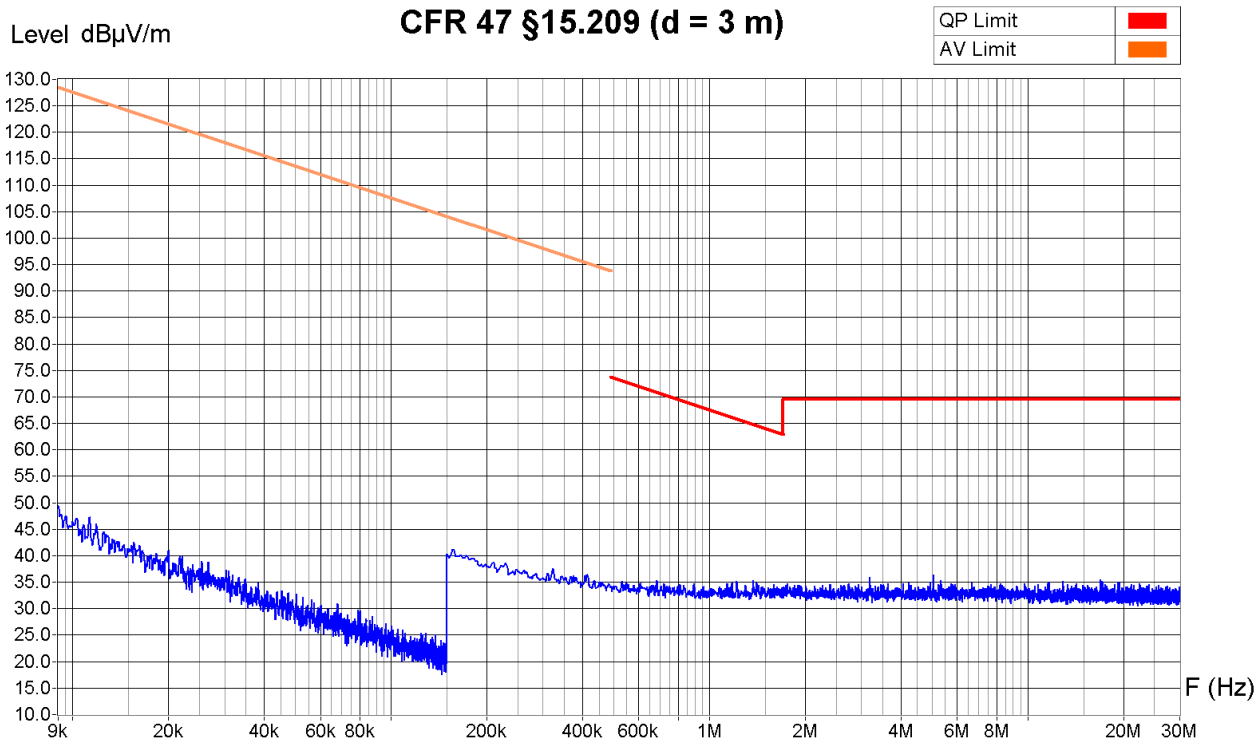
Measurement Type :	Radiated Field
Polarisation :	Perpendicular
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:58
Filename: 124_REH_9k-30M_TX902M_Per_FCC.png/.txt

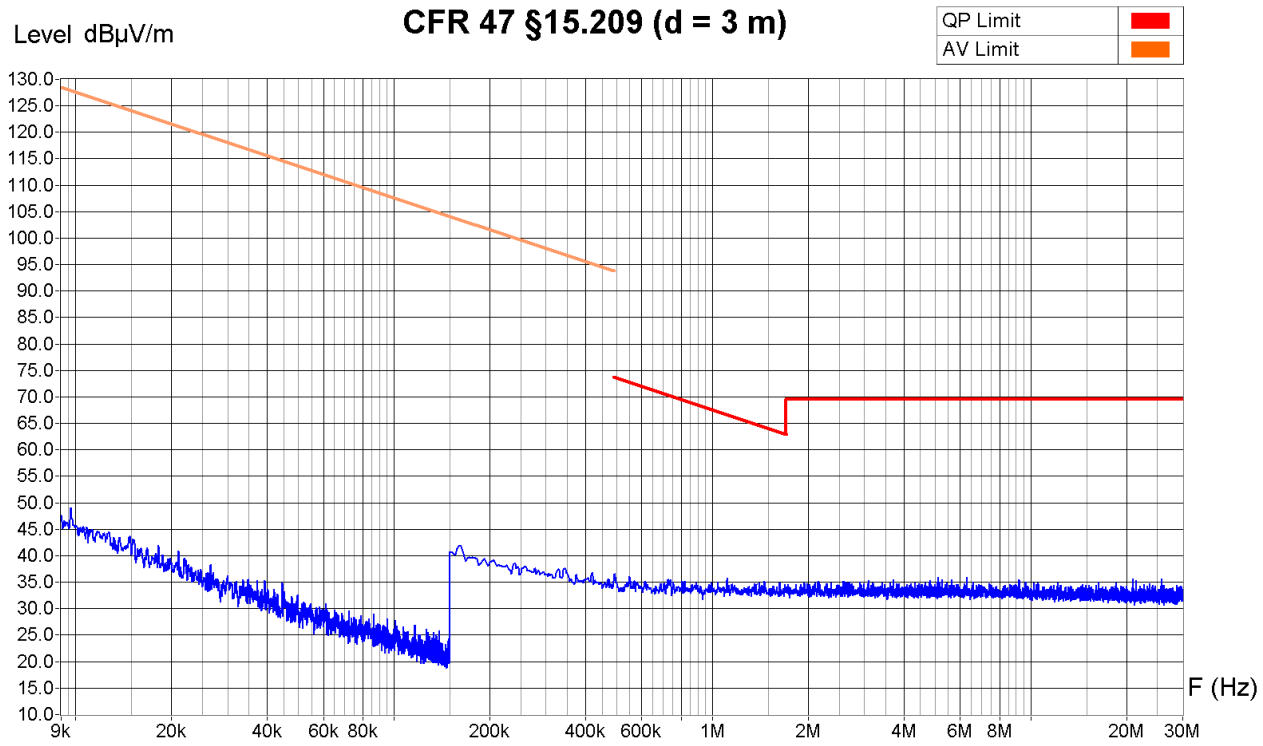
Measurement Type :	Radiated Field
Polarisation :	Perpendicular
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:56
Filename: 125_REH_9k-30M_TX915M_Per_FCC.png/.txt

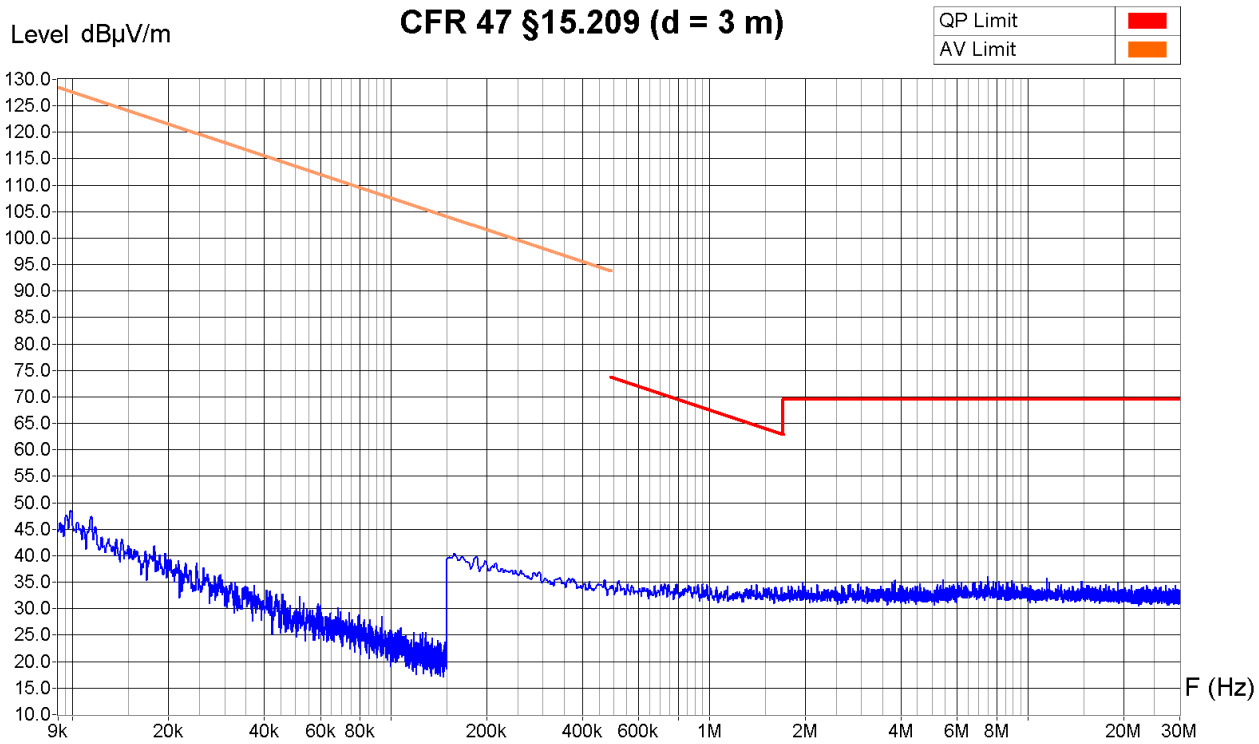
Measurement Type :	Radiated Field
Polarisation :	Perpendicular
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 10:51
Filename: 126_REH_9k-30M_TX928M_Per_FCC.png/.txt

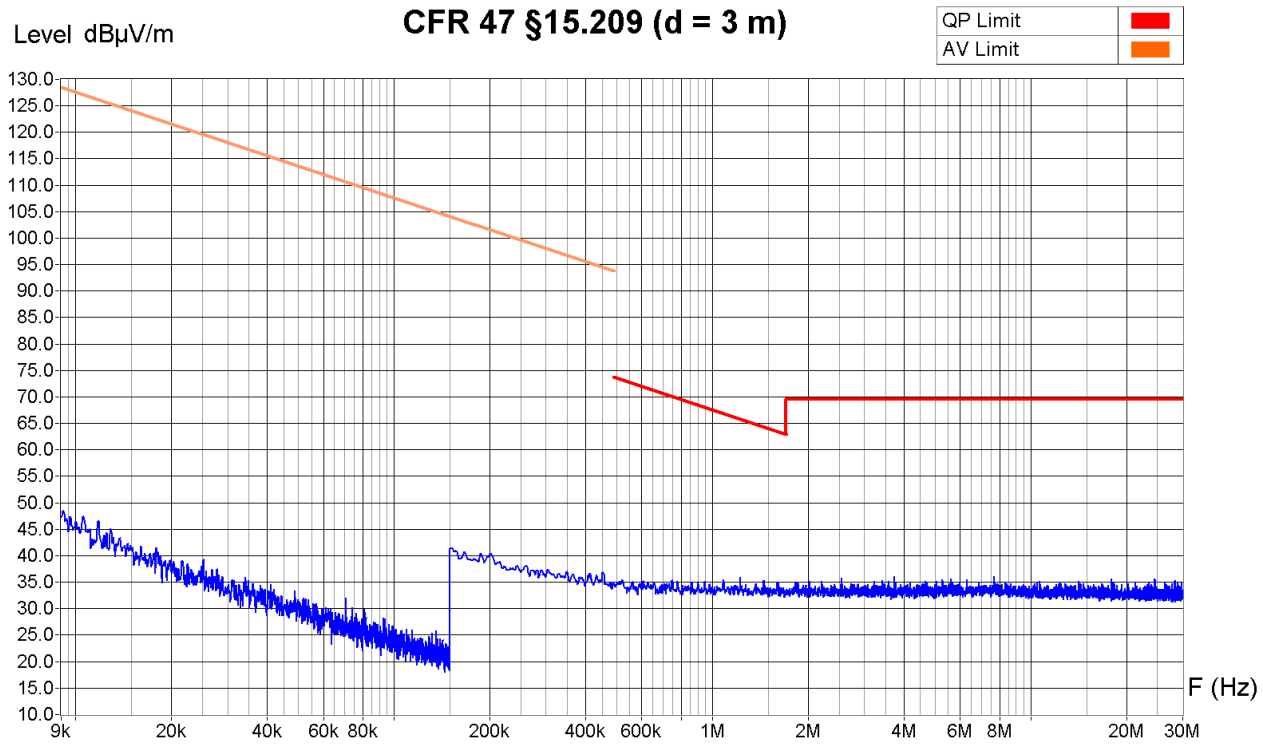
Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 11:13
Filename: 127_REH_9k-30M_TX902M_Hor_FCC.png/.txt

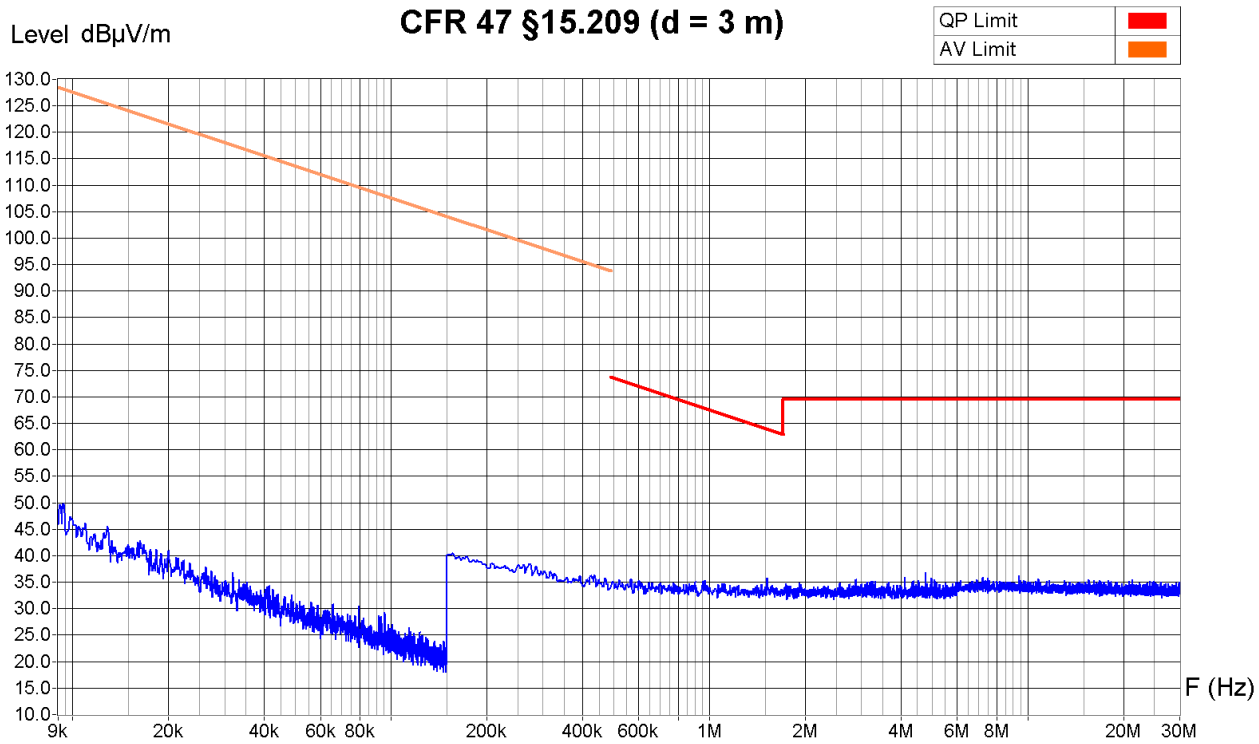
Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 11:18
Filename: 128_REH_9k-30M_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, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928 MHz, modulated, Power setting 16 dBm
Remarks :	



Zone	9 KHz - 150 KHz	150 KHz - 6 MHz	6 MHz - 30 MHz
Video Bandwidth	500 Hz	30 KHz	30 KHz
Resol Bandwidth	200 Hz	9 KHz	9 KHz

Operator: B. Itzcovich
Date/Time: 24.01.2020 11:23
Filename: 129_REH_9k-30M_TX928M_Hor_FCC.png/.txt

6.10.2 30 MHz to 1 GHz

Test site:	☐ SAC10		☐ open test site
	☒ SAC3		☐ .....
Distance:	☐ 3 m	☒ 10 m	☐ 30 m

