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April 30, 2019

Page 1 of 25

Prüfbericht / Test Report

Nr. / No. TR-72654-33448-03 (Edition 1)

Applicant: Siemens AG
Type of equipment: RFID Reader, 13.56 MHz
Type designation: SIMATIC RF340R
Order No.: ---
Test standards: FCC Code of Federal Regulations,
CFR 47, Part 15,
Sections 15.205, 15.207, 15.215 and 15.225

Industry Canada Radio Standards Specifications
RSS-GEN Issue 5, Sections 8.8, 8.9 and 8.10 and
RSS-210 Issue 9, Section B.6 (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.



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1 Description of the Equipment Under Test (EUT)

General data of EUT

Type designation ¹ :	SIMATIC RF340R
Parts ² :	
Serial number(s):	---
Manufacturer:	Siemens AG Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany
Type of equipment:	RFID Reader, 13.56 MHz
Version (HW / SW):	As received
FCC ID:	---
Industry Canada ID:	---
Additional parts/accessories:	

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.

Technical data of EUT	
Application frequency range:	13.11 MHz - 14.01 MHz
Frequency range:	13.553 MHz – 13.567 MHz
Operating frequency:	13.56 MHz
Type of modulation:	---
Pulse train:	---
Pulse width:	---
Number of RF-channels:	1
Channel spacing:	---
Designation of emissions ³ :	---
Type of antenna:	Integrated on printed board
Size/length of antenna:	14 cm x 6 cm
Connection of antenna:	☐ detachable ☒ not detachable

³ Also known as "Class of Emission".

2 Administrative Data

Application details

Applicant (full address):	Siemens AG Gleiwitzer Str. 555 90475 Nürnberg Germany
Contact person:	Mr. Bernd Hennig
Order number:	---
Receipt of EUT:	2018-05-07
Date(s) of test:	2018-05-07 to 2018-07-03
Note(s):	---

Report details

Report number:	TR-72654-33448-03
Edition:	3
Issue date:	April 30, 2019

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 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 complies with the requirements set forth in the

Code of Federal Regulations CFR 47, Part 15, Sections 15.207 and 15.209

of the Federal Communication Commission (FCC) and the

Radio Standards Specifications

RSS-GEN Issue 5, Sections 8.9 and 8.10 and

RSS-210 Issue 9, Section , B.6 (Category I Equipment)

of Industry Canada (IC).

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	Prüfergebnis / Test Result
April 30, 2019	 Karl Roidt Responsible for testing	 Markus Biberger Reviewer	☒ Erfüllt / Passed ☐ Nicht erfüllt / Not passed

5 Operation Mode and Configuration of EUT

Operation Mode(s)

Reading tag continuously

Configuration(s) of EUT

The EUT was configured as stand alone device

List of ports and cables

Port	Description	Classification ⁴	Cable type	Cable length
1	Serial interface (with DC)	signal/control port	Shielded	4 m

List of devices connected to EUT

Item	Description	Type Designation	Serial no. or ID	Manufacturer
1	Testsetup			Siemens AG

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) IC RSS-GEN Issue 5, section 6.6 IC RSS-210 Issue 9, section A.1.3 ANSI C63.10, section 6.9.1
Guide:	ANSI C63.10 / IC RSS-GEN Issue 5, section 6.6
Measurement setup:	☐ Conducted: See below ☒ Radiated: Radiated Emission Measurement 9 kHz to 30 MHz (6.2)
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, 15.215(b) and 15.225(a)-(d)
IC RSS-GEN Issue 5, sections 8.9 and 8.10 and
IC RSS-210 Issue 9, section B.6

Guide: ANSI C63.10

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.

