

FCC test report

Electromagnetic compatibility

Product: Smart Drive Panel module
Model: REES Panel

Report number: 20220227RPT01
Report status: Final
Date of report: 2022 July, 1

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The Netherlands
In the capacity of: Manufacturer

Applicant's representative: B. Smits

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1 Conclusion

The Smart Drive Panel module meets the emission limits of an unintentional radiator as described in 47 CFR 15 & ICES-003 (Issue 7), class A digital device.

It is the responsibility of the manufacturer to ensure, that all of the following products are equal to the measured sample. And as such ensure that all manufactured Smart Drive Panel modules are in compliance with the standards as mentioned above.

It is the responsibility of the customer to implement the modifications in a correct way.

1.1 Summary of results

Compliance table

A summary of the test results gained from testing the Smart Drive Panel module is shown in the table below.

Category	Standard	Class / level	Result (Pass / Fail)
Emission	47 CFR 15 & ICES-003 (Issue 7)	A	Pass

Note 1: The test results presented in this report relate only to the tested sample(s).

Note 2: The test results are based on the tested mode of operation(s), the applicable performance criteria and the acceptance criteria as specified by the customer.

Overview of performed tests and measurements

The following table gives a summary of the results of the tests that have been carried out on the Smart Drive Panel module.

Test sequence	Test description	Basic standard	EUT modified during test (yes/no)	Result (Pass/Fail)
2	Conducted emission, test with an AMN	ANSI C63.4 (2014)	No	Pass
1	Radiated emission up to 1 GHz (SAC)	ANSI C63.4 (2014)	No	Pass
--	Radiated emission above 1 GHz (FAC)	ANSI C63.4 (2014)	--	NA

The table below shows details about tests that are not applicable.

Phenomenon	Comment
Radiated emission above 1 GHz (FAR)	The highest frequency of the internal sources of the EUT is less than 108 MHz.

Cross reference table 47 CFR 15 – ICES 003

Test description	Section 47 CFR 15	Section ICES 003
Conducted emission, test with a LISN	15.107	3.2.1
Radiated emission up to 1 GHz (SAC)	15.109	3.2.2
Radiated emission above 1 GHz (FAC)	15.109	3.2.2

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3 General information

Introduction

Kiwa Dare is requested by Ridder Drive Systems B.V., to perform electromagnetic compatibility (EMC) tests.

The objective of the test was to assess the Smart Drive Panel module in accordance with the standards as mentioned in chapter 5 of this report. This report may only be used for this purpose.

At request of Ridder Drive Systems B.V., the EMC tests are carried out in order to find out whether the product complies with 47 CFR 15 of the FCC regulations for computers and other digital devices.

The test sample(s) were received on 2022 June, 20. Testing was performed on 2022 June, 20.

The tests are carried out at our facilities located in Woerden, The Netherlands.

The test results presented in this report relate only to the product tested.

In this report, the sample tested will be referred to as equipment under test (EUT).

This report is in conformity with ISO 17025.

Opinions or interpretations mentioned in this report are excluded from accreditation.

All tests as described in the applied standard(s) are carried out, unless otherwise specified in this report.

Report revision history

Report number	Revision	Date	Remarks
20220227RPT01	1	2022 July, 1	Initial report

Explanation status report

Status	Explanation
Draft	Preliminary unsigned report
Final	Formally signed report, with a final conclusion. Changes in the report will lead to a new report with a new report number.

Possible test case verdicts

Verdict	Clarification
NA or not applicable:	Test does not apply to the EUT
P(ass):	EUT does meet the requirement
F(ail):	EUT does not meet the requirement
U(ndetermined):	Pass or fail could not be established
NR or not requested:	Test is not requested by customer
Compliant:	EUT is compliant with the requirement
Non-compliant:	EUT is not compliant with the requirement

During pass or fail decisions, the measurement uncertainty is not taken into account.

Measurement uncertainties

The reported expanded uncertainty of measurement is based on a standard uncertainty of measurement multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %, but excluding the contribution of the EUT. The expanded uncertainty of measurement has been determined in accordance with EN 55016-4-2.

Test equipment

The instruments used to perform the tests are displayed in the appendix.

4 Standards and test plan

The EUT is assessed against the following requirements.

- Emission : 47 CFR 15 & ICES-003 (Issue 7)
- : KDB Publication 714737
- Test plan : No

If available, a test plan is used as a supplement.

4.1 Test plan deviations

No.

5 EUT details

Purpose, functional and physical description

End stop detection for green house motorised window openers.

General EUT data

EUT details, provided by the client:

Item	Description
Name	Smart Drive Panel module
Manufacturer	Zign Innovations B.V.
Brand	Ridder Drive Systems B.V.
Model number	REES Panel
Serial number	Proto 10
Rating power	4.8W
Rating amperage	200mA
Rating voltage	24 Volt
Rating frequency	50Hz-60Hz
Power supply during test	DC power supply from Zign and 24VAC 60Hz.
Dimensions (LxWxH)	150x100x100mm
Software release	0.12
Hardware release	0_3_0
Environment to be used	Industrial

Other EUT related data

The condition of the EUT during reception was undamaged and fully functional.
The highest generated or used frequency of the EUT is 64MHz.

