Prüfbericht / *Test Report* Nr. / *No.* TR-50511-74558-02 (Edition 2)

Applicant:	Endress + Hauser GmbH + Co. KG
Type of equipment:	Level Probing Radar
Type designation:	FWR30
Order No.:	196/1017781463
Test standards:	FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.207, 15.209 and 15.256 (partly) ISED RSS-211 Issue 1, Sections 5.1 and 5.2(partly) ISED RSS-GEN Issue 5, Sections 8.8, 8.9 and 8.10 (Category I Equipment)

Note:

The test data of this report is related only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.

Table of Contents

1 Description of the Equipment Under Test (EUT)

General data of EUT	
Type designation[1]:	FWR30
Parts[2]:	
Serial number(s):	FWR30_1095
Manufacturer:	Endress + Hauser GmbH + Co. KG
Type of equipment:	Level Probing Radar
Version:	As received
FCC ID:	LCGFWR3XWEL
IC:	2519A-WEL
Additional parts/accessories:	

Technical data of EUT		
Application frequency range:	75 GHz - 85 GHz	
Frequency range:	79 GHz – 81 GHz	
Operating frequency:	79 GHz	
Type of modulation:	FMCW	
Pulse train:	N/A	
Pulse width:	N/A	
Number of RF-channels:	1	
Channel spacing:	N/A	
Designation of emissions[3]:	4G0XXN	
Type of antenna:	Integrated	
Size/length of antenna:	N/A	
Connection of antenna:	☐ detachable	☒ not detachable
Type of power supply:	Battery supply	
Specifications for power supply:	nominal voltage:	3.6 V

[1] Type designation of the system if EUT consists of more than one part.
[2] Type designations of the parts of the system, if applicable.
[3] Also known as "Class of Emission".

2 Administrative Data

Application details	
Applicant (full address):	Endress + Hauser GmbH + Co. KG Hauptstraße 1 79689 Maulburg Germany
Contact person:	Mr. Ralf Reimelt
Order number:	196/1017781463
Receipt of EUT:	2019-11-20; 2019-12-13
Date(s) of test:	2019-11-20 – 2019-11-22; 2020-01-13
Note(s):	

Report details	
Report number:	TR-50511-74558-02
Edition:	2
Issue date:	2020-02-13

3 Identification of the Test Laboratory

Details of the Test Laboratory	
Company name:	TÜV SÜD Product Service GmbH
Address:	Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkkS Registration No. D-PL-11321-11-02 DAkkS Registration No. D-PL-11321-11-03
Laboratory recognition:	Registration No. BNetzA-CAB-16/21-15
Industry Canada test site registration:	3050A-2
Contact person:	Mr. Markus Biberger Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

4 Summary

Summary of test results
The tested sample partly complies with the requirements set forth in the **Code of Federal Regulations CFR 47, Part 15, Sections 15.205, 15.207, 15.209 and 15.256** of the Federal Communication Commission (FCC) and the **Radio Standards Specifications** **RSS-210 Issue 1, Sections 5.1 and 5.2** **RSS-GEN Issue 5, Sections 8.8, 8.9 and 8.10 (Category I Equipment)** of Innovation, Science and Economic Development Canada (ISED).

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

Datum / *Date*	Geprüft von / *Tested by*	Freigabe durch / *Checked by*
2020-02-13	Steindl Martin *SIGN-ID 328950* **Martin Steindl** Responsible for testing	Reviewer

Prüfergebnis / *Test Result*

☒ **Erfüllt / *Passed***

☐ **Nicht erfüllt / *Not passed***

5 Operation Mode and Configuration of EUT

Operation Mode(s)
Transmitting continuously

Configuration(s) of EUT
The EUT was tested as stand alone equipment

List of ports and cables				
Port	*Description*	*Classification*[4]	*Cable type*	*Cable length*
1	DC supply	dc power	Unshielded	2 m

List of devices connected to EUT				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
1	AC/DC convertor	LOGO! Power 24 V		Siemens

List of support devices				
Item	*Description*	*Type Designation*	*Serial no. or ID*	*Manufacturer*
	---			

[4] Ports shall be classified as ac power, dc power or signal/control port

6 Measurement Procedures

6.1 Bandwidth Measurements

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 2, section 2.202(a) CFR 47 Part 15, section 15.215(c) ISED RSS-Gen Issue 5, section 6.6 ISED RSS-210 Issue 9, section A.1.3 ANSI C63.10, section 6.9.1
Guide:	ANSI C63.10 / ISED RSS-Gen Issue 5, section 6.6
Measurement setup:	☐ Conducted: See below ☒ Radiated: Radiated Emission in Fully or Semi Anechoic Room (6.3)

If antenna is detachable bandwidth measurements shall be performed at the antenna connector (conducted measurement) when the transmitter is adjusted in accordance with the tune-up procedure, if applicable. The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.

If radiated measurements are performed the same test setups and instruments are used as with radiated emission measurements for the appropriate frequency range.

The analyzer settings are specified by the test description of the appropriate test record(s).