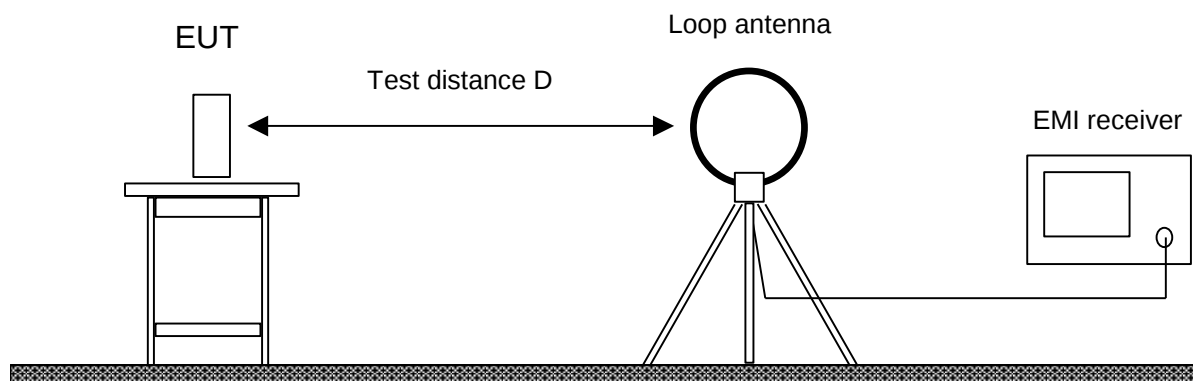
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

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	ESR7	22643	101713	Rohde & Schwarz
☒ EMI test receiver	ESW26	28268	101315	Rohde & Schwarz
☐ EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
☒ Loop antenna	HFH2-Z2	1016	882964/1	Rohde & Schwarz
☐ 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
☒ Semi anechoic room	No. 8	2057	---	Albatross
☒ Measurement Software	EMC32_K8 V9.25.01	1852	100016	Rohde & Schwarz
☒ Measurement Software	EMC32_K8 V10.20.01	1852	100016	Rohde & Schwarz
Note: Tests in July 2017 were performed with ESW26 and EMC32_K8 V10.20.01 software.				

6.3 Radiated Emission at Alternative Test Site

Measurement Procedure:

Rules and specifications:	CFR 47 Part 15, sections 15.205(b) and 15.225(d) IC RSS-GEN Issue 5, sections 8.9 and 8.10(b)(c) and IC RSS-210 Issue 9, section B.6
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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.

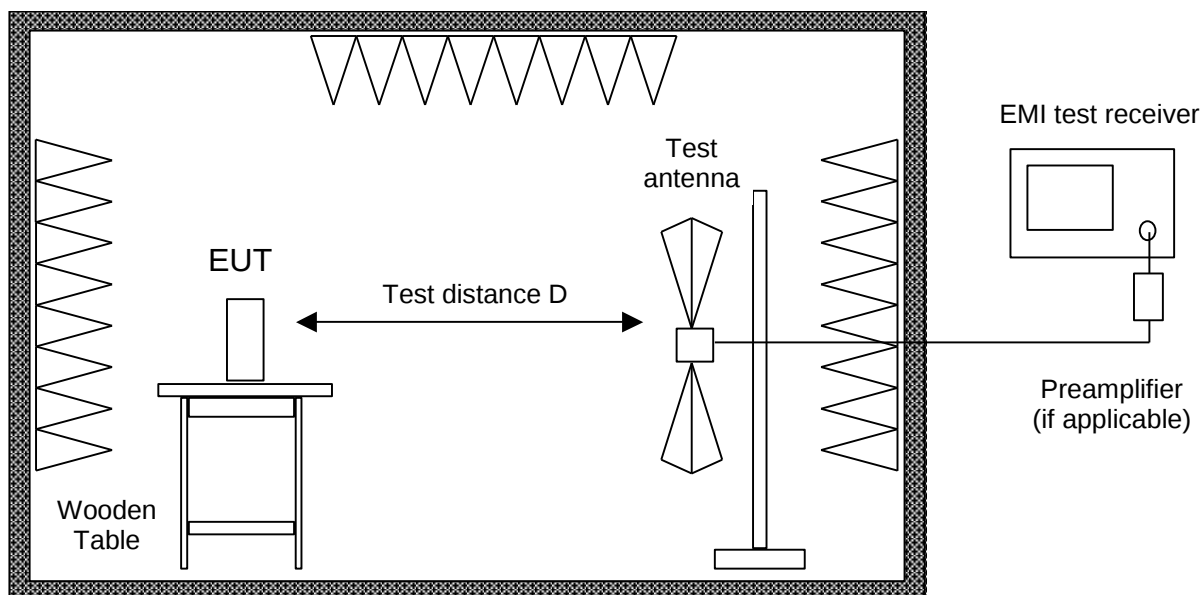
With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