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

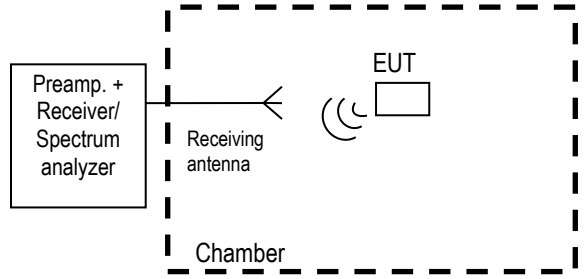
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

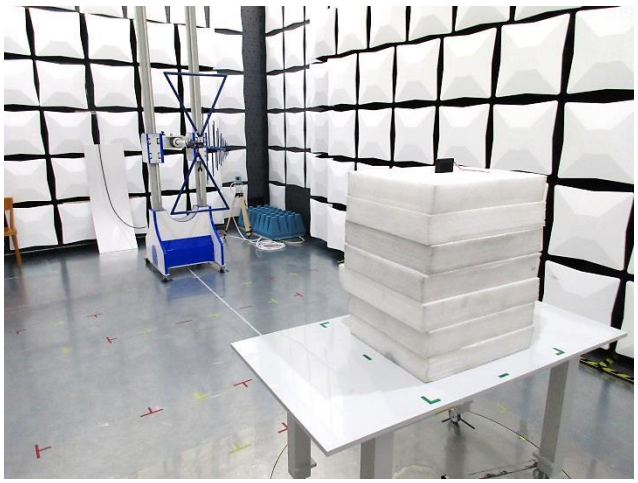
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. 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: 24 – 25 °C Humidity: 30 % Pressure QFE: 938 – 940 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;

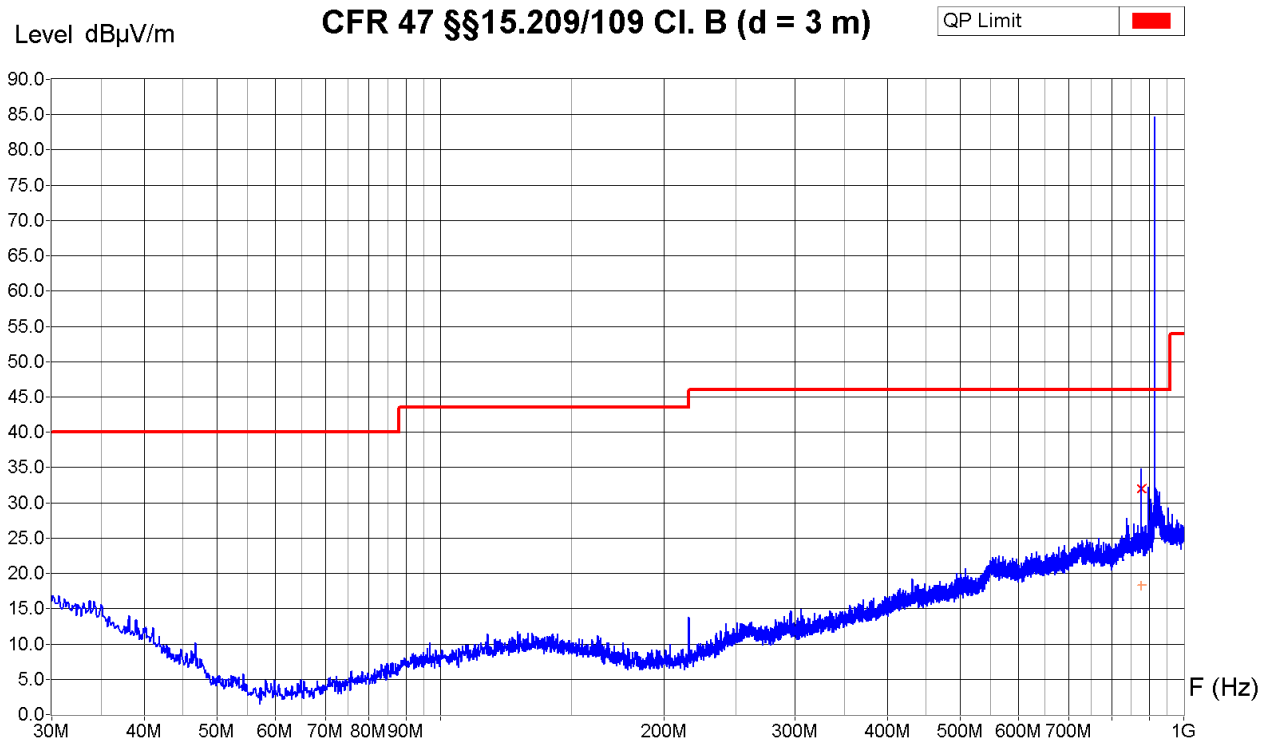
$$20\log\left(\frac{100\frac{\mu V}{m}}{1\frac{\mu V}{m}}\right)+20\log\left(\frac{3m}{3m}\right)=40\frac{dB\mu V}{m}\ at\ 3m$$

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 16-03
Receiver	☐ 85-04	☐ 90-43	☐ 94-35	☐ 04-29	☒ 16-03	
Preamplifier	☐ 90-01	☐ 95-86	☐ 05-56	☐ 05-59	☒ 16-03 internal	
Antenna (bilog)	☐ 94-03	☒ 05-38				
Filter	☒ 04-21					
Cables	☒ SAC3_RE_5m_1.0/3.0		☒ 06-00C			
Software and Revision	☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

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

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

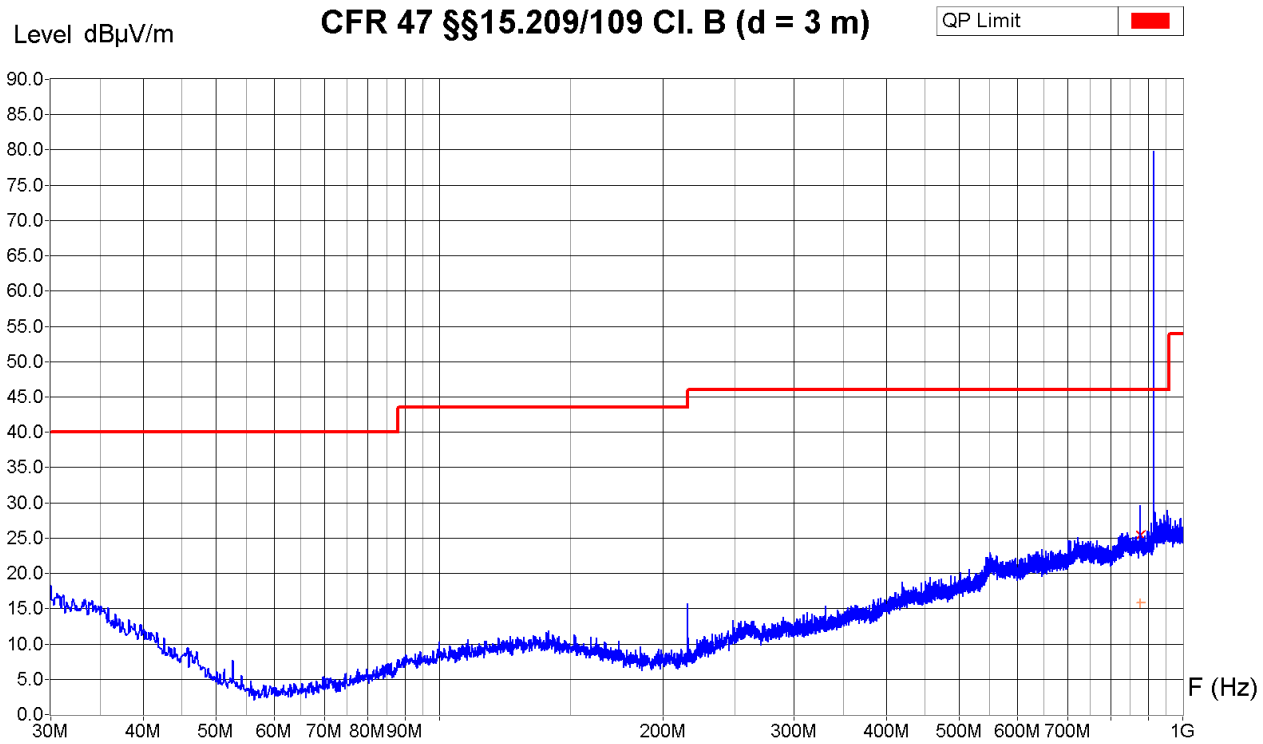
Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
876.60 MHz	36.2 dBµV/m	32.0 dBµV/m	18.4 dBµV/m	14.0 dB

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]
876.6	-9.7	+1.2	0.0	+22.5	= 14

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:41
Filename: 102_RE_30M-1G_TX915M_H_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 915 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



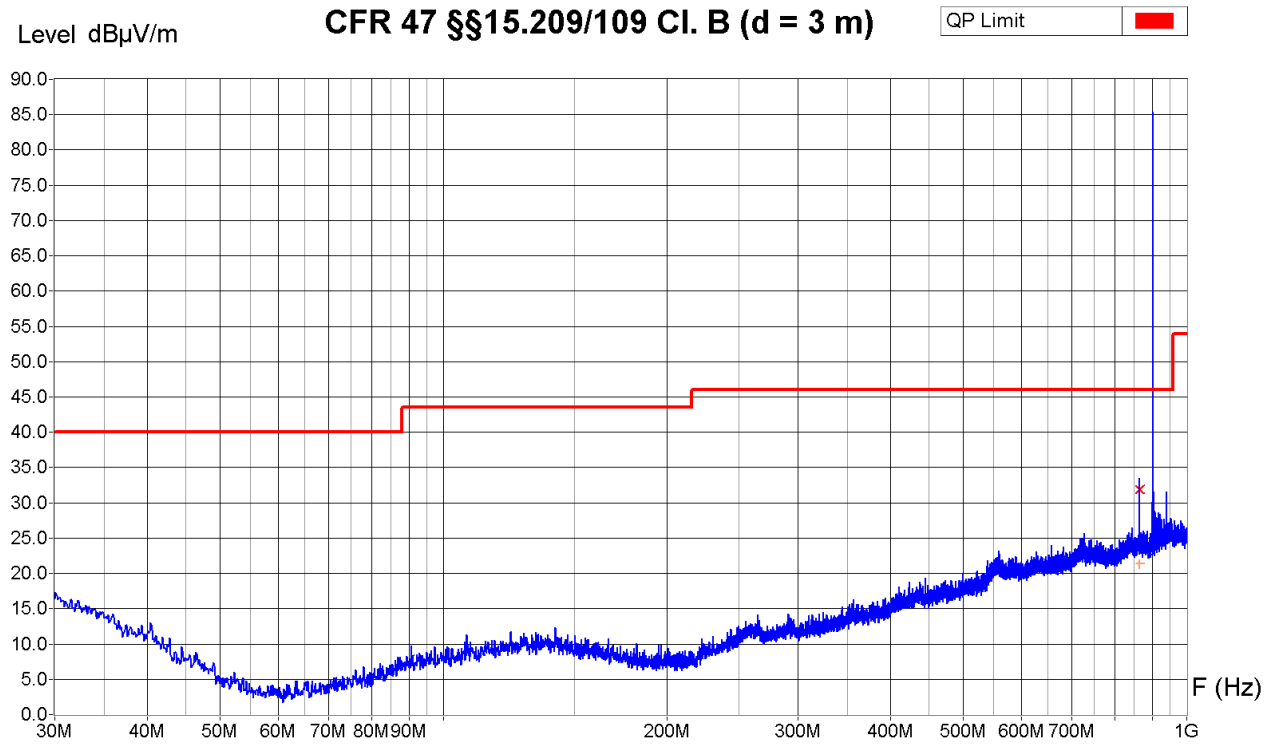
Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
876.60 MHz	32.0 dBµV/m	25.5 dBµV/m	15.8 dBµV/m	20.6 dB

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:50
Filename: 103_RE_30M-1G_TX915M_V_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



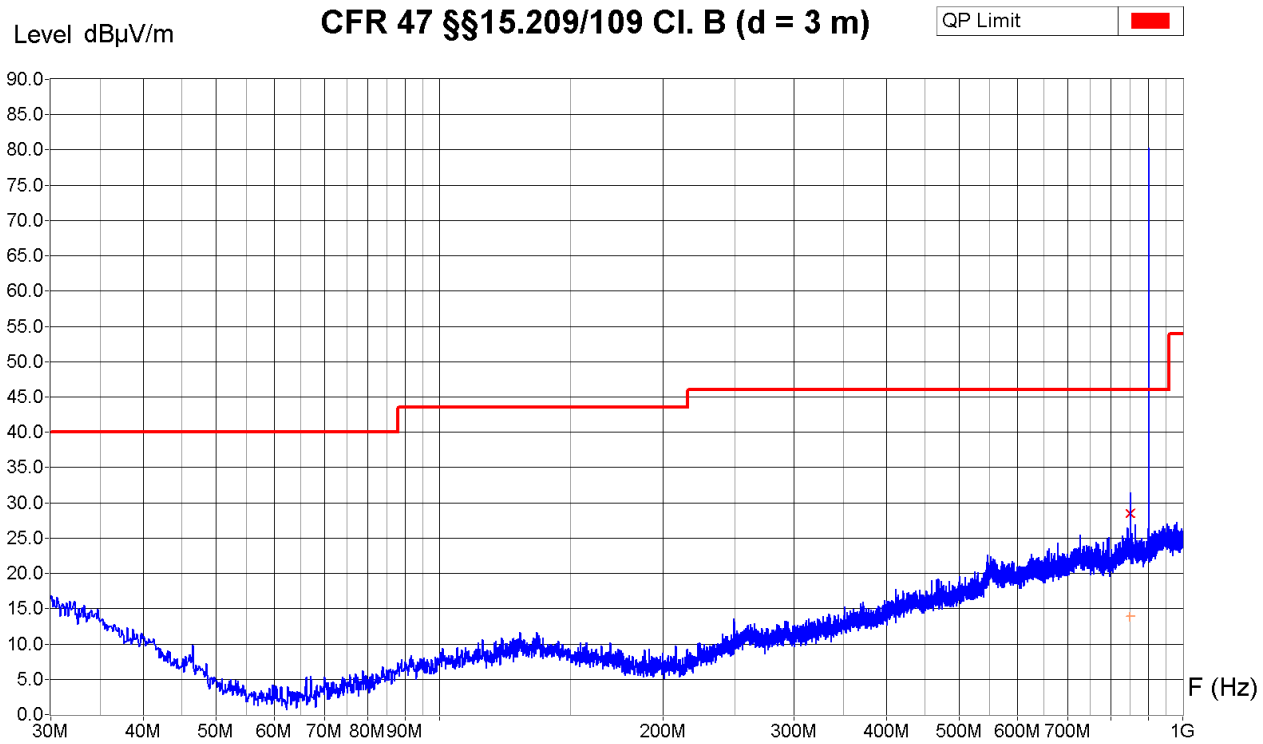
Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
863.60 MHz	37.8 dBµV/m	31.9 dBµV/m	21.4 dBµV/m	14.1 dB

Operator: B. Itzcovich
Date/Time: 17.01.2020 16:30
Filename: 104_RE_30M-1G_TX902M_H_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



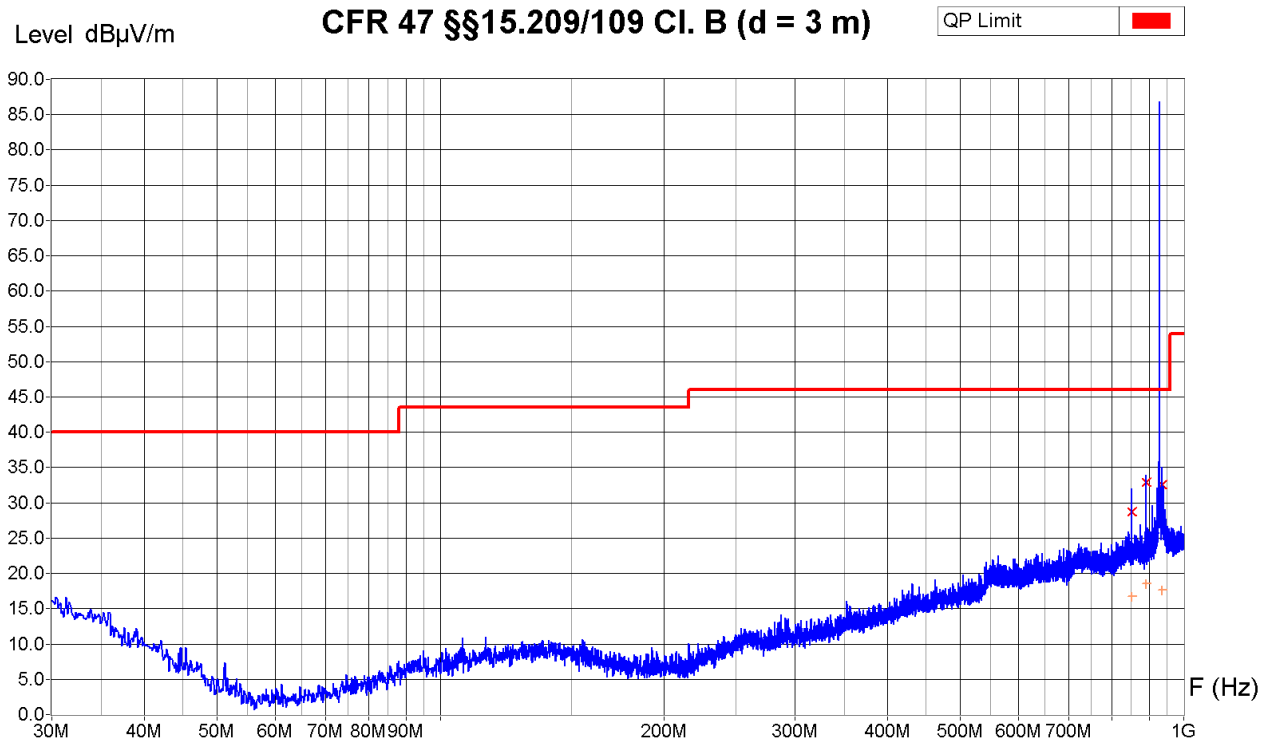
Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
850.40 MHz	42.8 dBµV/m	28.5 dBµV/m	13.9 dBµV/m	17.5 dB