6.2 Radiated Emission Measurement 9 kHz to 30 MHz

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.209 ISED RSS-GEN Issue 5, sections 8.9 and 8.10
Guide:	ANSI C63.4

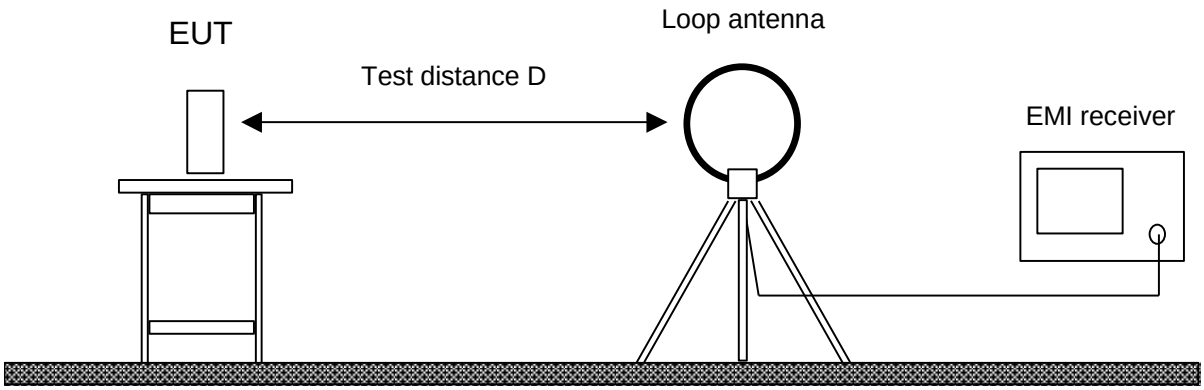
Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.
If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.



Test instruments used:

	Type	*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☒	Spectrum analyzer	FSP30	1666	100036	Rohde & Schwarz
☐	EMI test receiver	ESW26	28268	101315	Rohde & Schwarz
☐	Test receiver	ESHS 10	1028	860043/016	Rohde & Schwarz
☐	EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
☐	Preamplifier Cabin no. 2	CPA9231A	1716	3557	Schaffner
☒	Loop antenna	HFH2-Z2	1016	882964/1	Rohde & Schwarz
☒	Microwave cable Cabin no. 2	UFA210A-FG	1681	23516	Rosenberger Micro-Coax
☒	Microwave cable Cabin no. 2	KKSF1040016	2020	289854/4	Huber + Suhner
☒	Microwave cable Cabin no. 2	FA210AF020000000	2060	64566-2	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	EF393	2053	---	Albatross Projects
☐	Microwave cable Cabin no. 8	FB293C1050005050	2054	63834-1	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FB293C1080005050	2055	63833-1	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.4.12	RFS
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
☐	Microwave cable Cabin no. 8	FA210AF040005050G	2127	72061-01	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FA210AF04000505G	2056	64567-01	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
☒	Fully anechoic room	No. 2	1452	---	Albatross
☐	Semi anechoic room	No. 3	1453	---	Siemens
☐	Semi anechoic room	No. 8	2057	---	Albatross
☒	Measurement Software	EMC32_K8 V9.25.00	1852	100016	Rohde & Schwarz
☐	Measurement Software	EMC32_K8 V9.25.00	1852	100016	Rohde & Schwarz

6.3 Radiated Emission in Fully or Semi Anechoic Room

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.209 ISED RSS-GEN Issue 5, section 8.9
Guide:	ANSI C63.4

Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).

Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.

All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

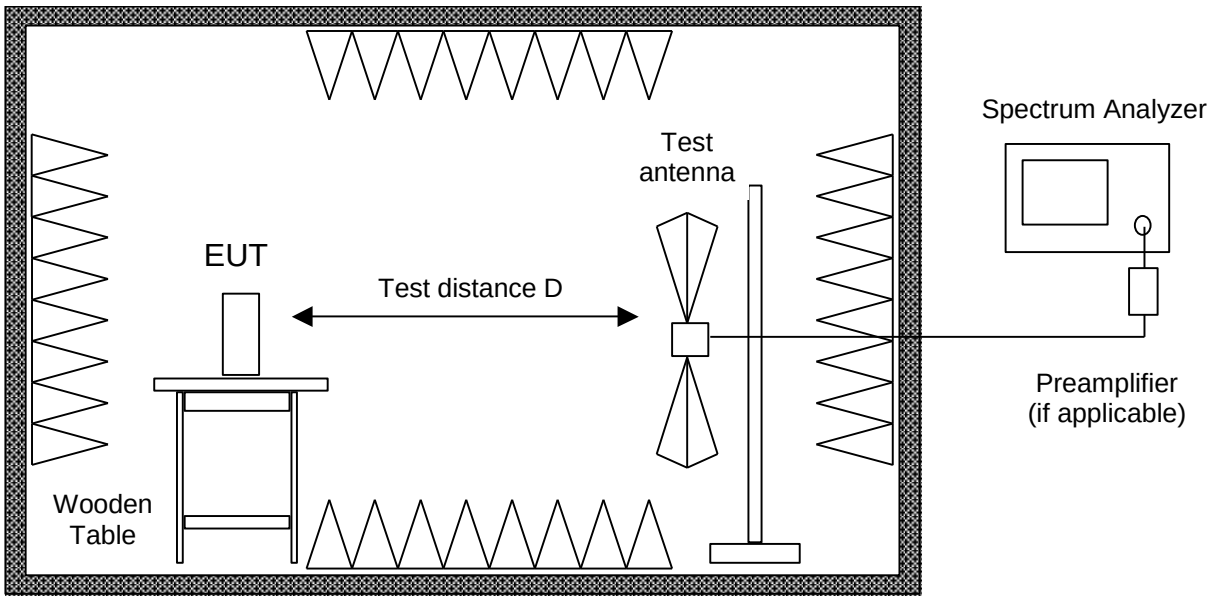
If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

Radiatetd Emissions above 1 GHz were performed with the antenna tilted to the direction of the EUT.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 respectively ANSI C63.10 for alternative test sites is used (see 6.4). If prescans are recorded in fully anechoic room they are indicated appropriately.