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 discharged 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)

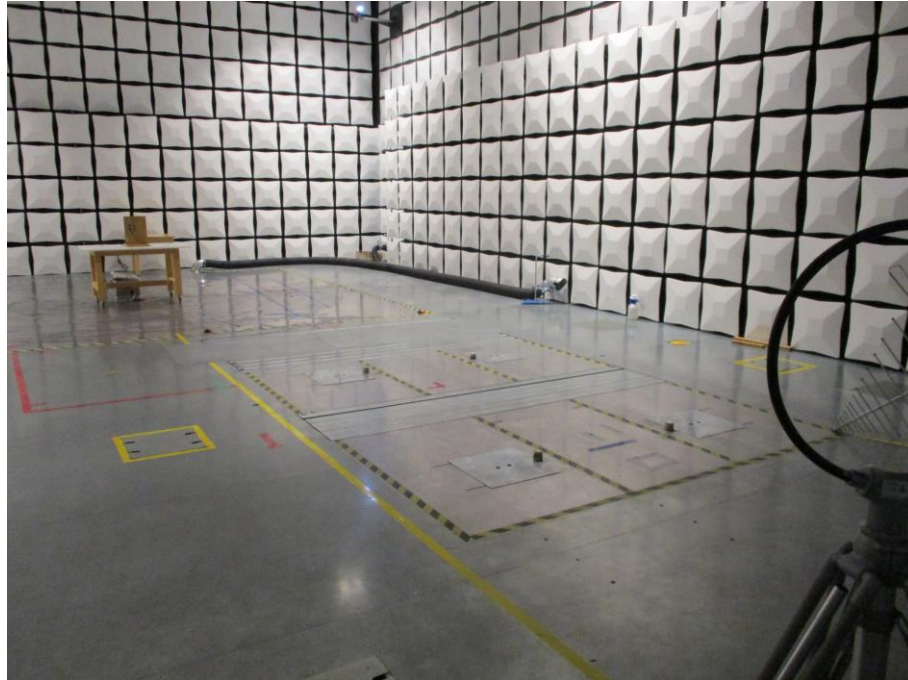
Test instruments used:

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
☐ EMI test receiver	ESU8	2044	100232	Rohde & Schwarz
☐ EMI test receiver	ESR7	22643	101713	Rohde & Schwarz
☒ EMI test receiver	ESW26	28268	101315	Rohde & Schwarz
☒ Trilog antenna Cabin no. 8	VULB 9163	2058	9163-408	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
☒ Semi anechoic room	No. 8	2057	---	Albatross
☒ Measurement Software	EMC32_K8 V9.25.00	1852	100016	Rohde & Schwarz
☒ Measurement Software	EMC32_K8 V10.20.01	1852	100016	Rohde & Schwarz

Note: Tests in July 2017 were performed with ESW26 and EMC32_K8 V10.20.01 software.