Equipment authorization

The EUT can be authorized as Supplier's Declaration of Conformity (SDoC).

Test configuration

The EUT is tested as tabletop equipment.
According to the specifications of the EUT, the upper frequency to be measured is 1GHz for Radiated emission.
According to the information of the customer, the class of emission is A.

Interfaces to external objects

The cable connections to EUT and peripheral equipment during testing are displayed in the table below.

Description	Port type	Cable length	Max cable length	Type of cable	Fixing shield	Load at port
Power supply 24VDC	DC supply	20m	250m	Unshielded	NA	EUT
Rees-interface RS485	I/O Communication	20m	250m	Unshielded	NA	RS485 to USB converter
Modbus RS485	I/O Communication	20m	250m	Unshielded	NA	RS485 to USB converter
Expansion interface RS485	I/O Communication	20m	250m	Unshielded	NA	RS485 to USB converter
5 relay outputs	I/O Communication	20m	250m	Unshielded	NA	Digital input of EUT monitoring setup outside anechoic chamber
2 climate interface digital input	I/O Communication	--	--	--	--	--

The maximum cable length is specified by the customer. It is the responsibility of the customer to clearly indicate in the user- or installation manual or on the product that the cable length must never be exceeded.

6 Operating conditions during test

Mode(s) of operation

The test mode(s) during testing were defined as:

Mode of operation	Description
Mode 1	All internal hardware circuits and all external and internal interfaces are activated and polled in a continuous, sequential manner.

The applicant's representative was present to witness the testing.

The appendix of this report shows photos of the test configuration during the tests.

Test considerations

Device can handle either 24 VAC or 24 VDC on its power input. After pre-scans at both 24 VAC and 24 VDC, tests were performed at 24 VAC.

7 Measurement software

The measurement software during testing was Raditeq Radimation version 2022.1.2.

8 Emission measurement results

8.1 Conducted emission, test with an AMN

Test method

The conducted emission tests at the supply port are carried out by means of a "line impedance stabilization network" (LISN). The tests are recorded with a spectrum analyzer / EMI receiver. The tests are carried out in accordance with the applied standard(s) (see chapter 5) and the basic standard ANSI_C63_4, where the first standard takes precedence. The measured value is calculated by the following formula:

$$V = V_r + a_c + F_{AMN}$$

Where:

- V = conducted disturbance level (measured value) [dB μ V]
- V_r = receiver indication (receiver reading) [dB μ V]
- a_c = cable loss (coax cable) [dB]
- F_{AMN} = artificial mains network loss (LISN) (LISN insertion loss) [dB]

Measurement uncertainty

The measurement uncertainty during testing is displayed in the table below.

Frequency	U (log)
9 kHz – 150 kHz (measurement at EUT port LISN)	± 4.1 dB
150 kHz – 30 MHz (measurement at EUT port LISN)	± 3.8 dB
150 kHz – 30 MHz (measurement with extension cord)	± 4.2 dB

Requirements

The requirements according 47CFR15 and ICES-003 are laid down in the table below.

Frequency band	QP limit class A	AV limit class A	QP limit class B	AV limit class B
150 kHz - 500 kHz	79 dB μ V	66 dB μ V	66-56 ¹ dB μ V	56-46 ¹ dB μ V
500 kHz - 5 MHz	73 dB μ V	60 dB μ V	56 dB μ V	46 dB μ V
5 MHz - 30 MHz	73 dB μ V	60 dB μ V	60 dB μ V	50 dB μ V

¹ Decreasing linear with log of frequency.