Fully or semi anechoic room

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☐	Spectrum analyzer		FSP30	1666	100036	Rohde & Schwarz
☒	Spectrum analyzer		FSV40	2364	101448	Rohde & Schwarz
☐	EMI test receiver	Cabin no. 3	ESPI7	2010	101018	Rohde & Schwarz
☐	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☐	EMI test receiver		ESW26	28268	101315	Rohde & Schwarz
☒	EMI test receiver		ESW44	39897	101814	Rohde & Schwarz
☒	External Waveguide Mixer		FS-Z60	25849	100177	Rohde & Schwarz
☒	External Waveguide Mixer		FS-Z90	25850	101610	Rohde & Schwarz
☒	External Waveguide Mixer		FS-Z110	25851	101464	Rohde & Schwarz
☒	External Waveguide Mixer		FS-Z170	22553	100953	Rohde & Schwarz
☒	External Waveguide Mixer		FS-Z220	25854	100965	Rohde & Schwarz
☐	External Waveguide Mixer		FS-Z325	25855	100922	Rohde & Schwarz
☐	Trilog antenna	Cabin no. 2	VULB 9163	1802	9163-214	Schwarzbeck
☐	Trilog antenna	Cabin no. 3	VULB 9163	1722	9163-188	Schwarzbeck
☒	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☐	Trilog antenna	Cabin no. 2	VULB 9162	2256	9162-048	Schwarzbeck

	Type	*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☐	Horn antenna	HF907	2073	100154	Rohde & Schwarz
☒	Horn antenna	HF907	4089	102777	Rohde & Schwarz
☐	Horn antenna	3160-03	1010	9112-1003	EMCO
☐	Horn antenna	3160-04	1011	9112-1001	EMCO
☐	Horn antenna	3160-05	1012	9112-1001	EMCO
☐	Horn antenna	3160-06	1013	9112-1001	EMCO
☒	Horn antenna	3160-07	1014	9112-1008	EMCO
☒	Horn antenna	3160-08	1015	9112-1002	EMCO
☒	Horn antenna	3160-09	1265	9403-1025	EMCO
☒	Horn antenna	3160-10	1575	399185	EMCO
☒	Horn antenna	24240-20	19946	157845	FLANN
☒	Horn antenna	25240-20	27898	249763	FLANN
☒	Horn antenna	27240-20	27899	244048	FLANN
☐	Microwave cable Cabin no. 2	UFA210A-FG	1681	23516	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 2	KKSF1040016	2020	289854/4	Huber + Suhner
☐	Microwave cable Cabin no. 2	FA210AF020000000	2060	64566-2	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	EF393	2053	---	Albatross Projects
☐	Microwave cable Cabin no. 8	FB293C1050005050	2054	63834-1	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FB293C1080005050	2055	63833-1	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.4.12	RFS
☐	Microwave cable Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
☐	Microwave cable Cabin no. 8	FA210AF040005050G	2127	72061-01	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FA210AF04000505G	2056	64567-01	Rosenberger Micro-Coax
☐	Microwave cable Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
☒	Microwave cable Cabin no. 11	SF104	44529	---	Huber + Suhner
☒	Microwave cable Cabin no. 11	SF118	44531	---	Huber + Suhner
☐	Fully anechoic room	No. 2	1452	---	Albatross
	Semi anechoic room	No. 8	2057	---	Albatross
☒	Semi anechoic room	No. 11	42961	---	Frankonia
☐	Measurement Software	EMC32_K2 V9.25.00	2033	100003	Rohde & Schwarz
☐	Measurement Software	EMC32_K8 V9.25.00	1852	100016	Rohde & Schwarz
☒	Measurement Software	EMC32_K11 V10.50.10	42986	---	Rohde & Schwarz

6.4 Radiated Emission at Alternative Test Site

Measurement Procedure:	
Rules and specifications:	CFR 47 Part 15, section 15.209 ISED RSS-GEN Issue 5, section 8.9
Guide:	ANSI C63.10

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 respectively ANSI C63.10 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