7 Photographs Taken During Testing

Test setup for radiated emission measurement 9 kHz – 30 MHz



Test setup for radiated emission measurement (alternate test site)



8 Test Results

FCC CFR 47 Parts 2 and 15			
Section(s)	Test	Page	Result
15.205(b) 15.215(b) 15.225(a)(d)	Radiated emission 9 kHz to 30 MHz	18	Test passed
15.205(b) 15.225(d)	Radiated emission 30 MHz to 1 GHz	20	Test passed

8.1 Radiated Emission Measurement 9 kHz to 30 MHz

Rules and specifications:	CFR 47 Part 15, sections 15.205 and 15.225(a)-(d) IC RSS-GEN Issue 5, sections 8.9 and 8.10(b)(c) and IC RSS-210 Issue 9, section B.6			
Guide:	ANSI C63.10			
Limit:	Frequency of Emission (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	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 - 13.110	30	29.5	30
	13.110 - 13.410	106	40.5	30
	13.410 - 13.553	334	50.5	30
	13.553 - 13.567	15848	84.0	30
	13.567 - 13.710	334	50.5	30
	13.710 - 14.010	106	40.5	30
	14.010 - 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)			

Test Result:	Test passed
--------------	-------------

Sample calculation of final values:

$$\text{Extrapolation Factor (dB)} = (\text{Log}(d) - \text{Log}(d_1)) \cdot \text{Extrapolation Factor (dB/decade)}$$

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value } d_1 \text{ (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Extrapolation Factor (dB)} + \text{Pulse Train Correction (dB)}$$

Note: Extrapolation factor (dB) and final value (dB $\mu\text{V/m}$) are relating to distance d.

Comment:	Transmitting continuously
Date of test:	2018-07-03
Test site:	Semi-anechoic room, cabin no. 8

Extrapolation factor: -40 dB/decade										
Frequency (MHz)	Detector	Distance		Reading Value (dBµV)	Correction Factor (dB/m)	Extrapolation Factor (dB)	Pulse Train Correction (dB)	Final Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
		d1 (m)	d (m)							
13,56000	Quasi-Peak	10	30	29,9	20,0	-19,1		30,8	84,0	53,2

8.2 Radiated Emission Measurement 30 MHz to 1 GHz

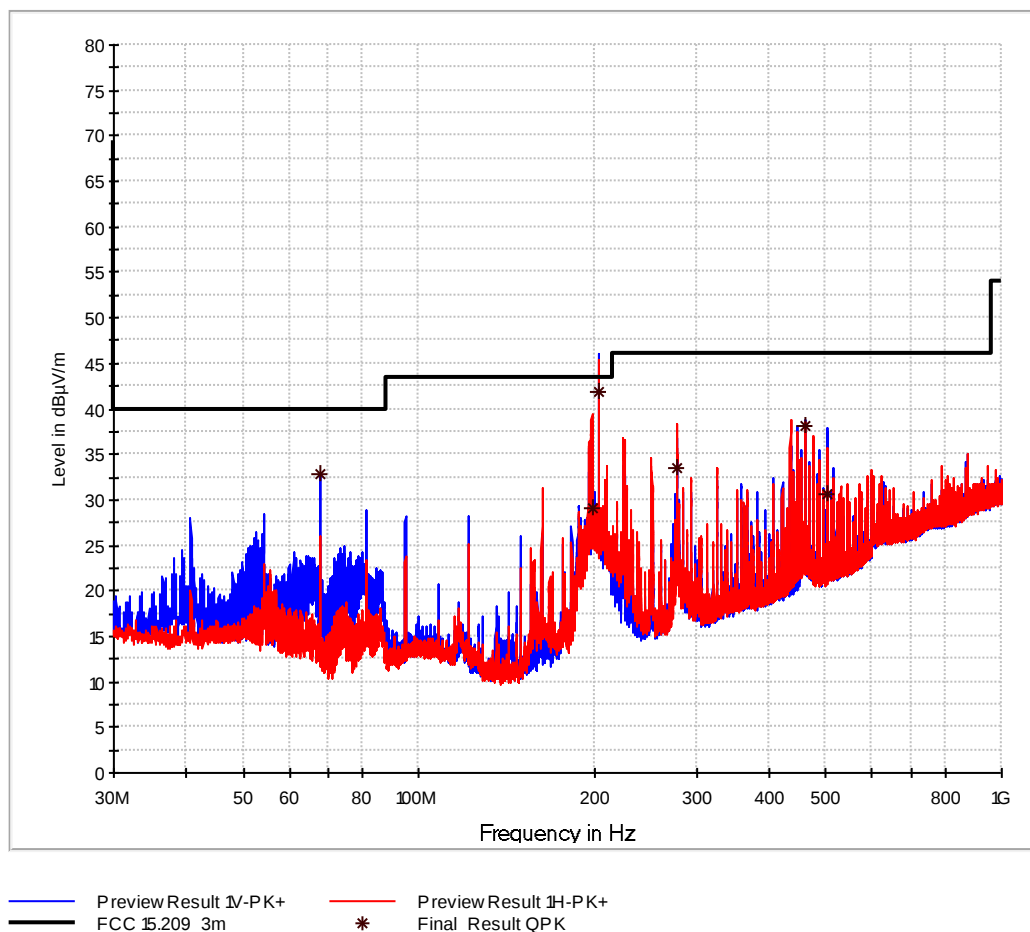
Rules and specifications:	CFR 47 Part 15, sections 15.205(b) and 15.225(d) IC RSS-GEN Issue 5, sections 8.9 and 8.10(b)(c) and IC RSS-210 Issue 9, section B.6		
Guide:	ANSI C63.10		
Limit:	Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
	30 - 88	100	40.0
	88 - 216	150	43.5
	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 at Alternative Test Site (6.3)		