Operator: B. Itzcovich
Date/Time: 17.01.2020 16:50
Filename: 105_RE_30M-1G_TX902M_V_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



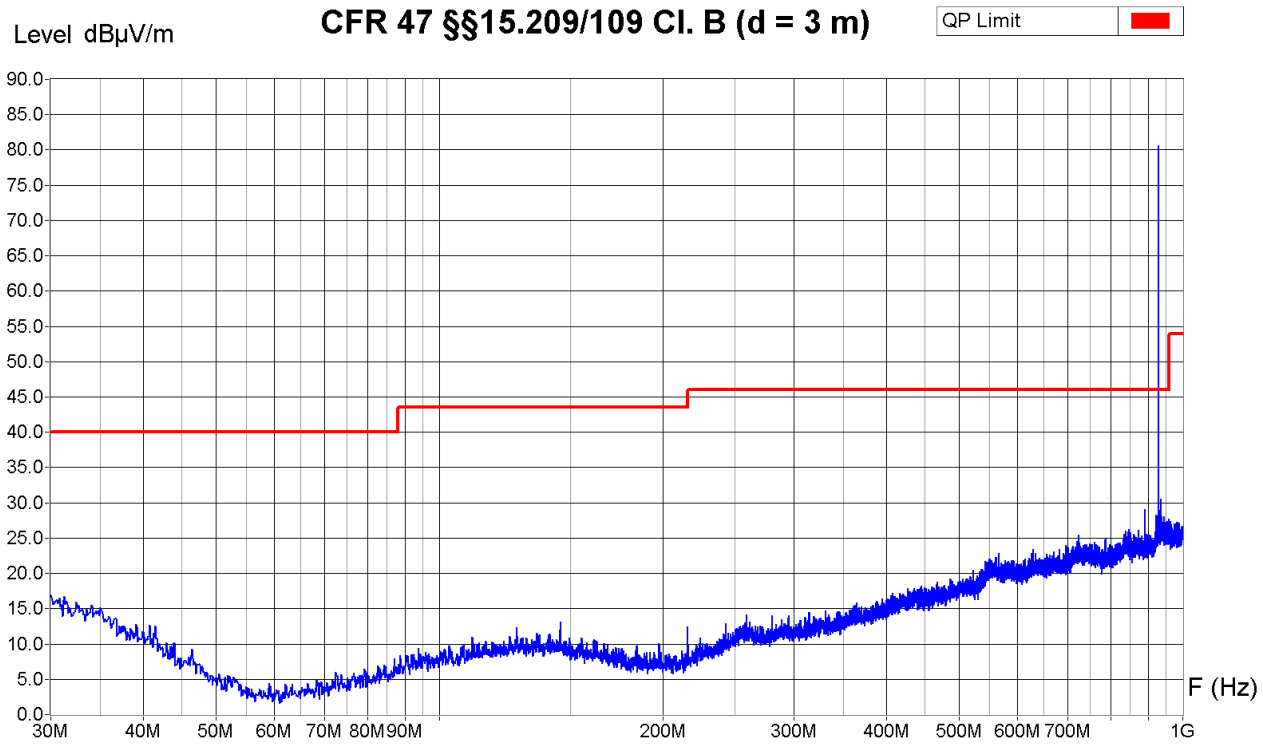
Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
851.20 MHz	34.5 dBµV/m	28.7 dBµV/m	16.7 dBµV/m	17.3 dB
889.60 MHz	37.2 dBµV/m	32.9 dBµV/m	18.5 dBµV/m	13.2 dB
934.30 MHz	39.5 dBµV/m	32.5 dBµV/m	17.7 dBµV/m	13.5 dB

Operator: B. Itzcovich
Date/Time: 17.01.2020 17:20
Filename: 106_RE_30M-1G_TX928M_H_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928 MHz, modulated, Power setting 16 dBm
Remarks :	With notch filter



Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Operator: B. Itzcovich
Date/Time: 17.01.2020 17:14
Filename: 107_RE_30M-1G_TX928M_V_FCC.png/.txt

6.10.3 1 GHz to 9.3 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.

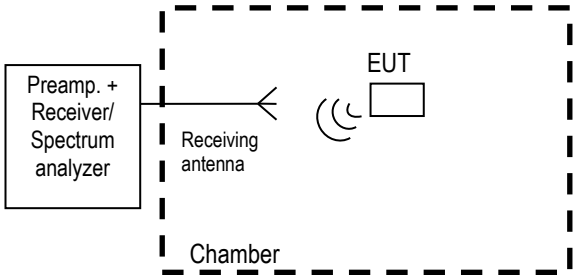
Modifications:	☒	None	☒	1	☐	2	☐	3	☐	4	☐	5

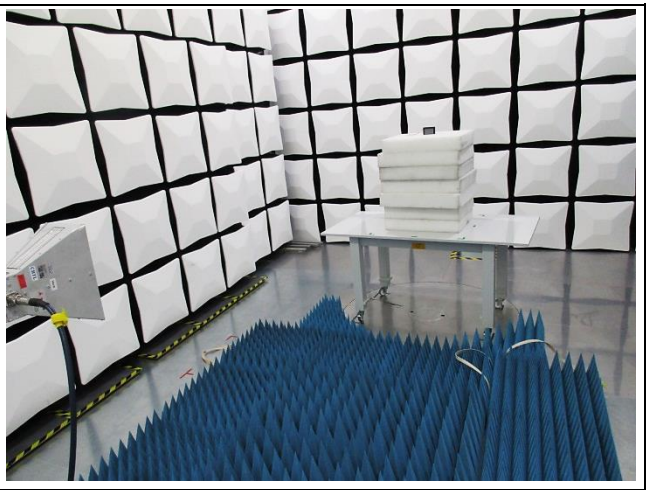
Comment: Proto 1 has no modifications, Proto 4 with modifications Level 1

Climatic conditions: Temperature: 23 – 25 °C Humidity: 30 – 35 % Pressure QFE: 935 – 945 hPa (2020-01)

Climatic conditions: Temperature: 24 °C Humidity: 32 % Pressure QFE: 936 hPa (2020-04-24)

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;

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

- 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: δ(dB) = 20log(Δ) = 20 log (20/500) = -27.96 dB

Test equipment: 2020-01

Spectrum analyzer		☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Preamplifier		☒ 05-56	☐ 05-87	☐ 14-27			
Antenna	(horn)	☐ 90-24	☒ 07-31				
Cables		☒ 06-00C	☐ 06-01	☒ 11-30			
Filter		☒ 04-21					
Attenuator 10dB		☐ 11-36					
		☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

Test equipment: 2020-04-24

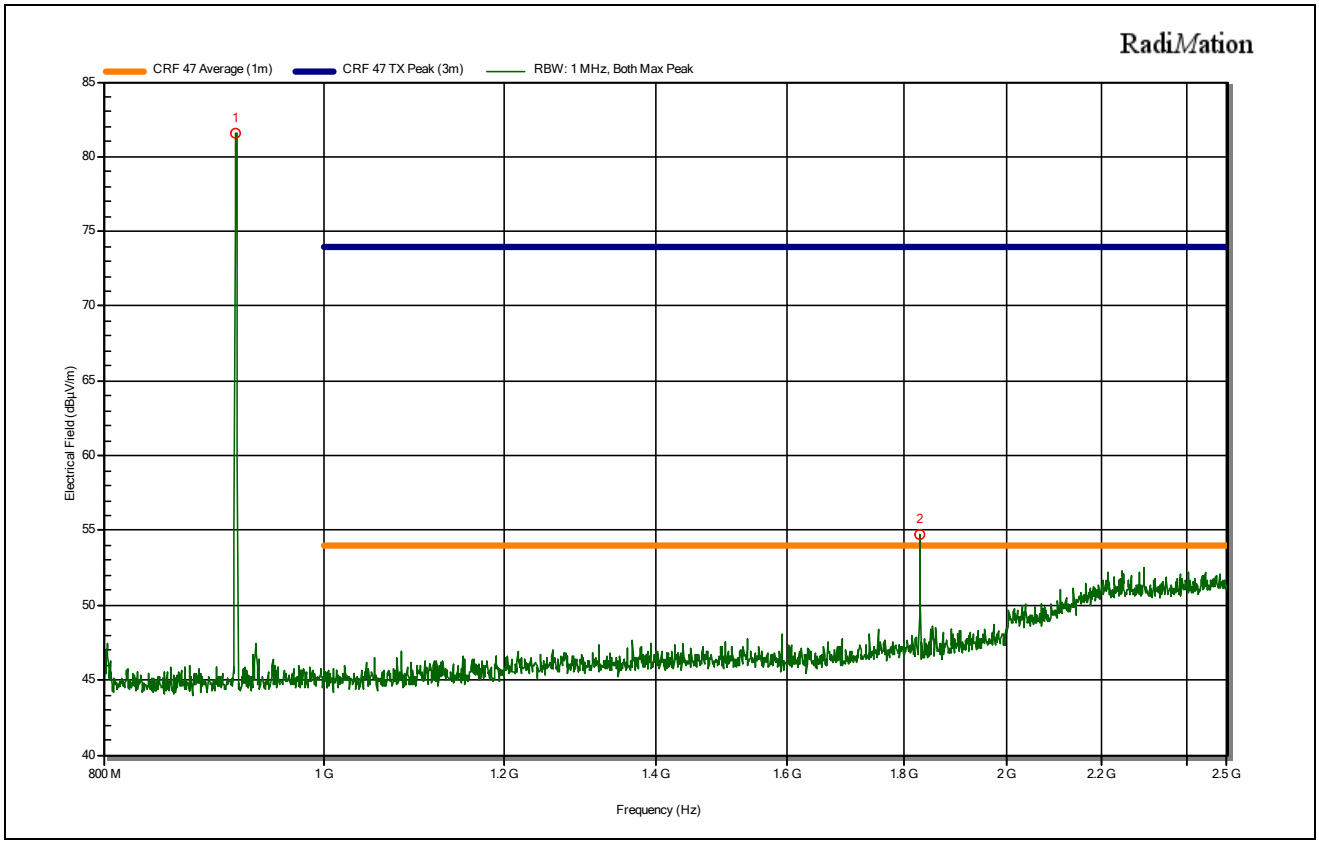
Spectrum analyser	☒ 168593	☐ 184454	☐ 25953
Receiver	☒ 168593	☐ 184454	☐ 25953
Preamplifier	☐ 14-27	☒ 05-56	
Notch filter	☒ 04-19	☐ 04-21	
Antenna, (horn))	☒ 07-31		
Cables	☒ 1.0, 2.0, 3.0	☐ 168547	
Software and Revision	☐ Vitam, Rev. 2_4_13		☒ RadiMation 2019.1.5

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

Client:	XC Tracer GmbH
Equipment:	XC Tracer Maxx, Proto 1 (MY)
Cables connected:	None
Operating mode:	TX, f = 915 MHz, modulated (random), Power setting 16 dBm; see § 4.4
Modification:	None
Remarks:	With notch filter and internal preamp

Settings of the measurement equipment

Limits	CRF 47 §§15.209/109 Cl. B (3m)	Frequency range	1 GHz ... 2.5 GHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	100 ms	Number of sweeps:	20
Geometry:	Height: 1 - 3 m; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak	Measure / Observation Time	1 s / 10 s
Geometry:	On the position of the maximum		



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average Correction	Calculated Average	Average Difference	Status	Angle	Height	Polarization
1	915 MHz	81.6 dBµV/m	---	-28.0 dB	53.6 dBµV/m	---	Pass *	202 degrees	1.5 m	Horizontal
2	1.83 GHz	54.7 dBµV/m	-19.3 dB	-28.0 dB	26.7 dBµV/m	-27.3 dB	Pass	180 degrees	1 m	Horizontal

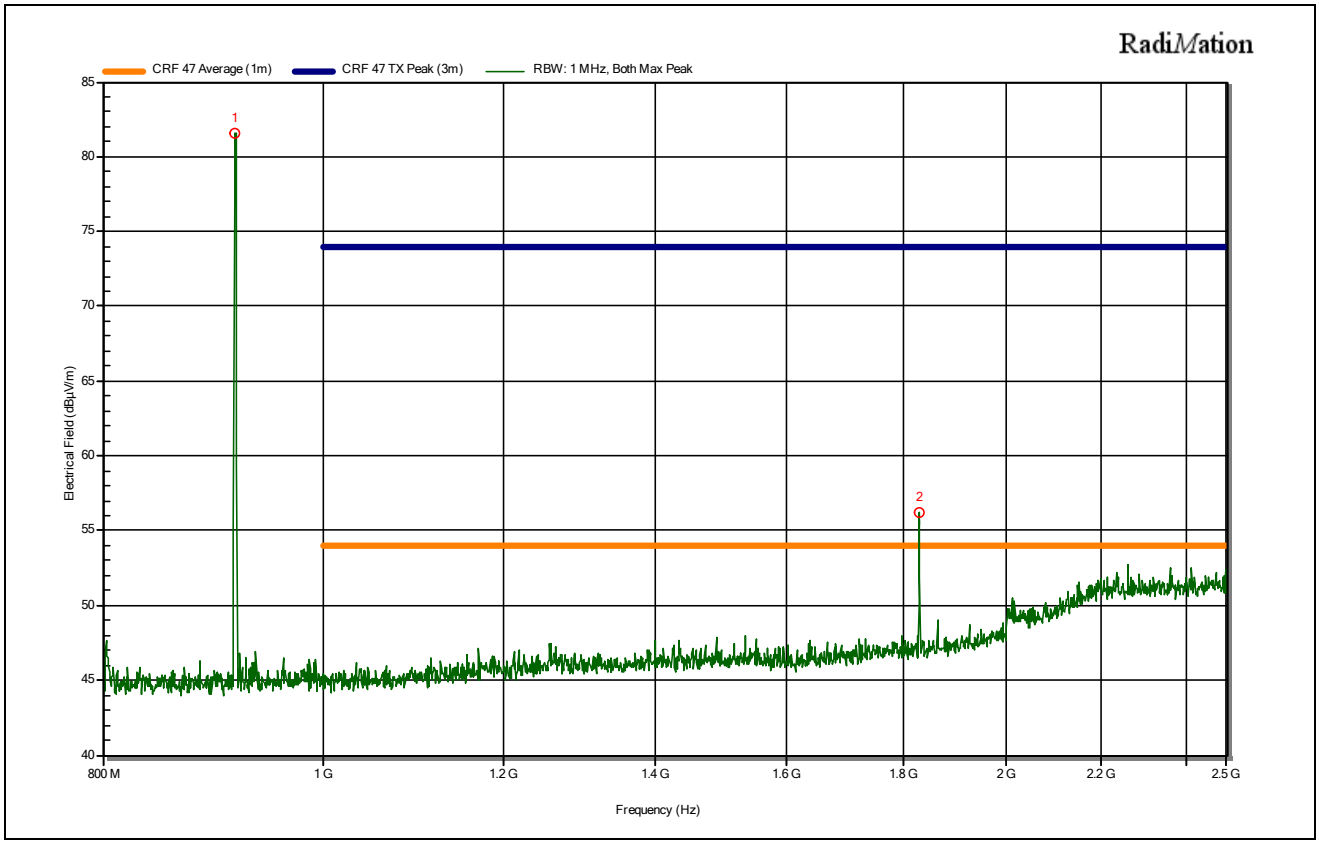
* Carrier of the radio service

Place and date of test:	Rossens, 2020-04-24
Operator:	F. Wyler

Client:	XC Tracer GmbH
Equipment:	XC Tracer Maxx, Proto 4 (MY)
Cables connected:	None
Operating mode:	TX, f = 915 MHz, modulated (random), Power setting 16 dBm; see § 4.4
Modification:	Level 1
Remarks:	With notch filter and internal preamp