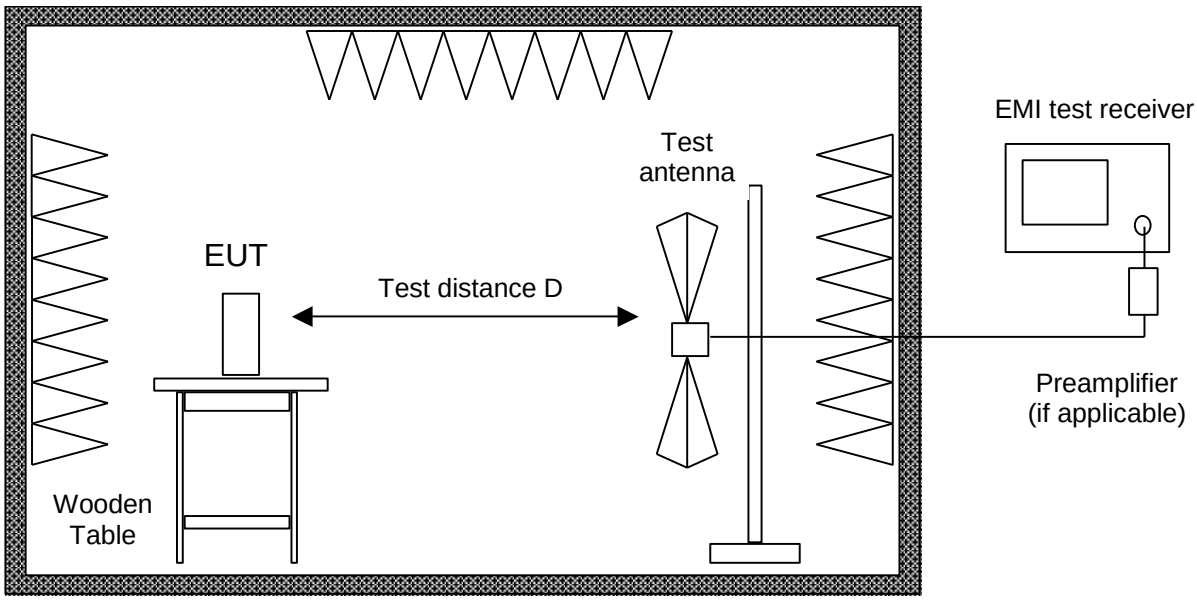
If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is dircharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.



Alternate test site (semi anechoic room)

Test instruments used:

	Type		*Designation*	*Inv.-no.*	*Serial No. or ID*	*Manufacturer*
☐	EMI test receiver		ESU8	2044	100232	Rohde & Schwarz
☒	EMI test receiver		ESW44	39897	101814	Rohde & Schwarz
☐	EMI test receiver		ESW26	28268	101315	Rohde & Schwarz
☐	Trilog antenna	Cabin no. 8	VULB 9163	2058	9163-408	Schwarzbeck
☒	Trilog antenna		VULB 9162	20116	9162-048	Schwarzbeck
☐	Microwave cable	Cabin no. 8	EF393	2053	---	Albatross Projects
☐	Microwave cable	Cabin no. 8	LCF12-50	2057	P1.6.19	RFS
☐	Microwave cable	Cabin no. 8	LCF12-50	2057	P1.3.9	RFS
☐	Microwave cable	Cabin no. 8	FA210AF04000505	2068	64610-1	Rosenberger Micro-Coax
☐	Microwave cable	Cabin no. 8	FA210AF040005050G	2127	72061-01	Rosenberger Micro-Coax
☒	Microwave cable	Cabin no. 11	SF104	44529	---	Huber + Suhner
☒	Microwave cable	Cabin no. 11	SF118	44531	---	Huber + Suhner
☐	Semi anechoic room		No. 8	2057	---	Albatross
☒	Semi anechoic room		No. 11	42961	---	Frankonia
☐	Measurement Software		EMC32_K8 V9.25.00	1852	100016	Rohde & Schwarz
☒	Measurement Software		EMC32_K11 V10.50.10	42986	---	Rohde & Schwarz

7 Test Results

FCC CFR 47 Parts 2 and 15			
Section(s)	*Test*	*Page*	*Result*
2.1046(a)	Conducted output power	---	Not applicable
2.202(a)	Occupied bandwidth	18	Recorded
15.256(g)(2)(ii)	Minimum Occupied bandwidth	19	Test passed
2.201, 2.202	Class of emission	20	Calculated
15.35(c)	Pulse train measurement for pulsed operation	---	Not applicable
15.205(a)	Restricted bands of operation	---	Not applicable
15.207	Conducted AC powerline emission 150 kHz to 30 MHz	---	Not applicable [5]
15.205(b) 15.209	Radiated emission 9 kHz to 30 MHz	24	Test passed
15.205(b) 15.209	Radiated emission 30 MHz to 200 GHz	25	Test passed
15.256(g)(3)	Fundamental emissions EIRP	22	Test passed
1.1307(b)(1)	RF Exposure Requirement	27	Test passed

[5] EUT is battery operated.

ISED RSS-GEN Issue 5			
Section(s)	*Test*	*Page*	*Result*
6.12	Transmitter output power (conducted)	---	Not applicable
6.6	Occupied Bandwidth	18	Recorded
9	Designation of emissions	20	Calculated
6.10	Pulsed operation	---	Not applicable
8.8	Transmitter AC power lines conducted emissions 150 kHz to 30 MHz	---	Not applicable [6]
8.10	Restricted bands and unwanted emission frequencies	---	Not applicable
6.4, 6.13, 8.9	Unwanted emissions 9 kHz to 30 MHz	24	Test passed
6.4, 6.13, 8.9	Unwanted emissions 30 MHz to 200 GHz	25	Test passed
3.2	Exposure of Humans to RF Fields	28	Exempted from SAR and RF evaluation

ISED RSS-211 Issue 1			
Section(s)	*Test*	*Page*	*Result*
5.1 (a)	Minimum Emission Bandwidth	19	Test passed
5.1 (d)	Unwanted emissions 9 kHz to 30 MHz	24	Test passed
5.1 (d)	Unwanted emissions 30 MHz to 200 GHz	25	Test passed
5.2 (a)	Maximum half-power beamwidth	---	Not performed [7]
5.2 (b)	Fundamental Emissions EIRP	23	Test passed
5.2 (c)	Side Lobe Gain	---	Not performed [7]
5.3 (b)	Maximum Average EIRP Outside the Tank Enclosure	---	Not applicable

[6] EUT is battery operated.
[7] Not ordered by applicant. Test data will be provided in separate report by applicant.