Measurement results

Conducted emission LISN 150 kHz to 30 MHz

Project number: 20220227

Test ID: 7

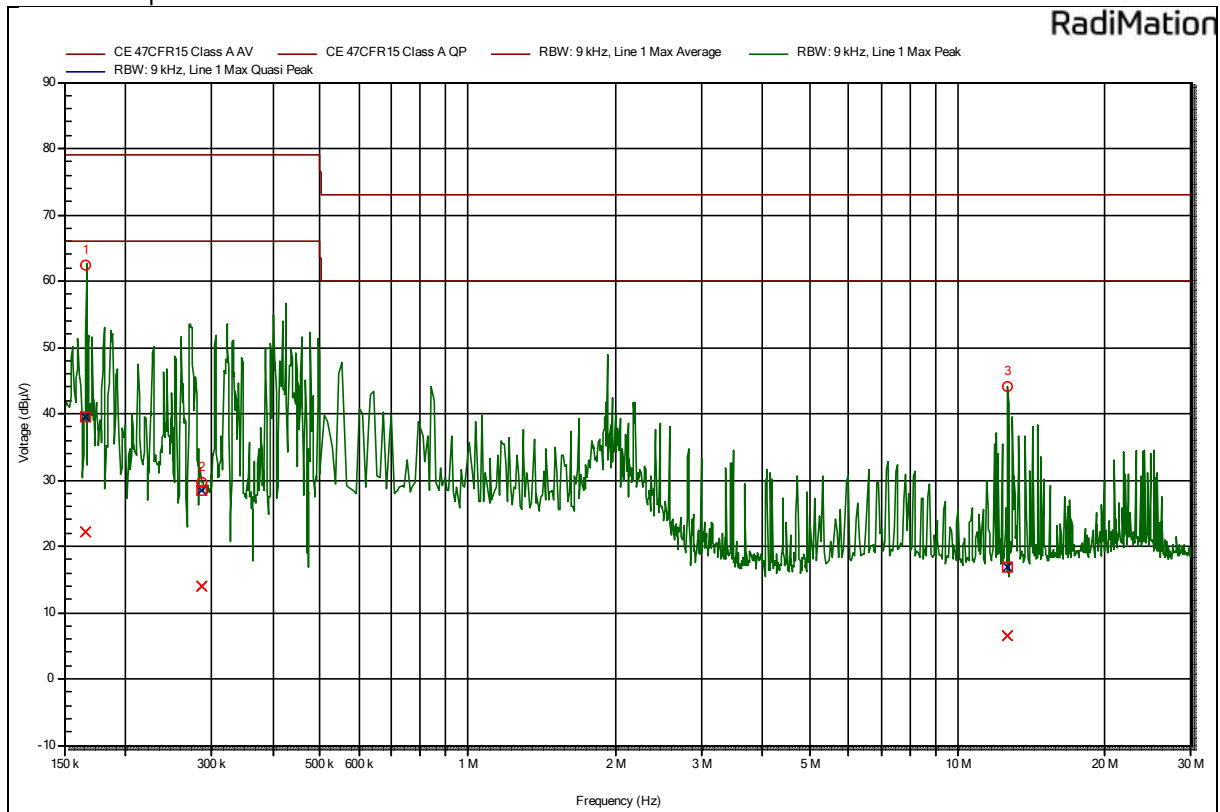
Resolution 9 kHz

Video bandwidth: 1 MHz

bandwidth:

line: Line 1

Mode of operation: Mode 1



Detected peaks

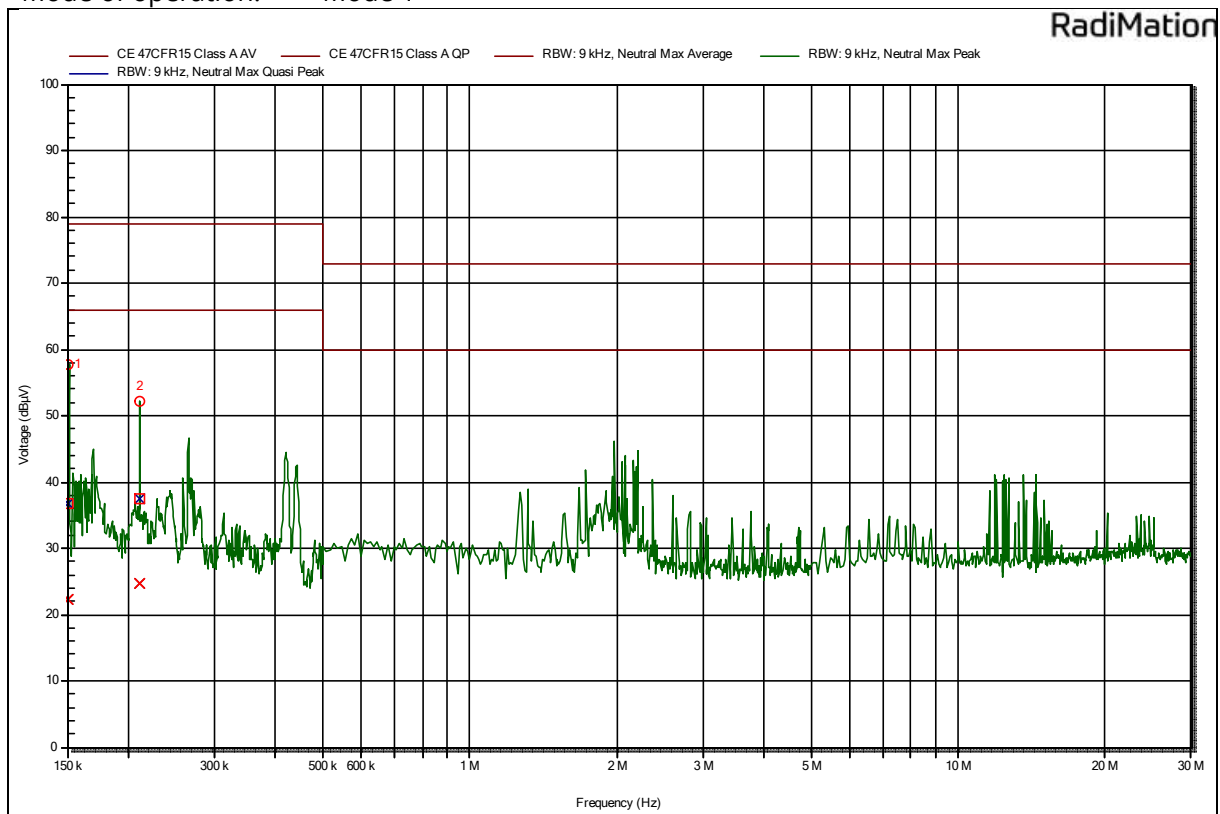
Peak Number	Frequency (MHz)	Quasi-Peak (dBμV)	Quasi-Peak Limit (dBμV)	Average (dBμV)	Average Limit (dBμV)	Status
1	0.166	39.4	79	22.1	66	Pass
2	0.287	28.4	79	14.1	66	Pass
3	12.67	16.8	73	6.5	60	Pass