Test Result:	Test passed
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Sample calculation of final values:

$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + \text{Correction Factor (dB/m)} + \text{Pulse Train Correction (dB)}$$

Comment:	Transmitting continuously	
Date of test:	2018-05-07	
Test site:	Semi-anechoic room, cabin no. 8	
Test distance:	Frequencies ≤ 8.2 GHz:	3 meters
	Frequencies > 8.2 GHz:	1 meter



Final Results 1:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
67,800000	32,90	40,00	7,10	1000,0	120,000	150,0	V	-142,0	10,2
198,400000	29,00	43,50	14,50	1000,0	120,000	109,0	H	-124,0	12,5
203,400000	41,89	43,50	1,61	1000,0	120,000	109,0	V	-18,0	12,6
278,190000	33,50	46,00	12,50	1000,0	120,000	100,0	H	-132,0	15,0
461,010000	38,21	46,00	7,79	1000,0	120,000	100,0	V	-91,0	19,0
501,690000	30,63	46,00	15,37	1000,0	120,000	149,0	V	-19,0	20,0

9 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, 2016
☒	CFR 47 Part 15	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)	October 1, 2016
☐	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 Compliance 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 Compliance of Radio Apparatus, published by Industry Canada	November 2014
☒	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



10 Test Equipment List with Calibration Data

Type	Inv.-No.	Type Designation	Serial Number	Manufacturer	Calibration Organization	Last Calibration	Next Calibration
EMI test receiver	28268	ESW26	101315	Rohde & Schwarz	Rohde & Schwarz	2018/05	2019/05
TRILOG Broadband Antenna	2058	VULB 9163	9163-408	Schwarzbeck	Rohde & Schwarz	2016/07	2018/07
Loop antenna	1016	HFH2-Z2	882964/0001	Rohde & Schwarz	Rohde & Schwarz	2016/07	2018/07
Semi anechoic room	2057	Cabin No. 8	---	Albatross	No cal. req.	No cal. req.	No cal. req.

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.

11 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2018-05-14	Karl Roidt	First Edition
3	2019-04-30	Karl Roidt	Third Edition: RSS-GEN Issue 4 updated to Issue 5