7.1 Occupied Bandwidth

Rules and specifications:	CFR 47 Part 2, section 2.202(a) ANSI C63.10, section 6.9.1
Guide:	ANSI C63.10
Description:	The occupied bandwidth according to CFR 47 Part 2, section 2.202(a), is measured as the 99% emission bandwidth, i.e. below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission. The occupied bandwidth according to ANSI C63.10, section 6.9.1; is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier. The span range of the spectrum analysator display shall be between two times and five times of the occupied bandwidth. The resolution bandwidth of the spectrum analyzer should be approximately 1 % to 5 % of the occupied bandwidth, unless otherwise specified, depending on the applicable requirement. The video bandwidth shall be at least three times greater than the resolution bandwidth. The dynamic range of the spectrum analyzator at the selected resolution bandwidth shall be more than 10 dB below the target “dB down” (attenuation) requirement.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	For plots please refer to Annex B.1.1
Date of test:	2020-01-13
Test site:	Fully anechoic room, cabin no. 2

Occupied Bandwidth (99 %):	**3.9855 GHz**

Occupied Bandwidth (continued)

Rules and specifications:	CFR 47 Part 15, sections 15.256(f)(1) ISED RSS-211 Issue 1, section 5.1(a)
Guide:	ISED RSS-Gen Issue 5, section 6.6 ANSI C63.10
Limit	The minimum fundamental emission bandwidth in the -10 dBc points shall be 50 MHz.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	For plots please refer to Annex B.1.2
Date of test:	2020-01-13
Test site:	Fully anechoic room, cabin no. 2

Test Result:	Test passed

Occupied Bandwidth (-10 dB):	**4.0376 GHz**
Limit:	**50 MHz**

7.2 Designation of Emissions

Rules and specifications:	CFR 47 Part 2, sections 2.201 and 2.202 ISED RSS-Gen Issue 5, section 9
Guide:	ANSI C63.10 / TRC-43

Type of modulation:	Frequency Modulation Continuous Wave (FMCW)

Designation of Emissions:	**4G0XXN**

7.3 Band of Operation

Rules and specifications:	CFR 47 Part 2, section 15.256(f)(2)
Guide:	KDB 890966 D01 V01 R01, section H
Description:	LPR devices operating under this section must confine their fundamental emission bandwidth within the 5.925 – 7.250 GHz, 24.05 – 29.0 GHz, and 75 – 85 GHz bands under all conditions of operating. As specified in section 15.215(c), the bandwidth of the fundamental must be contained within the frequency band over the temperature range -20 to +50 degrees Celsius with an imput voltage variation of 85 % to 115 % of rated input voltage. Frequency stability is to be measured according to section 2.1055 at the highest and lowest frequency of operation and with the modulation that produces the widest emission bandwidth.
Measurement procedure:	Bandwidth Measurements (6.1)

Comment:	See pots for details in Annex B.2
	Voltage-end-point with drop-off of carrier: 3.0 V
Date of test:	2020-01-13
Test site:	Fully anechoic room, cabin no. 2

Test Result:	Test passed

7.4 Fundamental Emissions EIRP

Rules and specifications:	CFR 47 Part 2, section 15.256(g)		
Guide:	KDB 890966 D01 V01 R01, section F		
Limit:	*Frequency band of operation (GHz)*	*Average emission limit (EIRP in dBm measured in 1 MHz)*	*Peak emission limit (EIRP in dBm measured in 50 MHz)*
	5.925 – 7.250	-33	7
	24.05 – 29.00	-14	26
	75 – 85	-3	34
Description:	The EIRP in 1 MHz is computed from the maximum power level measured within any 1 MHz bandwidth using a power averaging detector. The EIRP in 50 MHz is computed from the maximum power level in a 50 MHz bandwidth centered on the frequency at which the maximum average power level is realized and this 50 MHz bandwidth must be contained within the authorized operating bandwidth. The emission limits re based on boresight measurements (i.e. measurements performed within the main beam of the antenna).		
Measurement procedure:	Bandwidth Measurements (6.1)		

Comment:	See pots in Annex B.3 for details
Date of test:	2020-01-13
Test site:	Fully anechoic room, cabin no. 2

Peak Emission (dBm)	*Peak Limit(dBm)*	*Average emission (dBm)*	*Average limit (dBm)*
20.52	34.0	-16.05	-3.0

Test Result:	Test passed

Fundamental Emissions (continued)