Remarks

Pass.

Conducted emission LISN 150 kHz to 30 MHz

Project number: 20220227 Test ID: 8
Resolution 9 kHz Video bandwidth: 1 MHz
bandwidth:
line: Neutral
Mode of operation: Mode 1



Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBμV)	Quasi-Peak Limit (dBμV)	Average (dBμV)	Average Limit (dBμV)	Status
1	0.151	36.9	79	22.2	66	Pass
2	0.211	37.5	79	24.8	66	Pass

Remarks

Pass

8.2 Radiated emission up to 1 GHz (SAC)

Test method

The radiated emission tests are carried out in a semi anechoic chamber (SAC). The tests are recorded with a spectrum analyzer / EMI receiver. The test method is in accordance with the applied standard(s) (see chapter 5) and with the basic standard ANSI_C63_4 and paragraph 15.31 (f) (1) of 47 CFR 15 & ICES-003 (Issue 7), where the first standard takes precedence. The measured value is calculated by the following formula:

$$E = V_r + a_c + F_a$$

Where:

- E = field strength (measured value) [dB μ V/m]
- Vr = receiver indication (receiver reading) [dB μ V]
- ac = cable loss (coax cable) [dB]
- Fa = antenna factor (antenna) [dB/m]

Measurement uncertainty

The measurement uncertainty during testing is displayed in the table below.

Frequency	U (log)
30 MHz – 200 MHz vertical	± 4.9 dB
30 MHz – 200 MHz horizontal	± 4.8 dB
200 MHz – 1000 MHz vertical	± 6.4 dB
200 MHz – 1000 MHz horizontal	± 5.4 dB

Requirements

The requirements according 47CFR15 are laid down in the table below.

Frequency band	QP class A @ 3m	QP class A @ 10m	QP class B @ 3m	QP class B @ 10m
30 MHz - 88 MHz	49,5 dB μ V/m 300 μ V/m	39.1 dB μ V/m 90 μ V/m	40 dB μ V/m 100 μ V/m	29.5 dB μ V/m 30 μ V/m
88 MHz - 216 MHz	54 dB μ V/m 500 μ V/m	43.5 dB μ V/m 150 μ V/m	43,5 dB μ V/m 150 μ V/m	33.1 dB μ V/m 45 μ V/m
216 MHz – 960 MHz	56,9 dB μ V/m 700 μ V/m	46.4 dB μ V/m 210 μ V/m	46 dB μ V/m 200 μ V/m	35.6 dB μ V/m 60 μ V/m
960 MHz – 1 GHz	60 dB μ V/m 1000 μ V/m	49.5 dB μ V/m 300 μ V/m	54 dB μ V/m 500 μ V/m	43.5 dB μ V/m 150 μ V/m

The requirements according to ICES-003 are laid down in the table below.