Settings of the measurement equipment

Limits	CRF 47 §§15.209/109 Cl. B (3m)	Frequency range	1 GHz ... 2.5 GHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	100 ms	Number of sweeps:	20
Geometry:	Height: 1 - 3 m; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak	Measure / Observation Time	1 s / 10 s
Geometry:	On the position of the maximum		



Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average Correction	Calculated Average	Average Difference	Status	Angle	Height	Polarization
1	915 MHz	81.6 dBµV/m	---	-28.0 dB	53.6 dBµV/m	---	Pass *	202 degrees	1.5 m	Horizontal
2	1.83 GHz	56.2 dBµV/m	-17.8 dB	-28.0 dB	28.2 dBµV/m	-25.8 dB	Pass	180 degrees	2 m	Horizontal

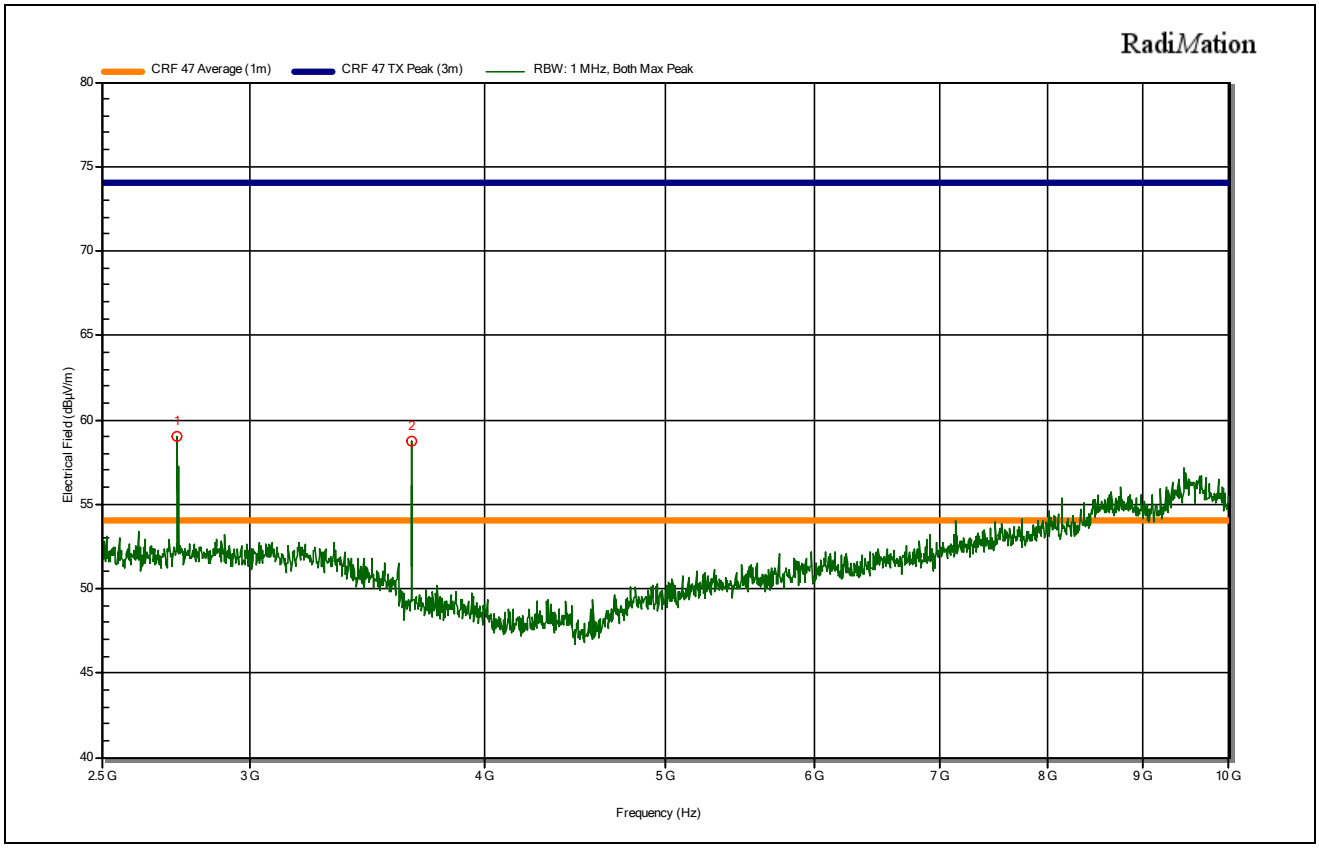
* Carrier of the radio service

Place and date of test:	Rossens, 2020-04-24
Operator:	F. Wyler

Client:	XC Tracer GmbH
Equipment:	XC Tracer Maxx, Proto 1 (MY)
Cables connected:	None
Operating mode:	TX, f = 915 MHz, modulated (random), Power setting 16 dBm; see § 4.4
Modification:	None
Remarks:	With external preamp

Settings of the measurement equipment

Limits	CRF 47 §§15.209/109 Cl. B (3m)	Frequency range	2.5 GHz ... 10 GHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	100 ms	Number of sweeps:	20
Geometry:	Height: 1 - 3 m; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak	Measure / Observation Time	1 s / 10 s
Geometry:	On the position of the maximum		



Detected peaks

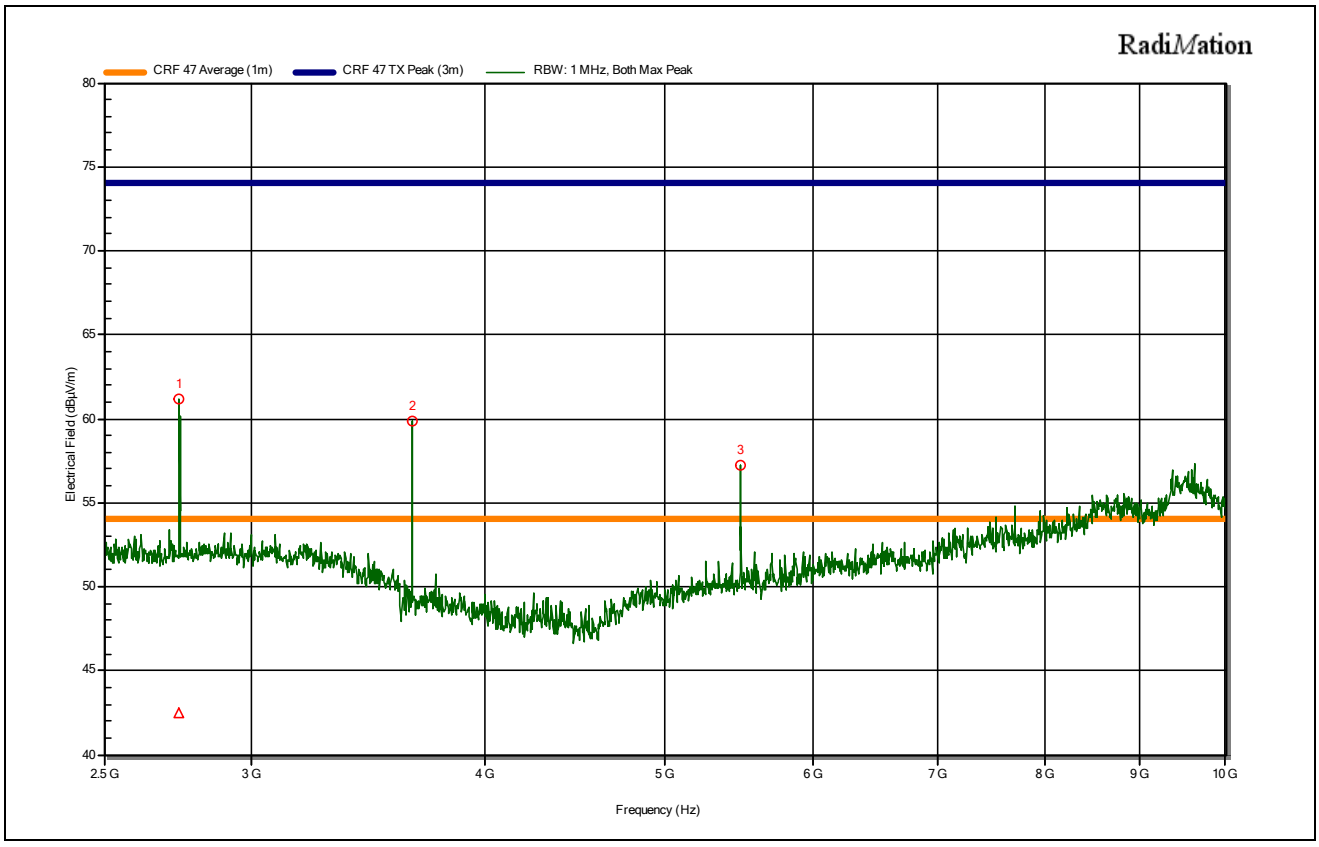
Peak Number	Frequency	Peak	Peak Difference	Average Correction	Calculated Average	Average Difference	Status	Angle	Height	Polarization
1	2.745 GHz	59.0 dBµV/m	-15.0 dB	-28.0 dB	31.0 dBµV/m	-23.0 dB	Pass	135 degrees	1 m	Vertical
2	3.66 GHz	58.8 dBµV/m	-15.2 dB	-28.0 dB	30.8 dBµV/m	-23.2 dB	Pass	202 degrees	1 m	Horizontal

Place and date of test: Rossens, 2020-04-24
Operator: F. Wyler

Client:	XC Tracer GmbH
Equipment:	XC Tracer Maxx, Proto 4 (MY)
Cables connected:	None
Operating mode:	TX, f = 915 MHz, modulated (random), Power setting 16 dBm; see § 4.4
Modification:	Level 1
Remarks:	With external preamp

Settings of the measurement equipment

Limits	CRF 47 §§15.209/109 Cl. B (3m)	Frequency range	2.5 GHz ... 10 GHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	100 ms	Number of sweeps:	20
Geometry:	Height: 1 - 3 m; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak	Measure / Observation Time	1 s / 10 s
Geometry:	On the position of the maximum		

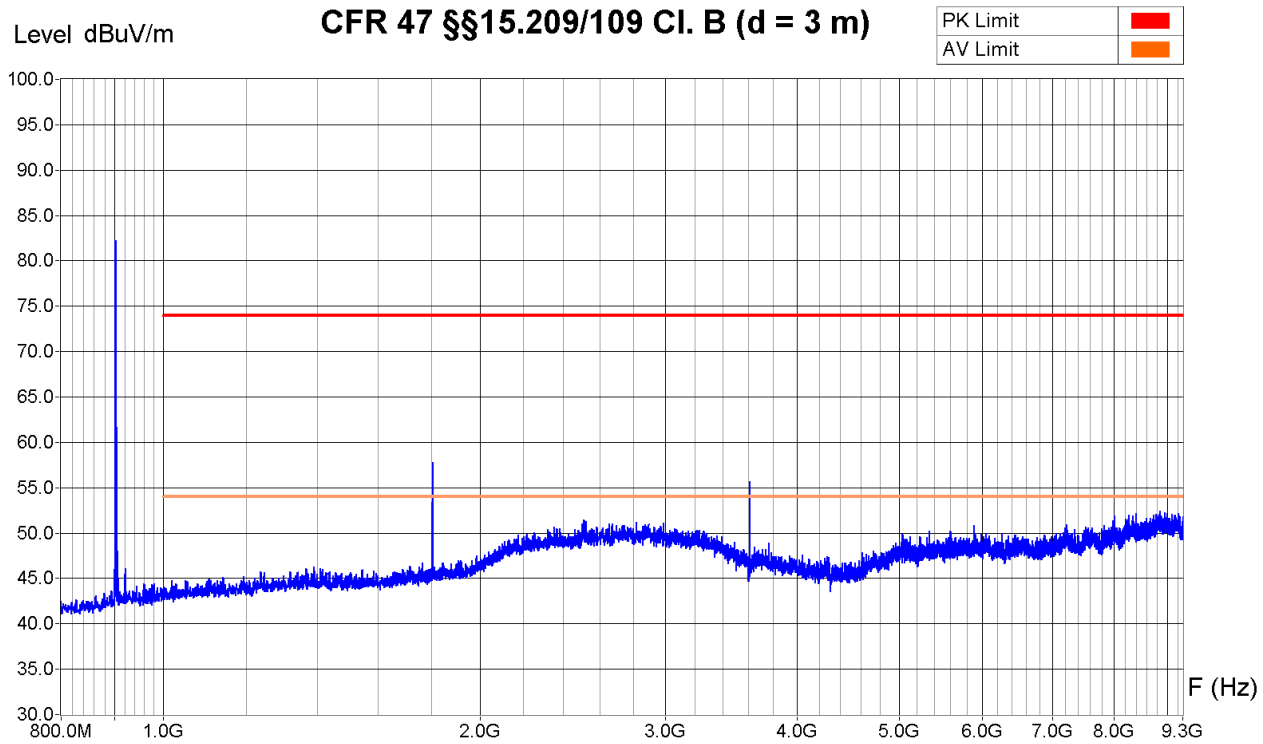


Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average Correction	Calculated Average	Average Difference	Status	Angle	Height	Polarization
1	2.745 GHz	61.1 dBµV/m	-12.9 dB	-28.0 dB	33.1 dBµV/m	-20.9 dB	Pass	135 degrees	1.5 m	Vertical
2	3.66 GHz	59.9 dBµV/m	-14.1 dB	-28.0 dB	31.9 dBµV/m	-22.1 dB	Pass	315 degrees	3 m	Horizontal
3	5.49 GHz	57.2 dBµV/m	-16.8 dB	-28.0 dB	29.2 dBµV/m	-24.8 dB	Pass	67 degrees	1 m	Horizontal

Place and date of test: Rossens, 2020-04-24
Operator: F. Wyler

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902MHz, modulated (random), Power setting 16 dBm
Remarks :	Zone 0.8 - 2.5 GHz with notch filter and internal preamp
	Zone 2.5 - 9.5 GHz with external preamp.
Limit does not apply to:	Carrier (902-928 MHz), H2 (1804-1856 MHz) & H7 (6314-6496 MHz)

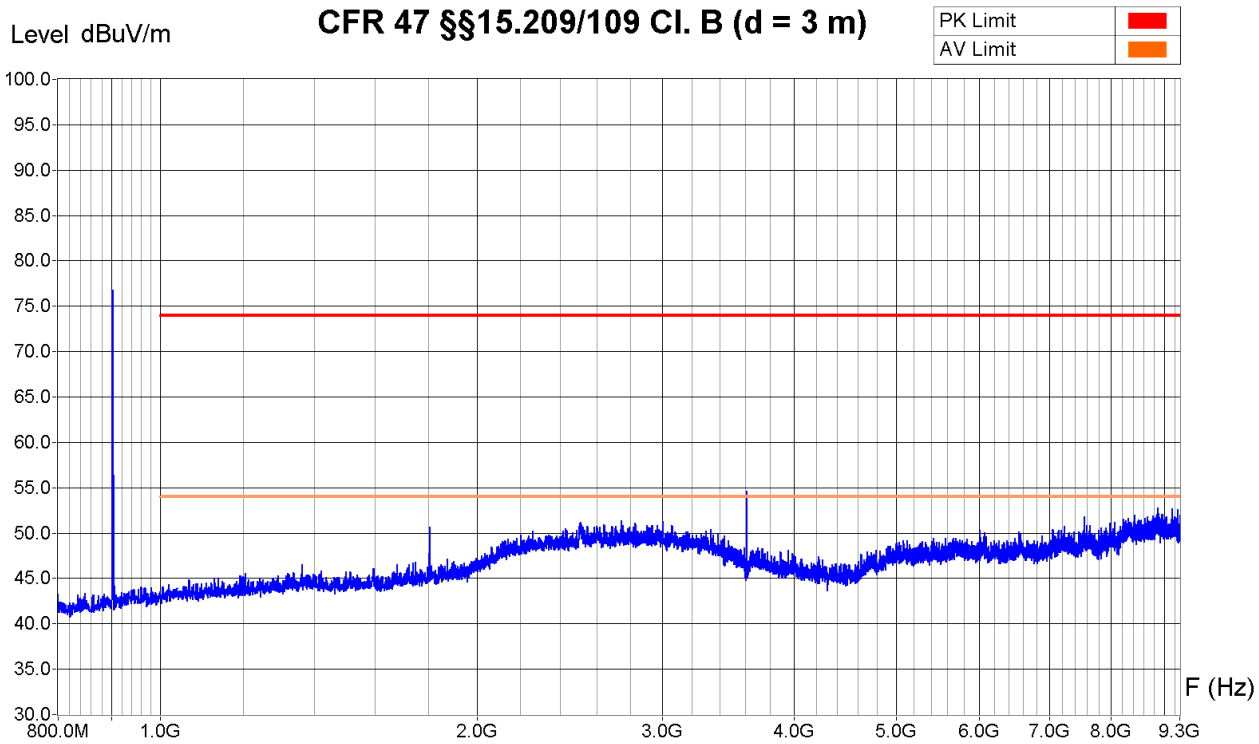


Zone	800 MHz - 2.50 GHz	2.50 GHz - 6 GHz	6 GHz - 9.50 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Final Result					
Frequency [GHz]	**Peak field [dBµV/m]**	**Correction for Average [dB]**	**Calculated Average field [dBµV/m]**	**Average Limit [dBµV/m]**	**Conclusion**
1.804	57.8	-28.0	29.8	54.0	**Pass**
3.608	55.7	-28.0	27.7	54.0	**Pass**