Rules and specifications:	RSS-211, section 5.2 (b)		
Guide:	ETSI EN 302 729		
Limit:	*Frequency band of operation (GHz)*	*Average emission limit (EIRP in dBm measured in 1 MHz)*	*Peak emission limit (EIRP in dBm measured in 50 MHz)*
	5.65 – 8.50	-33	7
	24.05 – 29.00	-14	26
	75 – 85	-3	34
Description:	The EIRP in 1 MHz is computed from the maximum power level measured within any 1 MHz bandwidth using a power averaging detector. The EIRP in 50 MHz is computed from the maximum power level in a 50 MHz bandwidth centered on the frequency at which the maximum average power level is realized and this 50 MHz bandwidth must be contained within the authorized operating bandwidth. The emission limits re based on boresight measurements (i.e. measurements performed within the main beam of the antenna).		
Measurement procedure:	Bandwidth Measurements (6.1)		

Comment:	See pots in Annex B.3 for details
Date of test:	2020-01-13
Test site:	Fully anechoic room, cabin no. 2

Peak Emission (dBm)	*Peak Limit(dBm)*	*Average emission (dBm)*	*Average limit (dBm)*
20.52	34.0	-16.05	-3.0

Test Result:	Test passed

7.5 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.209 ISED RSS-GEN Issue 5, sections 8.9 and 8.10			
Guide:	ANSI C63.10			
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance d (meters)
	0.009 - 0.490	2400/F(kHz)	67.6 - 20 · log(F(kHz))	300
	0.490 - 1.705	24000/F(kHz)	87.6 - 20 · log(F(kHz))	30
	1.705 - 30.000	30	29.5	30
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.			
Measurement procedure:	Radiated Emission Measurement 9 kHz to 30 MHz (6.2)			

Comment:	Presan, no emissions detected.
	For plot see Annex B.4
Date of test:	2019-11-22
Test site:	Cabin No. 2

Test Result:	Test passed

Sample calculation of final values:

Extrapolation Factor (dB) = (Log(d) - Log(d_1)) · Extrapolation Factor (dB/decade)

Final Value (dBµV/m) = Reading Value d_1 (dBµV) + Correction Factor (dB/m) + Extrapolation Factor (dB) + Pulse Train Correction (dB)

Note: Extrapolation factor (dB) and final value (dBµV/m) are relating to distance d.

7.6 Radiated Emission Measurement 30 MHz to 200 GHz

Rules and specifications:	CFR 47 Part 15, section 15.209 ISED RSS-GEN Issue 5, section 8.9		
Guide:	ANSI C63.10		
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
	30 - 88	100	40.0
	88 - 216	150	43.5
	216 - 960	200	46.0
	Above 960	500	54.0
	Additionally, the level of any unwanted emissions shall not exceed the level of the fundamental emission.		
Measurement procedures:	Radiated Emission in Fully or Semi Anechoic Room (6.3) Radiated Emission at Alternative Test Site (6.4)		

Comment:	For plot see Annex B.4
Date of test:	2019-11-20 to 2020-01-22
Test site:	Semi-anechoic room, cabin no. 8
Test distance:	Frequencies ≤ 8.2 GHz: 3 m Frequencies > 8.2 GHz, ≤ 18 GHz: 1 m Frequencies > 18 GHz, ≤ 60 GHz: 0.5 m Frequencies > 60 GHz, ≤ 90 GHz: 0.25 m Frequencies > 90 GHz: 0.1 m

Test Result:	Test passed

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV) + Correction Factor (dB/m) + Pulse Train Correction (dB)

Frequency (MHz)	Antenna Polarization	Detector	Receiver Reading (dBµV)	Correction Factor (dB/m)	Pulse Train Correction (dB)	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30,060	vertical	Quasi-Peak	3,8	18,6		22,4	40,0	17,6
3996,000	vertical	Peak	15,0	37,9		52,9	74,0	21,2
3996,000	vertical	Average	2,1	37,9		40,0	54,0	14,0
7771,750	vertical	Peak	21,1	43,4		64,5	74,0	9,5
7771,750	vertical	Average	8,1	43,4		51,5	54,0	**2,5**
9659,000	horizontal	Peak	14,7	45,0		59,7	74,0	14,4
9659,000	horizontal	Average	1,1	45,0		46,1	54,0	7,9
12776,750	vertical	Peak	15,4	47,5		62,9	74,0	11,1
12776,750	vertical	Average	2,0	47,5		49,5	54,0	4,6
12777,500	vertical	Peak	15,0	47,5		62,5	74,0	11,5
12777,500	vertical	Average	1,7	47,5		49,2	54,0	4,8
17567,000	vertical	Average	1,7	54,4		56,1	63,5	7,4

7.7 RF Exposure Requirement

Rules and specifications:	CFR 47 Part 1, section 1.1307(b)(1)
Guide:	OET Bulletin 65, Edition 97-01
Limits	Limits for general population / uncontrolled exposure:

Frequency Range (MHz)	*Electric Field Strength (V/m)*	*Magnetic Field Strength (A/m)*	*Power Density (mW/cm²)*	*Averaging Time (min)*
0.3 – 1.34	614	1.63	100 *	30
1.34 – 30	824/f	2.19 / f	180 / f *	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	---	---	f / 1500	30
1500 - 100000	---	---	1.0	30

f = Frequency in MHz

* Plane wave equivalent power density

Worst-case-duty-cylce as declared by applicant: 0.0000171 = 0.00171 %
FMCW ramp duration: 1.024 ms
Maximum one pulse per minute: 60 s