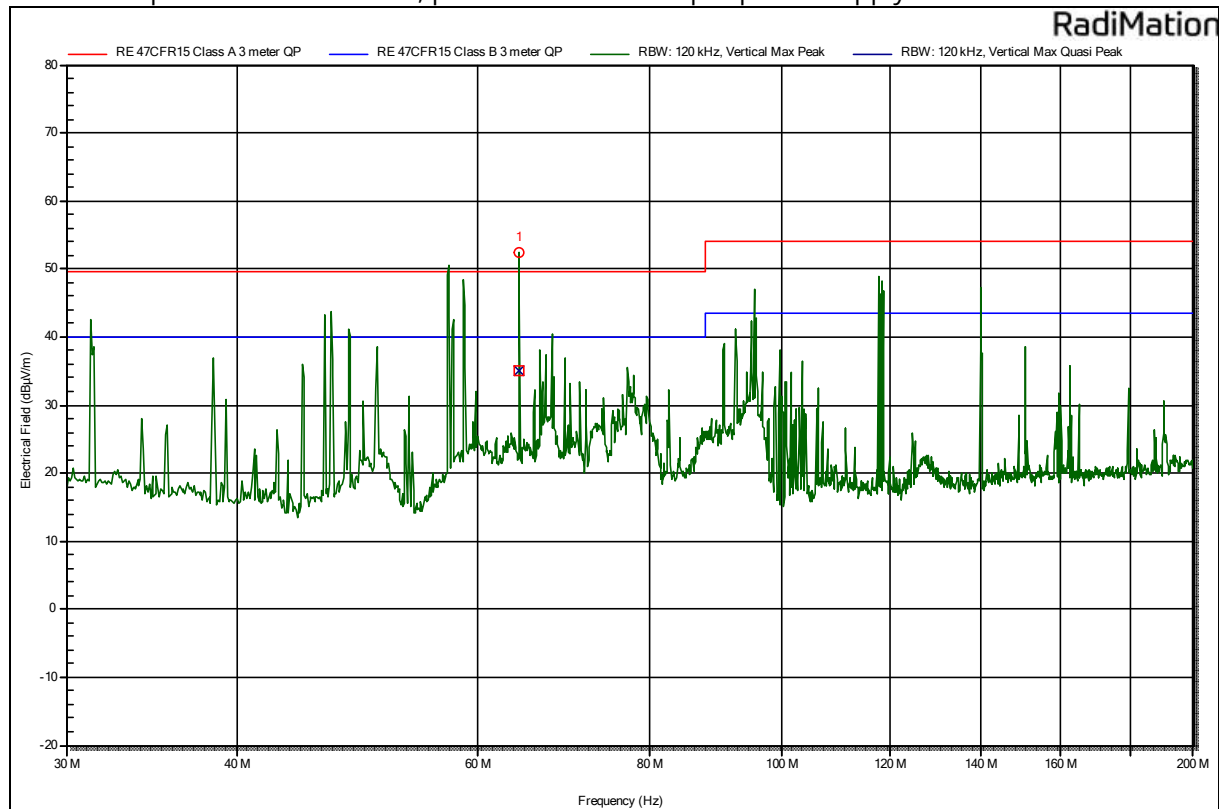
Frequency band	QP class A @ 3m	QP class A @ 10m	QP class B @ 3m	QP class B @ 10m
30 MHz - 88 MHz	50 dB μ V/m	40 dB μ V/m	40 dB μ V/m	30 dB μ V/m
88 MHz - 216 MHz	54 dB μ V/m	43.5 dB μ V/m	43,5 dB μ V/m	33.1 dB μ V/m
216 MHz - 230 MHz	56.9 dB μ V/m	46.4 dB μ V/m	46 dB μ V/m	35.6 dB μ V/m
230 MHz - 960 MHz	57 dB μ V/m	47 dB μ V/m	47 dB μ V/m	37 dB μ V/m
960 MHz - 1 GHz	60 dB μ V/m	49.5 dB μ V/m	54 dB μ V/m	43.5 dB μ V/m

Because the limits in accordance with 47CFR15 are the most stringent limits, the 47CFR15 limits are applied worst-case.

[Measurement results](#)

Radiated emission semi anechoic chamber 30 MHz to 200 MHz

Project number: 20220227 Test ID: 1
Resolution 120 kHz Video 1 MHz
bandwidth: bandwidth:
Antenna distance: 3 m Antenna height: 1 - 4 m
Antenna polarization: Vertical
Mode of operation: Mode 1, pre-scan at 24VDC input power supply.



Detected peaks

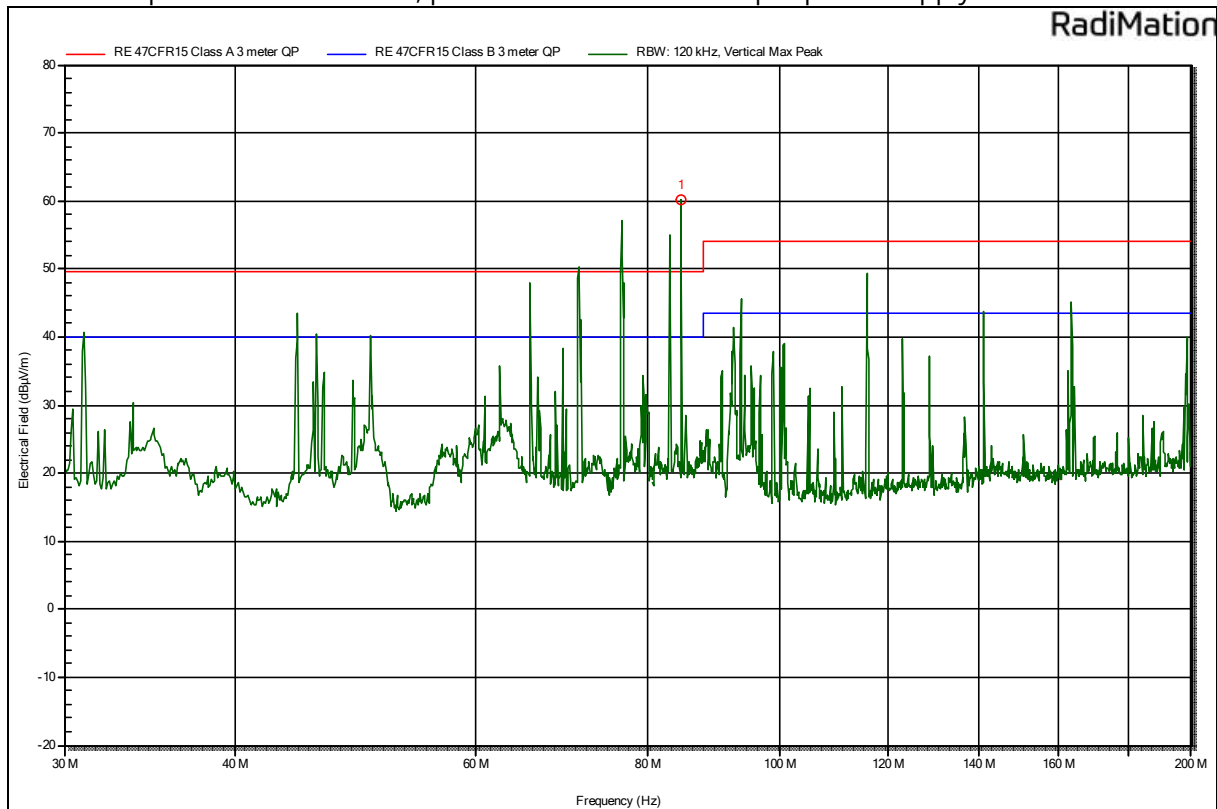
Peak Number	Frequency (MHz)	Quasi-Peak (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	64.286	35.1	40	-2	1	Vertical	Pass