Operator: B. Itzcovich
Date/Time: 10.01.2020 15:43
Filename: 86_RE_1-9G3_TX902M_16dBm_H_FCC_Pt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 902MHz, modulated (random), Power setting 16 dBm
Remarks :	Zone 0.8 - 2.5 GHz with notch filter and internal preamp
	Zone 2.5 - 9.5 GHz with external preamp.
Limit does not apply to:	Carrier (902-928 MHz), H2 (1804-1856 MHz) & H7 (6314-6496 MHz)

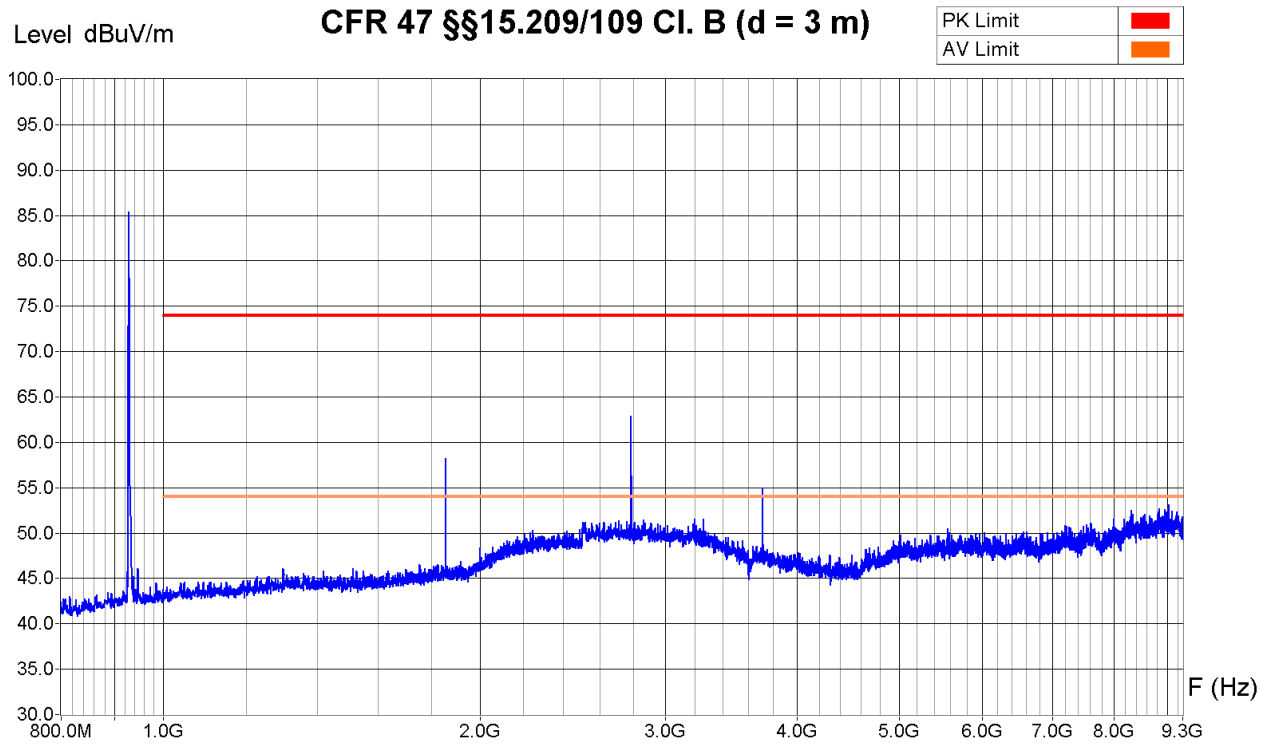


Zone	800 MHz - 2.50 GHz	2.50 GHz - 6 GHz	6 GHz - 9.50 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Final Result					
Frequency [GHz]	**Peak field [dBµV/m]**	**Correction for Average [dB]**	**Calculated Average field [dBµV/m]**	**Average Limit [dBµV/m]**	**Conclusion**
3.608	54.6	-28.0	26.6	54.0	**Pass**

Operator: B. Itzcovich
Date/Time: 10.01.2020 16:10
Filename: 87_RE_1-9G3_TX902M_16dBm_V_FCC_Pt.

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928MHz, modulated (random), Power setting 16 dBm
Remarks :	Zone 0.8 - 2.5 GHz with notch filter and internal preamp
	Zone 2.5 - 9.5 GHz with external preamp.
Limit does not apply to:	Carrier (902-928 MHz), H2 (1804-1856 MHz) & H7 (6314-6496 MHz)

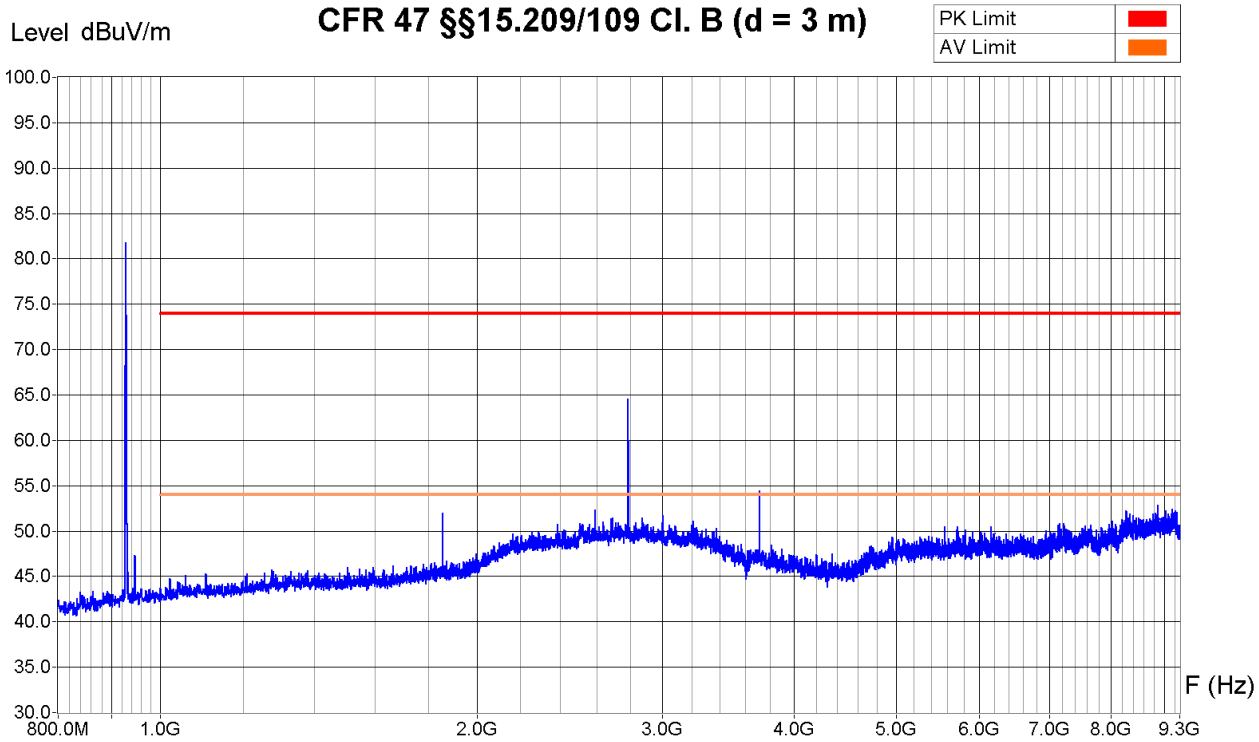


Zone	800 MHz - 2.50 GHz	2.50 GHz - 6 GHz	6 GHz - 9.50 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Final Result					
Frequency [GHz]	**Peak field [dBµV/m]**	**Correction for Average [dB]**	**Calculated Average field [dBµV/m]**	**Average Limit [dBµV/m]**	**Conclusion**
1.856	58.2	-28.0	30.2	54.0	**Pass**
2.784	62.9	-28.0	34.9	54.0	**Pass**
3.712	55.0	-28.0	27.0	54.0	**Pass**

Operator: B. Itzcovich
Date/Time: 13.01.2020 11:11
Filename: 88_RE_1-9G3_TX928M_16dBm_H_FCC_Pt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	TX, f = 928MHz, modulated (random), Power setting 16 dBm
Remarks :	Zone 0.8 - 2.5 GHz with notch filter and internal preamp
	Zone 2.5 - 9.5 GHz with external preamp.
Limit does not apply to:	Carrier (902-928 MHz), H2 (1804-1856 MHz) & H7 (6314-6496 MHz)



Zone	800 MHz - 2.50 GHz	2.50 GHz - 6 GHz	6 GHz - 9.50 GHz
Video Bandwidth	3 MHz	3 MHz	3 MHz
Resol Bandwidth	1 MHz	1 MHz	1 MHz

Final Result					
Frequency [GHz]	**Peak field [dBµV/m]**	**Correction for Average [dB]**	**Calculated Average field [dBµV/m]**	**Average Limit [dBµV/m]**	**Conclusion**
2.784	64.5	-28.0	36.5	54.0	**Pass**
3.712	54.4	-28.0	27.4	54.0	**Pass**

Operator: B. Itzcovich
Date/Time: 13.01.2020 10:58
Filename: 89_RE_1-9G3_TX928M_16dBm_V_FCC_Pt.

6.11 Spurious emissions, receive mode – radiated

6.11.1 30 MHz to 1 GHz

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

Distance: ☐ 3 m ☒ 10 m ☐ 30 m

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

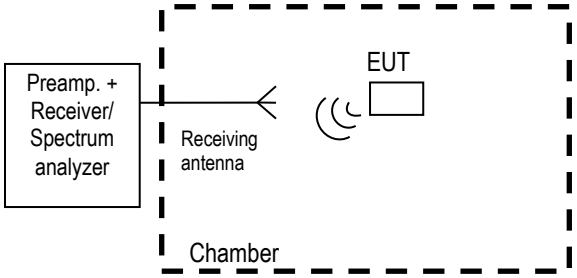
Meas. Uncertainty: ± 4.6 dB (30 – 300 MHz) / ± 3.7 dB (300 – 1000 MHz)

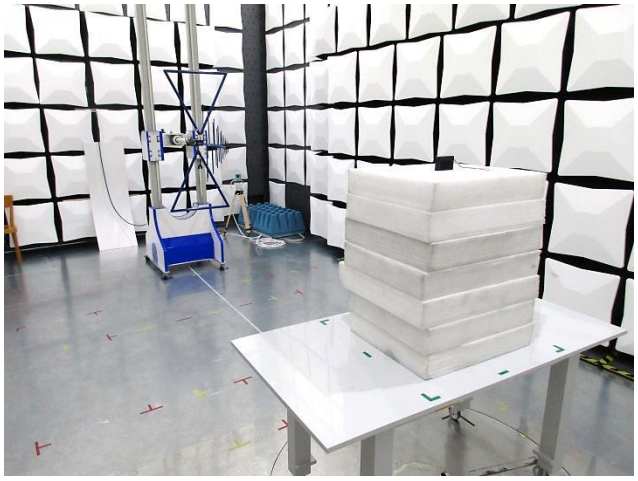
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. The turning table is operated through 360° during the measurements. 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.

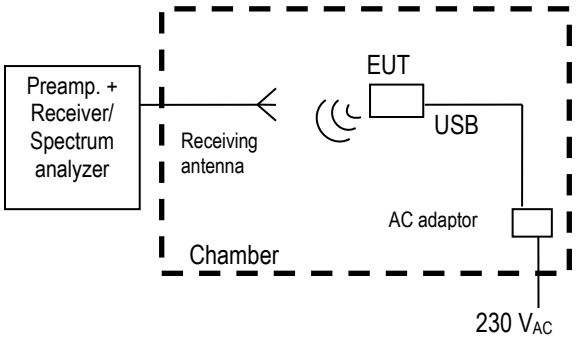
Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Climatic conditions: Temperature: 25 °C Humidity: 30 % Pressure QFE: 938 hPa

Test set-up:







Test equipment:

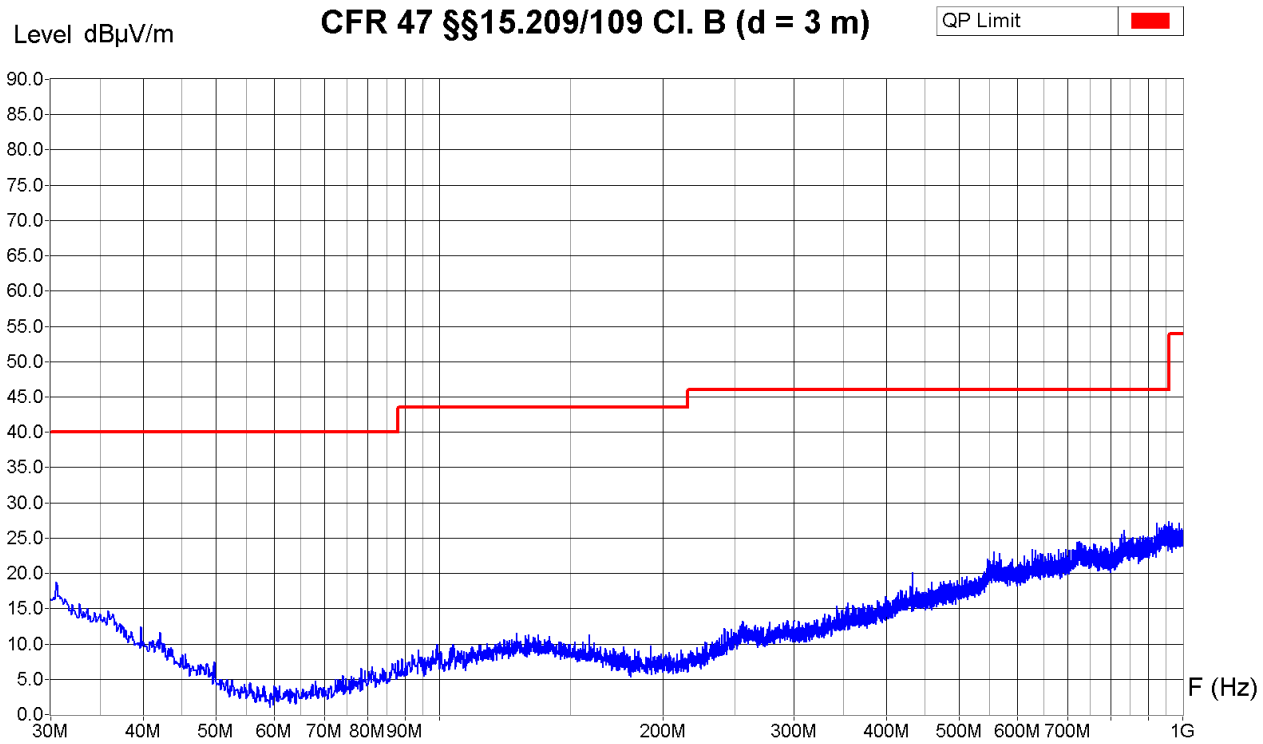
Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 16-03
Receiver	☐ 85-04	☐ 90-43	☐ 94-35	☐ 04-29	☒ 16-03	
Preamplifier	☐ 90-01	☐ 95-86	☐ 05-56	☐ 05-59	☒ 16-03 internal	
Antenna (bilog)	☐ 94-03	☒ 05-38				
Filter	☐ 04-21					
Cables	☒ SAC3_RE_5m_1.0/3.0		☐ 06-00C			
Software and Revision	☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