Prediction:[8]	$S = PG / (4 \pi R^2)$
Where:	S: Power density P: Power input into antenna G: Power gain of the antenna relative to an isotropic radiator R: Distance to the center of radiation of the antenna
Maximum output power:	P = 112.72 mW · 0.0000171 = 1.928 µW
Antenna gain:	G: Not applicable
Prediction distance	R = 4.5 cm (declared by applicant)
Power density at 20 cm:	$S = 7.57 \cdot 10^{-6}$ mW/cm²
Limit	S_{lim} = 1.0 mW/cm²

Test Result:	Test passed

[8] MPE Prediction of MPE according to equation from page 19 of OET Bulletin 65, Ed. 97-01

7.8 Exposure of Humans to RF Fields

Rules and specifications:	ISED RSS-Gen Issue 5, section 3.2
Guide:	ISED RSS-102 Issue 5, section 2.5

Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: CP = **..... W**			☐	
The effective isotropic radiated power (EIRP in watts) is calculated using				
☐ the numerical antenna gain: G = **.....**		☐		
$EIRP = G \cdot CP \Rightarrow EIRP$ = **..... W**				
☐ the field strength[9] in V/m: FS = **..... V/m**			☐	
$EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP$ = **..... W**				
with:				
Distance between the antennas in m: D = **..... m**			☐	
☒ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in watts) given by[9]:				
Duty cycle / *EIRP (dBm) PK* / *EIRP (mW)*: 0.0000171 / 20.52 dBm / 112.72 mW · 0.0000171 = 1.928 µW			☒	
Selection of output power				
The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.): TP = **1.928 µW**				

Worst-case-duty-cylce as declared by applicant: 0.0000171 = 0.00171 %
FMCW ramp duration: 1.024 ms
Maximum one pulse per minute: 60 s

[9] The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses.
If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.

Exposure of Humans to RF Fields (continued)		Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is					
☒ less than or equal to 20 cm	☐ greater than 20 cm		☒		
Transmitting device is					
☐ in the vicinity of the human head	☐ body-worn		☐		

SAR evaluation					
SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required. For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.					
Frequency (MHz)	Exemption limits (mW)[10] at separation distance of				
	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥50 mm
≤300 [11]	71	101	132	162	193	223	254	284	315	345
450	52	70	88	106	123	141	159	177	195	213
835	17	30	42	55	67	80	92	105	117	130
1900	7	10	18	34	60	99	153	225	316	431
2450	4	7	15	30	52	83	123	173	235	309
3500	2	6	16	32	55	86	124	170	225	290
5800	1	6	15	27	41	56	71	85	97	106
Carrier frequency:			f	=	**75 GHz – 85 GHz**					
Distance:			d	=	**45 mm**					
Transmitter output power:			TP	=	**1.928 µW**					
Limit:			TP_{limit}	=	**97 mW**					☒
☐ SAR evaluation is documented in test report no.										

Test Result:	Test passed

[10] The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separaton distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from alinear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from athird order polynomial fit.

[11] Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.

Exposure of Humans to RF Fields (continued)	Applicable	Declared by applicant	Measured	Exemption
RF exposure evaluation				
RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows: ☐ below 20 MHz[12] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance). ☐ between 3 kHz and 10 MHz exposure limits apply as following: ☐ In a uncontrolled environment the basic restriction for the instantaneous internal electric field strength is equal to or less than $2.7 \cdot 10\text{-}4\ f$ V/m_{rms} at any part of the body where *f* is in Hz. The instantaneous RF field strength is equal or less than 83 V/m_{rms} and equal or less than 90 A/m_{rms}. ☐ In a controlled environment the basic restriction for the instantaneous internal electric field strength is equal to or less than $1.35 \cdot 10\text{-}4\ f$ V/m_{rms} at any part of the body where *f* is in Hz. The instantaneous RF field strength is equal or less than 170 V/m_{rms} and equal or less than 180 A/m_{rms}. ☐ at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4{,}49/f^{0.5}$ W (adjusted for tune-up tolerance, where *f* is in MHz. ☐ at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance). ☐ at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \cdot 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where *f* is in MHz. ☐ at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance). In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.				
Carrier frequency: f = Transmitter output power: TP = Limit: TP_{limit} =				☐
☐ RF exposure evaluation is documented in test report no.				

[12] Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine RF Exposure evaluation, shall demostrate compilance tot he instanteneous limits in IC RSS-102, issue 5, section 4.

8 Referenced Regulations

All tests were performed with reference to the following regulations and standards:

☒	CFR 47 Part 2	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)	October 1, 2019
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2019
☐	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	June 13, 2014 (published on June 20, 2014)
☒	ANSI C63.10	American national Standard of Procedures for Compilance Testing of Unlicensed Wireless Devices	June 27, 2013 (published on September 13, 2013)
☒	RSS-Gen	Radio Standards Specification RSS-Gen Issue 5 containing General Requirements for Compilance of Radio Apparatus, published by Industry Canada	March 2019
☒	RSS-210	Radio Standards Specification RSS-210 Issue 9 for Licence-Exempt Radio Apparatus: Category I Equipment, published by Industry Canada	August 2016
☐	RSS-310	Radio Standards Specification RSS-310 Issue 3 for Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment, published by Industry Canada	December 2010
☒	RSS-102	Radio Standards Specification RSS-102 Issue 5: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), published by Industry Canada	March 2015
☐	ICES-003	Interference-Causing Equipment Standard ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement, published by Industry Canada	January 2016
☒	CISPR 22	Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, “Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement”	1997
☐	CAN/CSA CISPR 22-10	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (Adopted IEC CISPR 22:2008, sixth edition, 2008-09)	2010