Remarks

pre-scan

Radiated emission semi anechoic chamber 30 MHz to 200 MHz

Project number: 20220227 Test ID: 3
Resolution 120 kHz Video 1 MHz
bandwidth: bandwidth:
Antenna distance: 3 m Antenna height: 1 - 4 m
Antenna polarization: Vertical
Mode of operation: Mode 1, pre-scan at 24VAC 60Hz input power supply.



Detected peaks

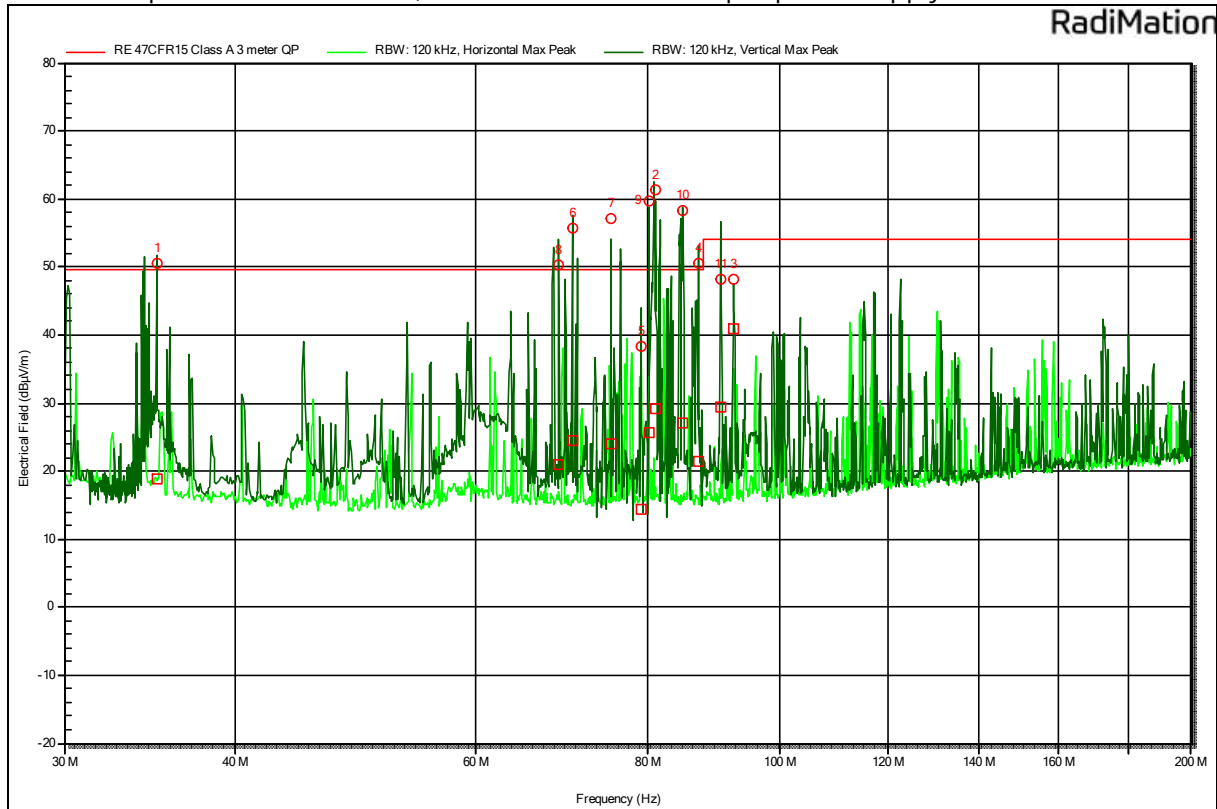
Peak Number	Frequency (MHz)	Angle (degrees)	Height (m)	Polarization
1	84.700	-2	1	Vertical

Remarks

pre-scan

Radiated emission semi anechoic chamber 30 MHz to 200 MHz

Project number: 20220227 Test ID: 4
Resolution 120 kHz Video 1 MHz
bandwidth: bandwidth:
Antenna distance: 3 m Antenna height: 1 - 4 m
Antenna polarization: Both
Mode of operation: Mode 1, tested at 24VAC 60Hz input power supply.



Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	35.071	18.9	49.5	14	1.5	Vertical	Pass
2	81.195	29.1	49.5	-64	1.8	Vertical	Pass
3	92.581	41	54	-111	2.5	Vertical	Pass
4	87.202	21.5	49.5	-40	3	Vertical	Pass
5	79.233	14.3	49.5	-43	1.5	Vertical	Pass
6	70.549	24.6	49.5	-64	1	Vertical	Pass
7	75.307	24	49.5	111	1	Vertical	Pass
8	69.026	21	49.5	-137	1.8	Vertical	Pass
9	80.229	25.8	49.5	-86	1.8	Vertical	Pass
10	85.075	27	49.5	131	1	Vertical	Pass
11	90.726	29.5	54	293	2	Vertical	Pass

Remarks

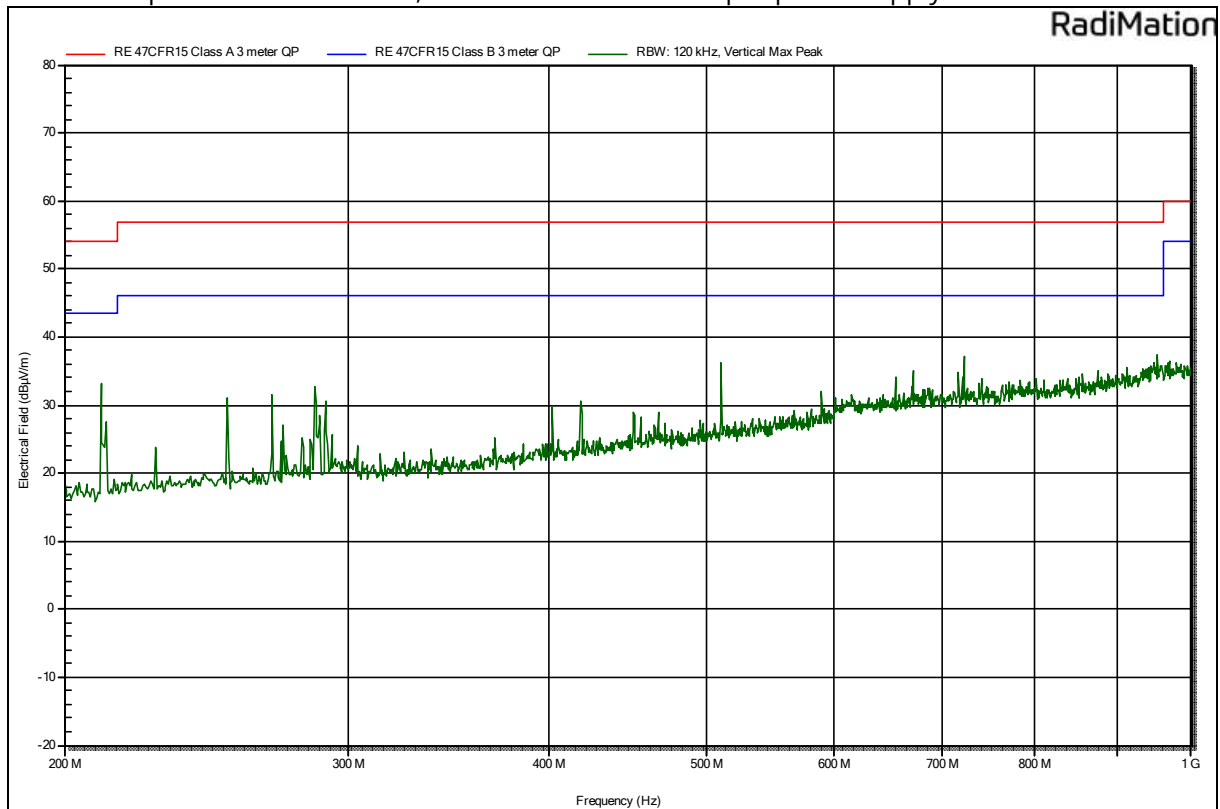
Pass, the peaks are transient peaks from the 5 switching relays.

Reference number: 20220227RPT01

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Radiated emission semi anechoic chamber 200 MHz to 1 GHz

Project number:	20220227	Test ID:	5
Resolution	120 kHz	Video	1 MHz
bandwidth:		bandwidth:	
Antenna distance:	3 m	Antenna height:	1 - 4 m
Antenna polarization:	Vertical		
Mode of operation:	Mode 1, tested at 24VAC 60Hz input power supply.		