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

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;

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

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	RX, f = 915 MHz
Remarks :	Without filter

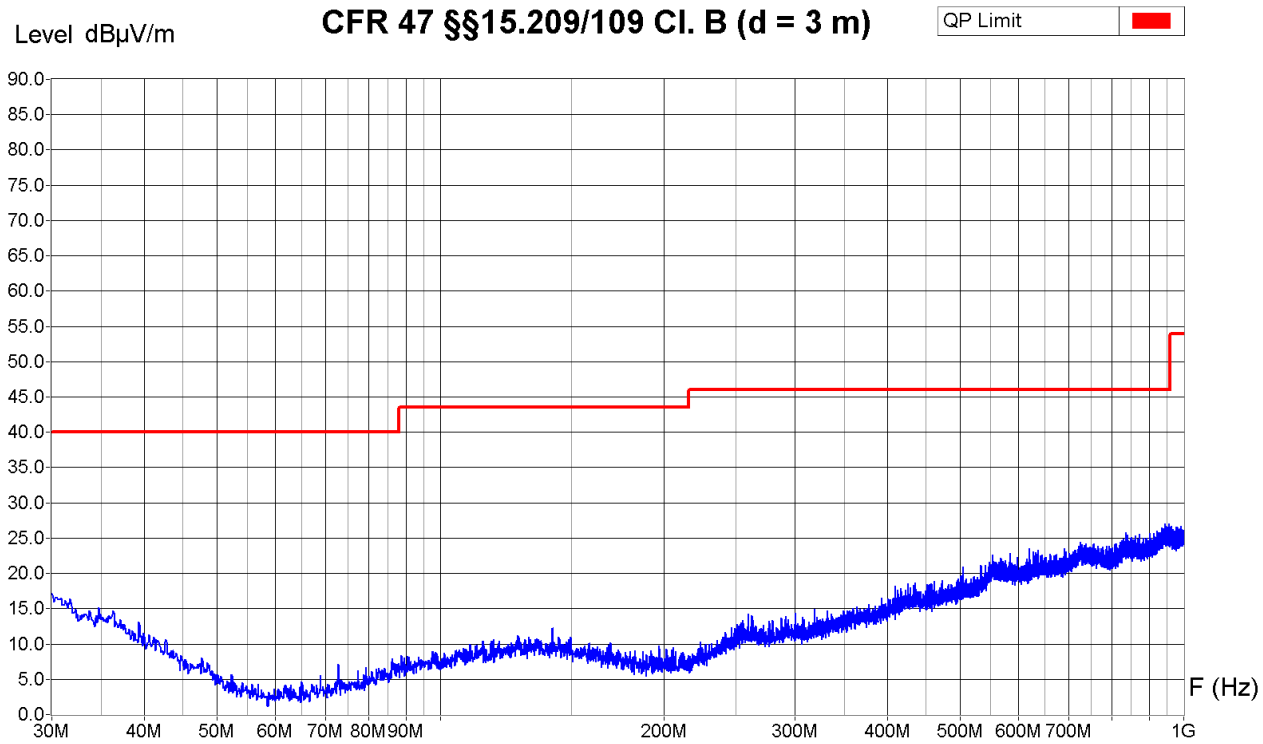


Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Sample calculation with all conversion and correction factors used					
Frequency [MHz]	Analyser Peak value [dBµV]	Cable att. corr. [dB]	Preamp. gain corr. [dB]	Antenna factor corr. [dB]	PK field [dBµV/m]
30.6	-0.4	+0.2	0.0	+17.6	= 17.4

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:29
Filename: 100_RE_30M-1G_RX_H_FCC.png/.txt

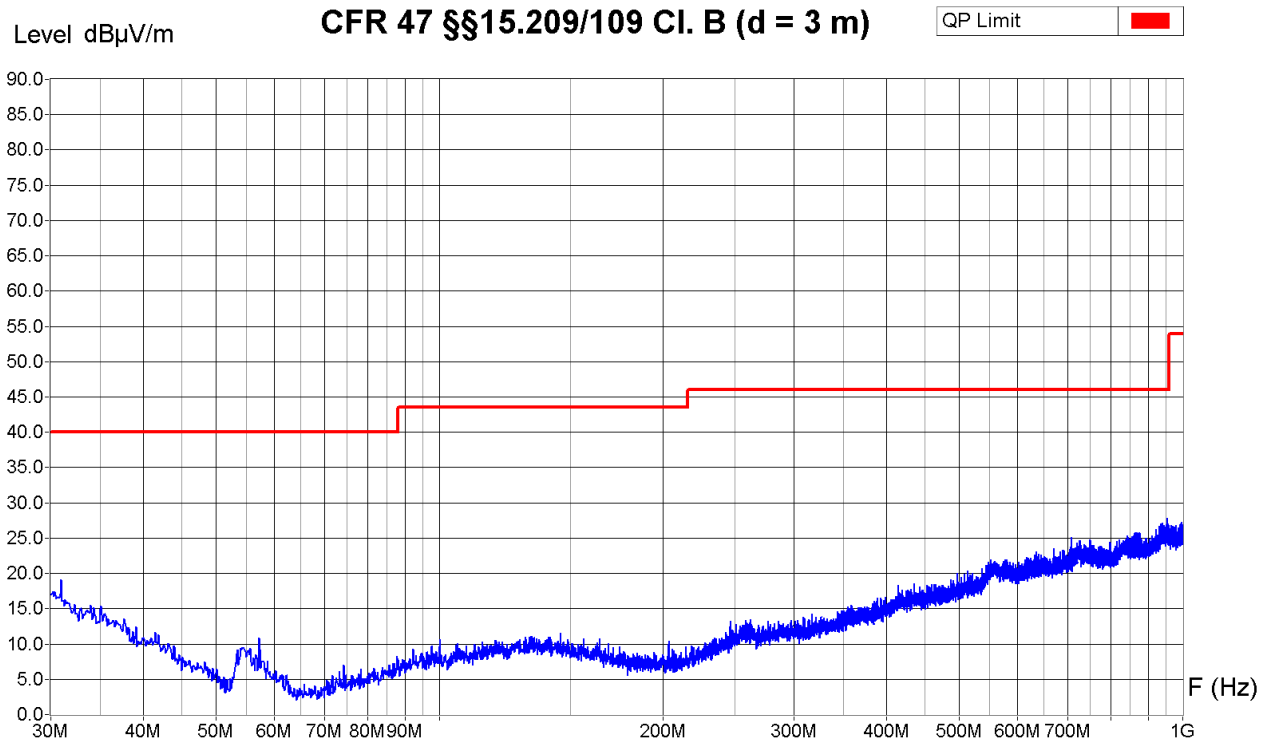
Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	RX, f = 915 MHz
Remarks :	Without filter



Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:32
Filename: 101_RE_30M-1G_RX_V_FCC.png/.txt

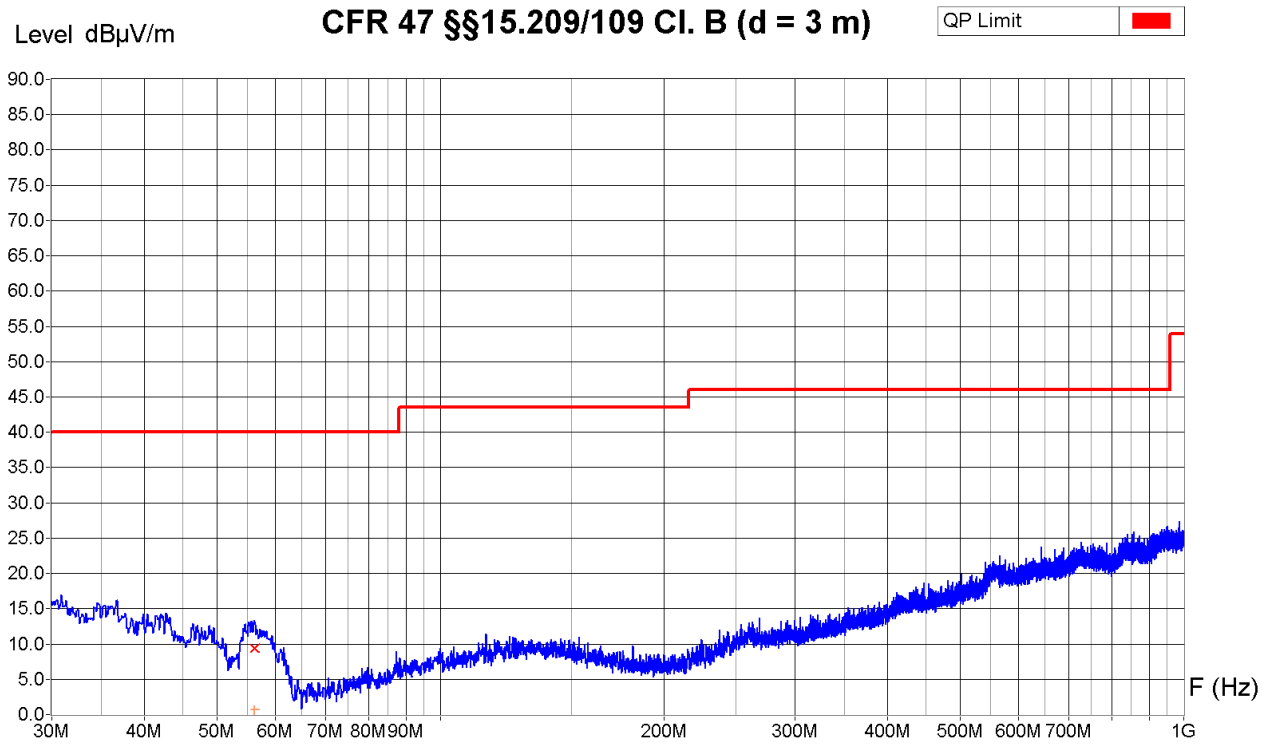
Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Without filter



Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:23
Filename: 98_RE_30M-1G_Charging_H_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 4m
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Without filter



Zone	30 MHz - 1 GHz
Video Bandwidth	300 KHz
Resol Bandwidth	120 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
56.20 MHz	15.5 dBµV/m	9.4 dBµV/m	0.7 dBµV/m	30.6 dB

Operator: B. Itzcovich
Date/Time: 13.01.2020 18:18
Filename: 99_RE_30M-1G_Charging_V_FCC.png/.txt

6.11.2 1 GHz to 6 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)

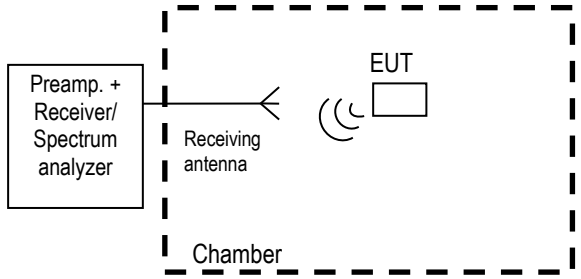
Meas. Uncertainty: ± 4.7 dB

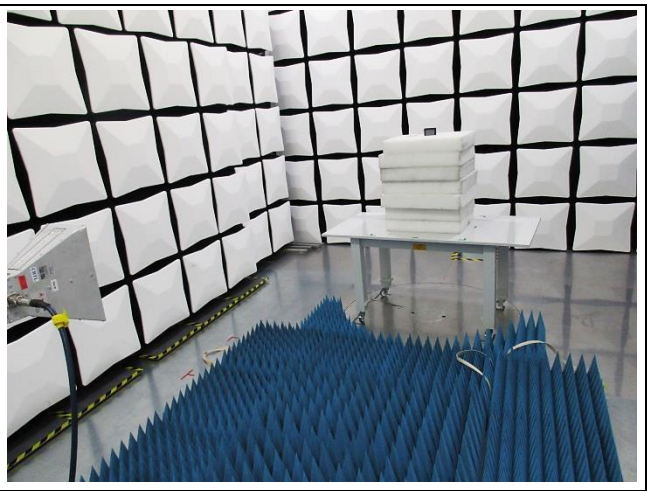
Test method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations, and aimed at the source by tilting. The turning table is operated 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

Climatic conditions: Temperature: 24 °C Humidity: 30 % Pressure QFE: 940 hPa

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;

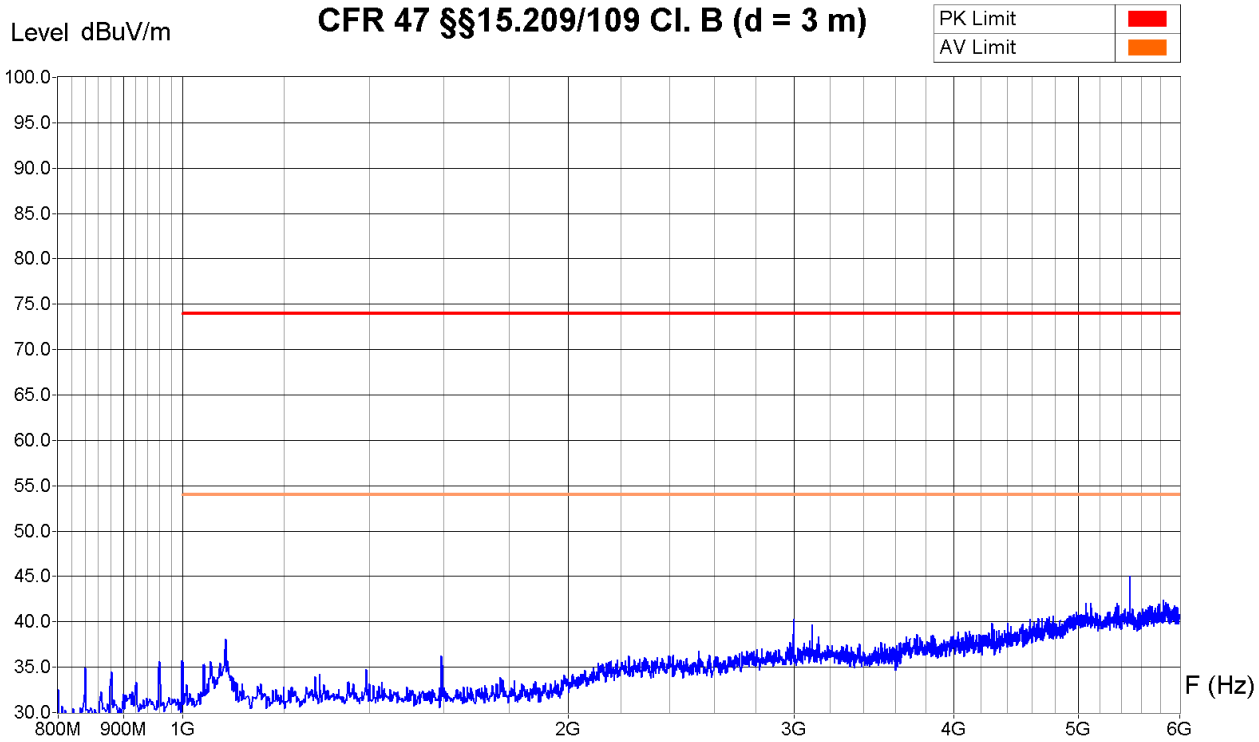
$$20\log\left(\frac{500\,\frac{\mu V}{m}}{1\,\frac{\mu V}{m}}\right)+20\log\left(\frac{3m}{3m}\right)=54\,\frac{dB\mu V}{m}\;at\;3m$$

Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 18-01
Preamplifier	☐ 05-56	☐ 05-87	☒ 14-27			
Antenna (horn)	☐ 90-24	☒ 07-31				
Cables	☒ 06-00C	☐ 06-01	☒ 11-30			
Filter	☐ 04-21					
Software and Revision	☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

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

Measurement Type :	Radiated Field
Polarisation :	Horizontal
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	RX, f = 915 MHz
Remarks :	With out filter, with external preamp.