☒	TRC-43	Designation of Emissions, Class of Station and Nature of Service, published by Industry Canada	November 2012

9 Test Equipment List with Calibration Data

Type	*Inv.-No.*	*Type Designation*	*Serial Number*	*Manufacturer*	*Calibration Organization*	*Last Calibration*	*Next Calibration*
EMI test receiver	28268	ESW44	101814	Rohde & Schwarz	Rohde & Schwarz	2019-02	2020-02
Spectrum analyser	1666	FSP30	100063	Rohde & Schwarz	Rohde & Schwarz	2019-02	2020-08
Spectrum analyser	2364	FSV40	101448	Rohde & Schwarz	Rohde & Schwarz	2019-01	2020-01
Double ridged horn antenna	40089	HF907	102777	Rohde & Schwarz	Rohde & Schwarz	2019-02	2021-02
Horn antenna	1014	3160-07	9112-1008	EMCO Elektronik	See note 3		
Horn antenna	1015	3160-08	9112-1002	EMCO Elektronik	See note 3		
Horn antenna	1265	3160-09	9403-1025 (931941-010)	EMCO Elektronik	See note 3		
Horn antenna	1575	3160-10	399185	EMCO Elektronik	See note 3		
Horn antenna	2086	24240-20	157845	Flann	See note 3		
Horn antenna	27898	25240-20	249763	Flann	See note 3		
Horn antenna	27899	27240-20	244048	Flann	See note 3		
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	2019-12	2020-12
TRILOG Broadband Antenna	20116	VULB 9162	9162-048	Schwarzbeck	Rohde & Schwarz	2019-01	2022-01
Waveguide mixer	25849	FS-Z60	100177	Rohde & Schwarz	Rohde & Schwarz	2017-04	2020-01
Waveguide mixer	25850	FS-Z90	101610	Rohde & Schwarz	Rohde & Schwarz	2016-12	2020-01
Waveguide mixer	25851	FS-Z110	101464	Rohde & Schwarz	Rohde & Schwarz	2016-11	2020-01
Waveguide mixer	22553	FS-Z170	100953	Rohde & Schwarz	Rohde & Schwarz	2016-08	2020-01
Waveguide mixer	25854	FS-Z220	100965	Rohde & Schwarz	Rohde & Schwarz	2018-03	2020-01

Note 1: No calibration required.
Note 2: Not calibrated separately but with the whole test system when recording calibration data.
Note 3: No calibration required. Devices are checked before use.
Note 4: No calibration required. Devices are checked by calibrated equipment during test.

10 Measurement Uncertainty

Radio Testing			
Test	k_p	*Expanded Uncer-tainty*	*Note*
Occupied Bandwidth	2.0	±1.14 %	2
RF-Frequency error	1.96	$\pm 1 \cdot 10^{-7}$	7
RF-Power, conducted carrier	2	±0.079 dB	2
RF-Power uncertainty for given BER	1.96	+0.94 dB / -1.05	7
RF power, conducted, spurious emissions	1.96	+1.4 dB / -1.6 dB	7
RF power, radiated			
25 MHz – 4 GHz	1.96	+3.6 dB / -5.2 dB	8
1 GHz – 18 GHz	1.96	+3.8 dB / -5.6 dB	8
18 GHz – 26.5 GHz	1.96	+3.4 dB / -4.5 dB	8
40 GHz – 170 GHz	1.96	+4.2 dB / -7.1 dB	8
Spectral Power Density, conducted	2.0	±0.53 dB	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	±2,89 %	2
6 kHz – 25 kHz	2	±0.2 dB	2
Maximum frequency deviation for FM	2	±2,89 %	2
Adjacent channel power 25 MHz – 1 GHz	2	±2.31 %	2
Temperature	2	±0.39 K	4
(Relative) Humidity	2	±2.28 %	2
DC- and low frequency AC voltage			
DC voltage	2	±0.01 %	2
AC voltage up to 1 kHz	2	±1.2 %	2
Time	2	±0.6 %	2

Radio Interference Emission Testing			
Test	k_p	*Expanded Uncer-tainty*	*Note*
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1

Radio Interference Emission Testing (continued)			
Test	k_p	*Expanded Uncer-tainty*	*Note*
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Immunity Testing			
Test	k_p	*Expanded Uncer-tainty*	*Note*
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Note 1:
The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%

Note 2:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%

Note 3:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2.05, providing a level of confidence of p = 95.45%

Note 4:
It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95%confidence.

Note 5:
The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%

Note 6:
The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%

Note 7:
The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) to is based on a standard uncertainty multiplied by a coverage factor of k_p = 1.96, providing a level of confidence of p = 95.45%

Note 8:
The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96, providing a level of confidence of p = 95.45%

11 Revision History

Revision History			
Edition	*Date*	*Issued by*	*Modifications*
1	2020-01-14	M. Steindl	First Edition
2	2020-02-13	M. Steindl	Corrected typo in type designation Extracted photos of test setups in to Annex A Extracted plots taken during test in to Annex B Added antenna diagrams as provided by applicant in to Annex C.