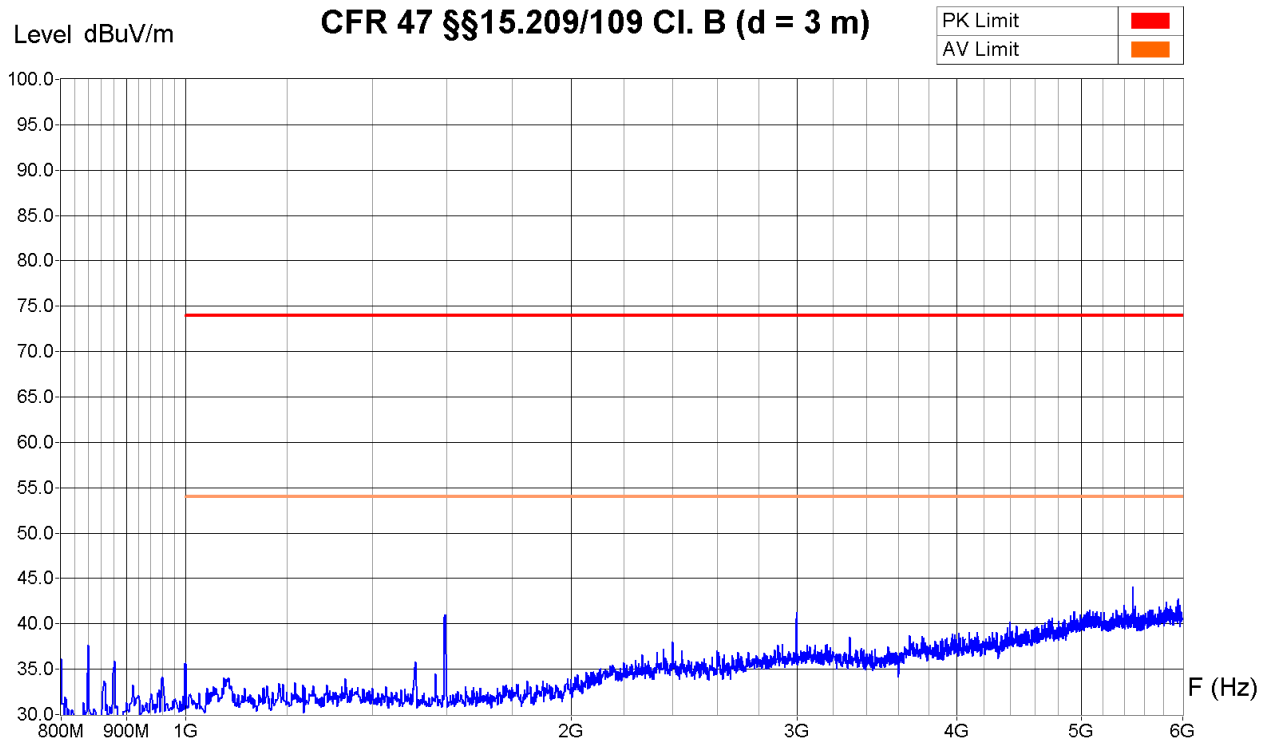


Zone	800 MHz - 6 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

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]
5.492	48.8	1.6	-38.4	+32.5	= 44.5

Operator: B. Itzcovich
Date/Time: 13.01.2020 12:05
Filename: 90_RE_1-6G_RX915M_H_FCC.png/.txt

Measurement Type :	Radiated Field
Polarisation :	Vertical
Table Angle :	0 - 360°
Antenna Height :	1 - 3m (tilted)
Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	RX, f = 915 MHz
Remarks :	With out filter, with external preamp.



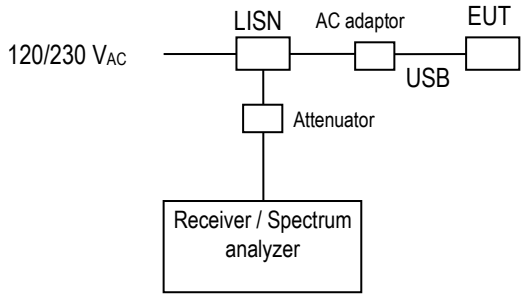
Zone	800 MHz - 6 GHz
Video Bandwidth	3 MHz
Resol Bandwidth	1 MHz

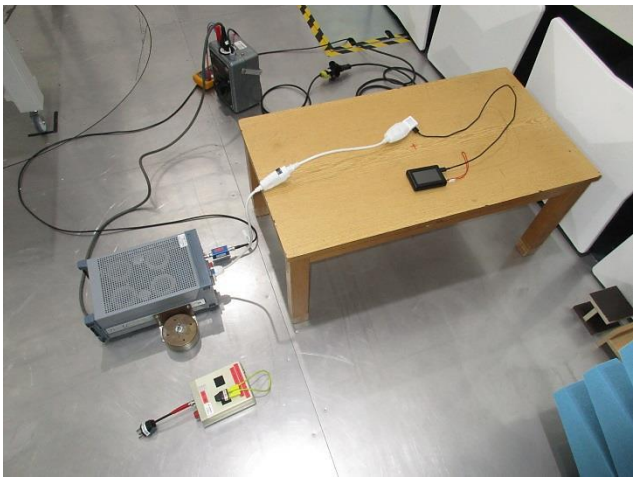
Operator: B. Itzcovich
Date/Time: 13.01.2020 12:12
Filename: 91_RE_1-6G_RX915M_V_FCC.png/.txt

6.12 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 ☐ 3 ☐ 4 ☐ 5	
Climatic conditions:	Temperature: 23 °C	Humidity: 30 % Pressure QFE: 946 hPa

Test set-up:





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

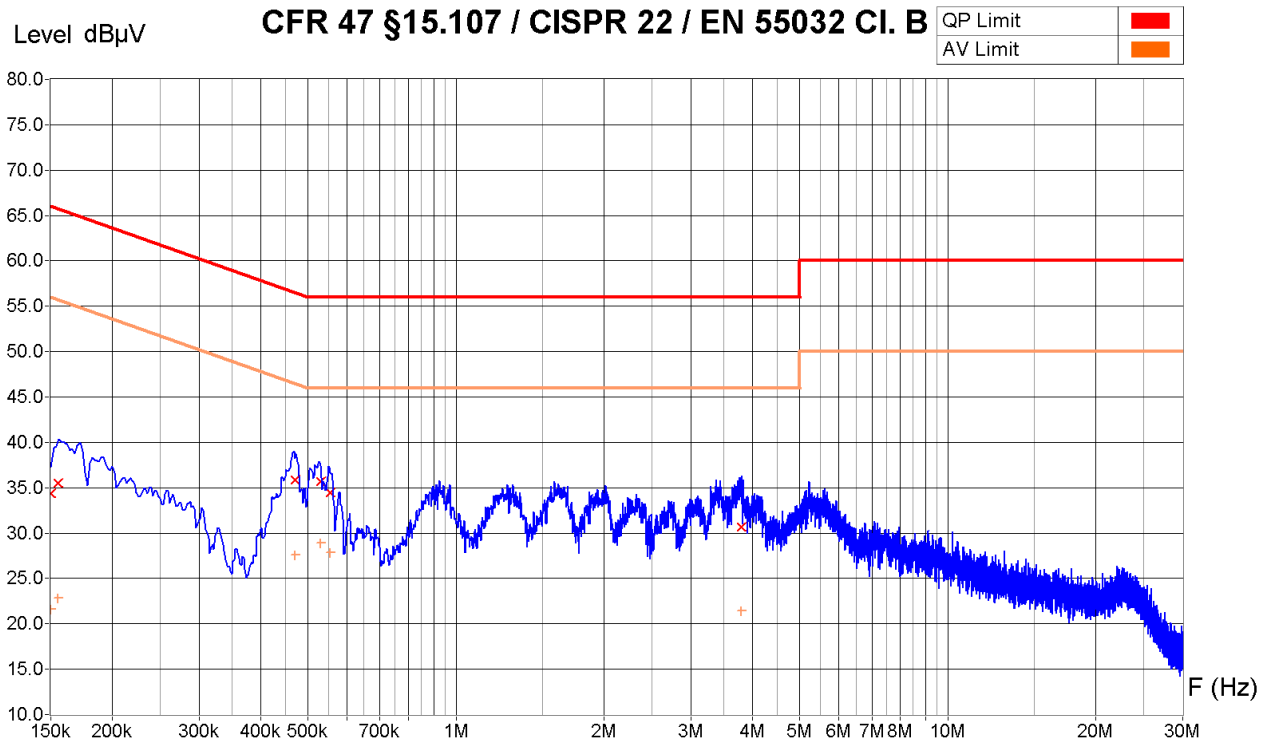
Test equipment:

Spectrum analyzer	☐ 88-14	☐ 94-24	☐ 02-06	☐ 03-45	☐ 05-39	☒ 16-03
Receiver	☐ 85-12	☐ 90-11	☒ 16-03	☐ 04-28	☐ 06-29	
LISN	☐ 85-13	☐ 90-08	☐ 94-36	☐ 94-40	☐ 95-12	☒ 00-43
Protection 10 dB	☐ 95-33	☐ 95-35	☒ 91-45	☐ 96-38	☐ included in LISN	
Protection 20 dB	☐ 91-46	☐ 95-33	☐ 95-38	☐ included in LISN		
Variable transformer	☒ 75-04					
Multimeter	☒ 08-17					
Cables	☒ SAC3_CE_8m		☒ SAC3_CE_3m			
Software and Revision	☒ Vitam, Rev. 2.4.13		☐ RadiMation 2015.1.7			

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

Measurement Type :	Voltage Interference
Supply :	Line 1
Other :	120 V / 50 Hz

Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Measured on typical AC-USB adaptor SAMSUNG EP-TA50EWE



Zone	150 KHz - 30 MHz
Video Bandwidth	30 KHz
Resol Bandwidth	9 KHz

Receiver Measures

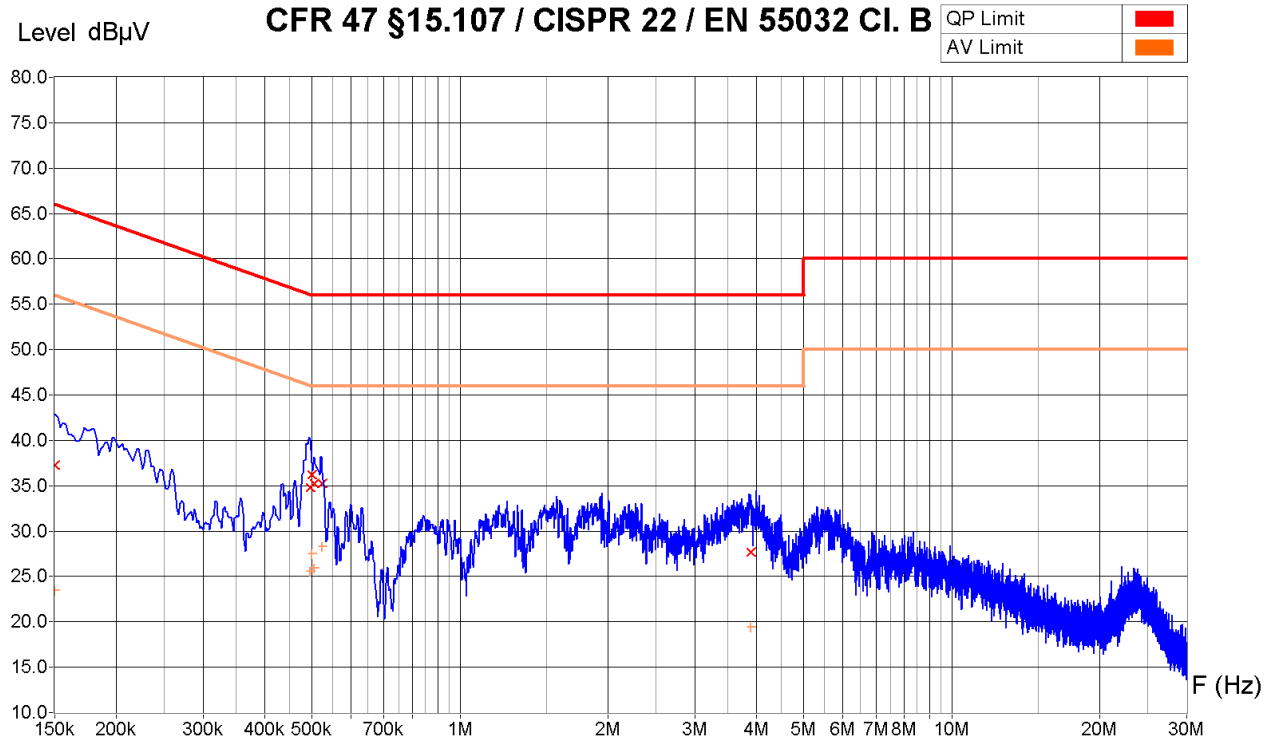
Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
150.10 KHz	41.5 dBµV	34.3 dBµV	21.6 dBµV	31.7 dB
155 KHz	40.4 dBµV	35.5 dBµV	22.8 dBµV	30.2 dB
470 KHz	41.1 dBµV	35.9 dBµV	27.6 dBµV	20.7 dB
530 KHz	38.8 dBµV	35.7 dBµV	28.9 dBµV	20.3 dB
555 KHz	37.9 dBµV	34.5 dBµV	27.9 dBµV	21.5 dB
3.80 MHz	36.4 dBµV	30.7 dBµV	21.5 dBµV	25.3 dB

Sample calculation with all conversion and correction factors used				
Frequency [kHz]	Receiver QP value [dBµV]	Cable att. corr. [dB]	Attenuator corr. [dB]	QP voltage [dBµV]
470	25.8	+0.1	+ 10.0	= 35.9

Operator: B. Itzcovich
Date/Time: 16.01.2020 09:07
Filename: 111_CE_150k-30M_charging_120V_L.png/.txt

Measurement Type :	Voltage Interference
Supply :	Neutral
Other :	120 V / 50 Hz

Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Measured on typical AC-USB adaptor SAMSUNG EP-TA50EWE



Zone	150 KHz - 30 MHz
Video Bandwidth	30 KHz
Resol Bandwidth	9 KHz

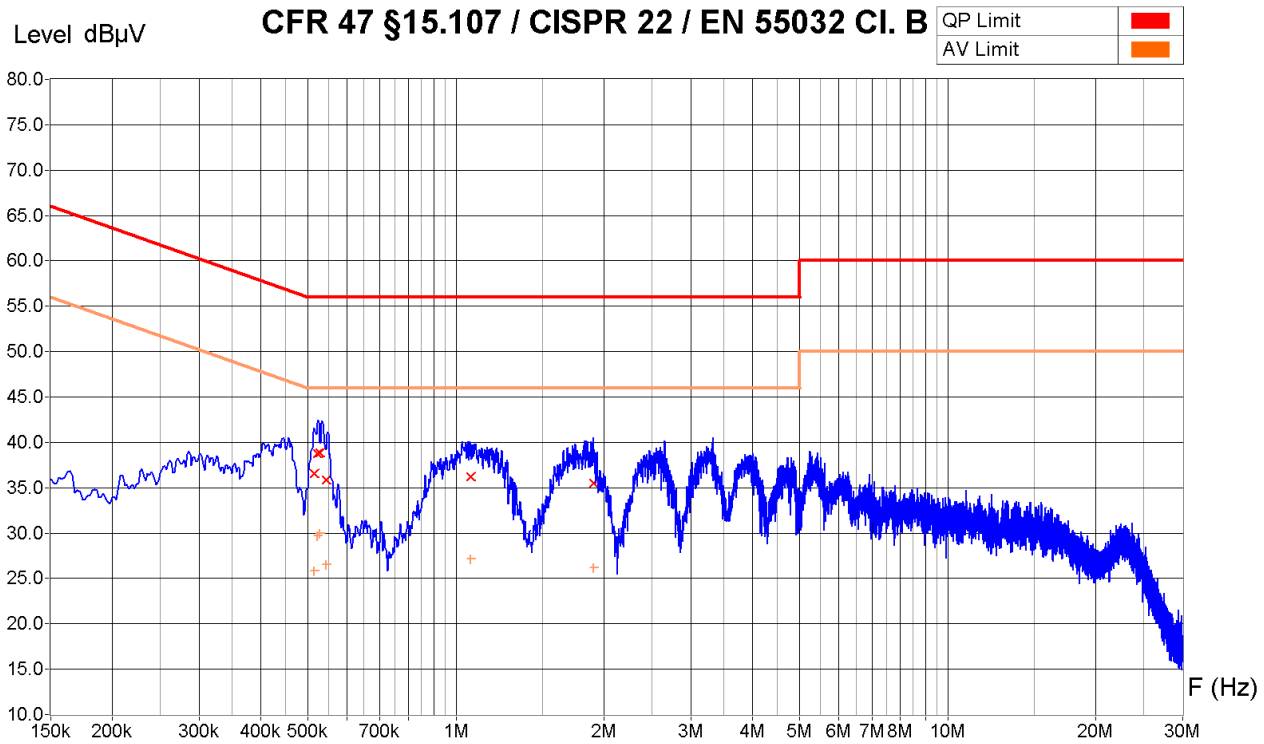
Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
150.10 KHz	42.1 dBµV	37.2 dBµV	23.4 dBµV	28.8 dB
495 KHz	39.5 dBµV	34.8 dBµV	25.6 dBµV	21.3 dB
500 KHz	40.0 dBµV	36.2 dBµV	27.5 dBµV	19.8 dB
505 KHz	39.4 dBµV	35.3 dBµV	25.9 dBµV	20.7 dB
525 KHz	39.3 dBµV	35.3 dBµV	28.3 dBµV	20.7 dB
3.90 MHz	33.2 dBµV	27.7 dBµV	19.4 dBµV	28.3 dB

Operator: B. Itzcovich
Date/Time: 16.01.2020 09:02
Filename: 112_CE_150k-30M_charging_120V_N.png/.txt

Measurement Type :	Voltage Interference
Supply :	Line 1
Other :	230 V / 50 Hz

Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Measured on typical AC-USB adaptor SAMSUNG EP-TA50EWE



Zone	150 KHz - 30 MHz
Video Bandwidth	30 KHz
Resol Bandwidth	9 KHz

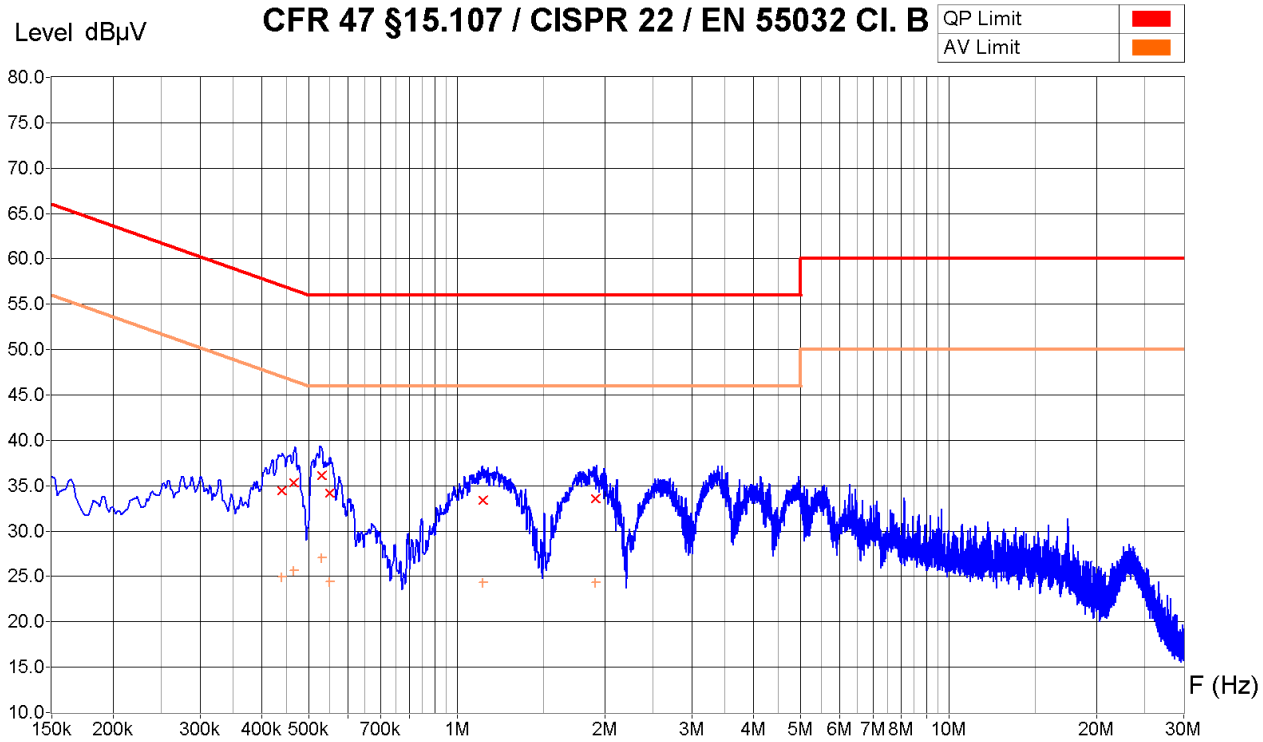
Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
515 KHz	41.9 dBµV	36.5 dBµV	25.8 dBµV	19.5 dB
522 KHz	43.4 dBµV	38.8 dBµV	29.7 dBµV	17.2 dB
528 KHz	42.8 dBµV	38.9 dBµV	30.0 dBµV	17.1 dB
544 KHz	41.3 dBµV	35.8 dBµV	26.6 dBµV	20.2 dB
1.07 MHz	40.9 dBµV	36.2 dBµV	27.1 dBµV	19.8 dB
1.90 MHz	40.6 dBµV	35.5 dBµV	26.2 dBµV	20.5 dB

Operator: B. Itzcovich
Date/Time: 16.01.2020 09:19
Filename: 113_CE_150k-30M_charging_230V_L.png/.txt

Measurement Type :	Voltage Interference
Supply :	Neutral
Other :	230 V / 50 Hz

Equipment Under Test :	XC Tracer Maxx, Proto 1 (MY)
Set-Up :	Chamber SAC3. See photos. Peak detector sweep
Operating Conditions :	Charging
Remarks :	Measured on typical AC-USB adaptor SAMSUNG EP-TA50EWE



Zone	150 KHz - 30 MHz
Video Bandwidth	30 KHz
Resol Bandwidth	9 KHz

Receiver Measures

Frequency	Peak	QuasiPeak (x)	Average (+)	QP Margin
440 KHz	39.3 dBµV	34.5 dBµV	25.0 dBµV	22.6 dB
465 KHz	40.3 dBµV	35.3 dBµV	25.7 dBµV	21.3 dB
530 KHz	39.9 dBµV	36.2 dBµV	27.1 dBµV	19.8 dB
550 KHz	38.8 dBµV	34.2 dBµV	24.4 dBµV	21.8 dB
1.13 MHz	37.2 dBµV	33.4 dBµV	24.3 dBµV	22.6 dB
1.91 MHz	37.6 dBµV	33.5 dBµV	24.3 dBµV	22.5 dB

Operator: B. Itzcovich
Date/Time: 16.01.2020 09:22
Filename: 114_CE_150k-30M_charging_230V_N.png/.txt

6.13 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.

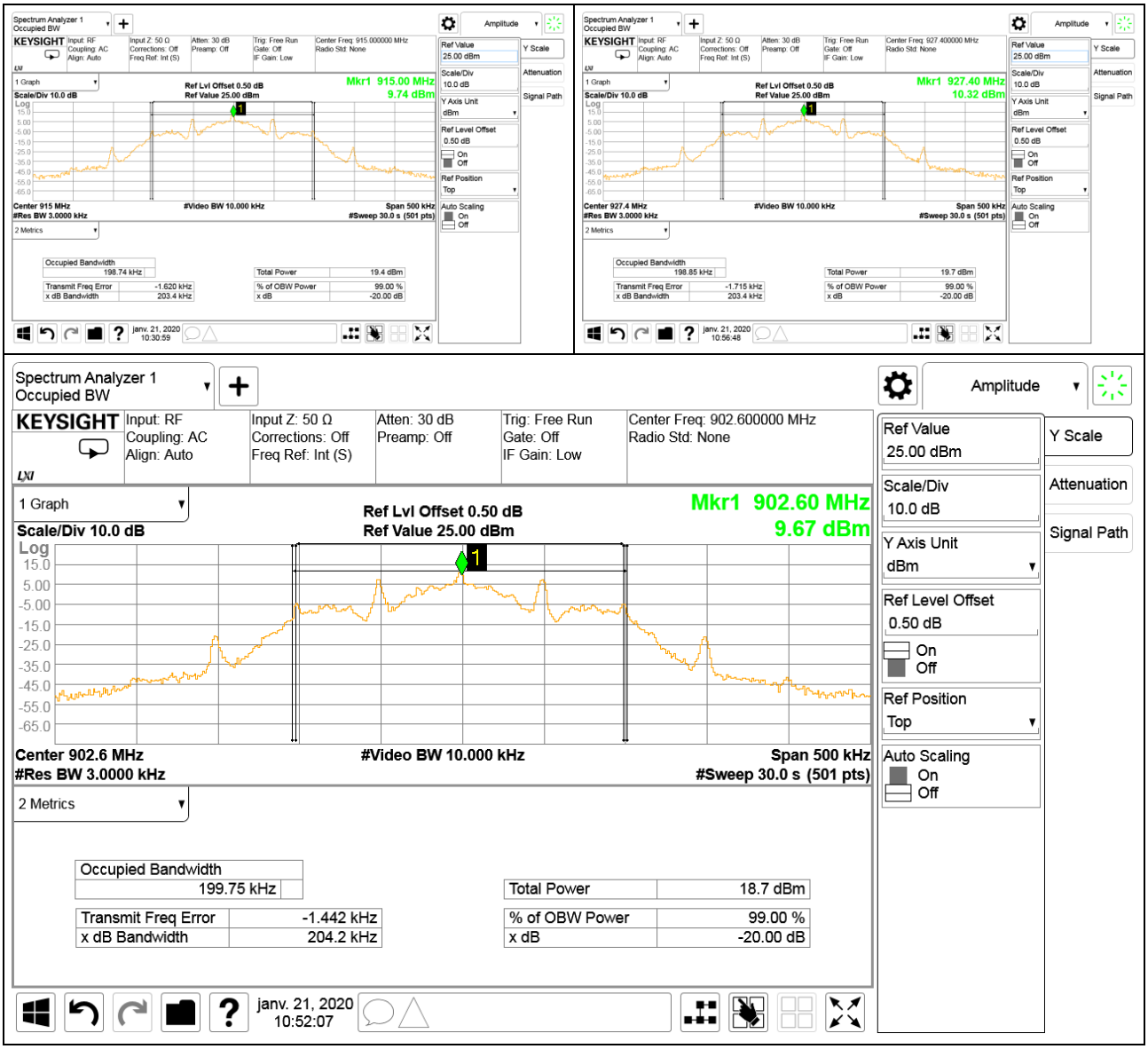
Modifications: ☒ None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

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 kHz (occupied bandwidth)

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

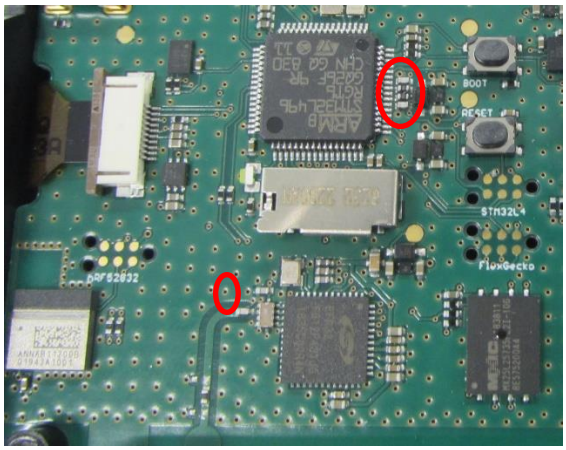
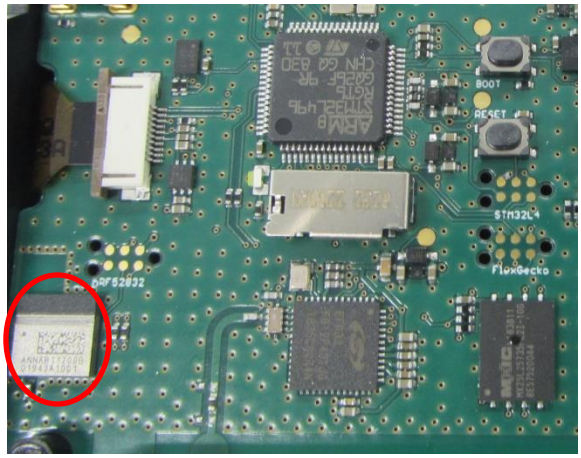
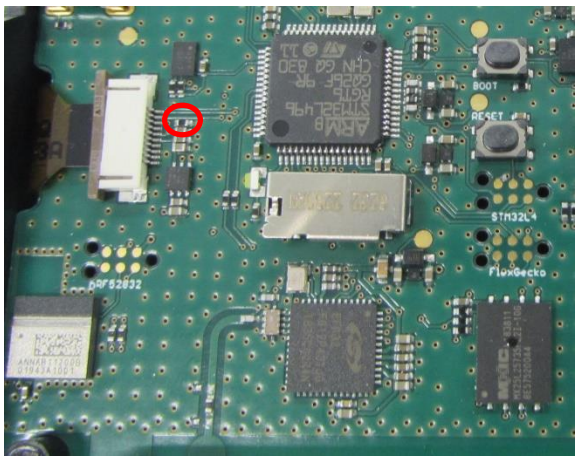
Designation of emission: 200KFXD



Place and date of test: Rossens, 2020-01-21
Operator: B. Itzcovich

7. Modifications on the EUT

7.1 Level: 1

	In order to improve the GPS reception Two ferrite bead capacitor filters has been added to the output oft he CPU clock and MOSI line. In order to improve the spurious emission a via has been moved a litte farer from the TX line- Date of modification: 2020-04-24
	The bluetooth reference design has been adapted to the newest release. Date of modification: 2020-04-24
	Pull Up resistor for LCD Display added. Connected Display_Enable with MCU. Date of modification: 2020-04-24

8. Appendix

8.1 Test equipment

Inventory No.	Designation	Manufacturer	Type	Cal. Date	Next calibr.	Cal. Period [year]
90-25	Loop antenna	Chase	HLA6120	02 Jun 2017	02 Jun 2020	3
05-38	Bi-Log antenna	Chase	CBL6111C	01 Nov 2018	30 Aug 2020	2
07-31	Horn antenna	Schwarzbeck	BBHA 9120 D	09 Oct 2018	09 Oct 2020	2
89-01	Dipole antenna	Schwarzbeck	UHAP – 10dB	12 Jun 2013	12 Jun 2020	7
04-21	Notch Filter	Montena EMC	CR900R	27 Jun 2017	27 Jun 2020	3
91-45	Attenuator	Montena EMC	10 dB	05 Jun 2018	05 Jun 2020	2
05-56	Preamplifier	Montena EMC	30 dB / 2 – 18 GHz	02 Dec 2019	02 Dec 2021	2
14-27	Preamplifier	Montena EMC	AFS42-00101800-25-S-42	28 Jun 2019	28 Jun 2021	2
13-16	Signal Generator	Anapico	APSIN20G	10 Jul 2018	10 Jul 2020	2
06-00C	Cable	Huber&Suhner	SF106PA 600mm	02 Jun 2017	02 Jun 2020	3
SAC3_RE_5m_1.0	Cable	Huber&Suhner	SF104A 5m	30 Sep 2019	30 Sep 2021	2
SAC3_RE_5m_2.0	Cable	Huber&Suhner	SF104A 5m	30 Sep 2019	30 Sep 2021	2
SAC3_RE_5m_3.0	Cable	Huber&Suhner	SF104A 5m	30 Sep 2019	30 Sep 2021	2
SAC3_CE_8m	Cable	Huber&Suhner	ST106PA 8m	30 Sep 2019	30 Sep 2021	2
SAC3_CE_3m	Cable	Huber&Suhner	RG 58 C/U 3m	30 Sep 2019	30 Sep 2021	2
11-30	Cable	Huber&Suhner	ST18A 3m	29 Jun 2018	29 Jun 2020	2
11-45	Cable	Huber&Suhner	SF106P 2m	06 Feb 2020	06 Feb 2022	2
10-51	Cable	Huber&Suhner	SF104 5m	06 Feb 2020	06 Feb 2022	2
00-43	LISN	Rohde&Schwarz	ESH3-Z5	17 Sep 2019	17 Sep 2021	2
18-01	Spectr. Analyzer	Keysight	N9020B	11 Mar 2018	11 Mar 2020	2
16-03	Receiver + Spectr. Analyzer	Rohde&Schwarz	ESR7 1316.3003K07	25 Oct 2019	25 Oct 2021	2
168593	EMI Test Receiver	Rohde & Schwarz	ESU26	15 Oct 2019	15 Oct 2021	2
09-04	Power sensor	Agilent	E9304A H19	06 Jan 2020	06 Jan 2022	2
03-12	Wattmeter	Agilent	E4418B	06 Jan 2020	06 Jan 2022	2
08-17	Multimeter	Fluke	87V	14 Feb 2019	14 Feb 2021	2
99-07	Power supply	Coutant	LA200.2	- - -	- - -	-
75-04	Transformer	Variac	W10HMT	- - -	- - -	-

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.