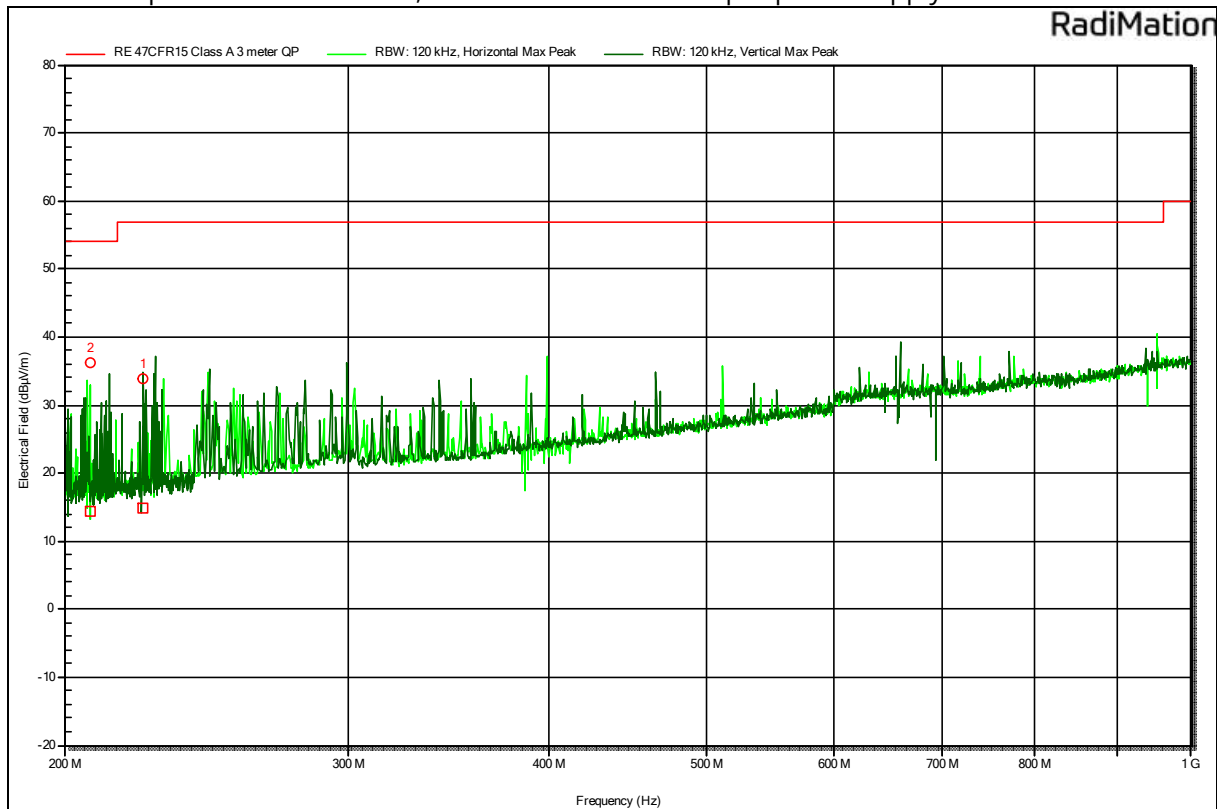


Remarks

pre-scan

Radiated emission semi anechoic chamber 200 MHz to 1 GHz

Project number: 20220227 Test ID: 6
Resolution 120 kHz Video 1 MHz
bandwidth: bandwidth:
Antenna distance: 3 m Antenna height: 1 - 4 m
Antenna polarization: Both
Mode of operation: Mode 1, tested at 24VAC 60Hz input power supply.



Detected peaks

Peak Number	Frequency (MHz)	Quasi-Peak (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Angle (degrees)	Height (m)	Polarization	Status
1	224.035	15	56.9	246	1.5	Vertical	Pass
2	207.567	14.3	54	43	2.5	Horizontal	Pass

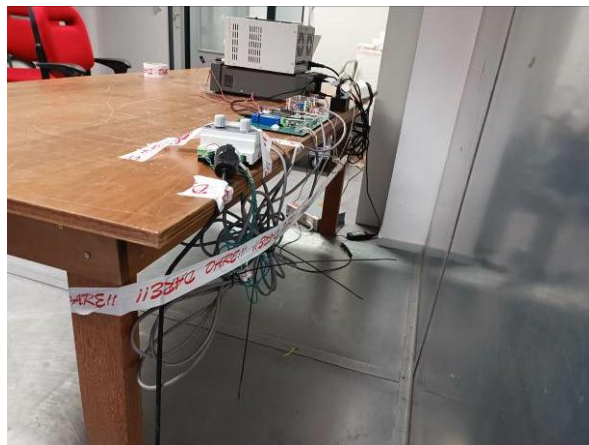
Remarks

Pass

9 Appendix A: Photos



Conducted emission



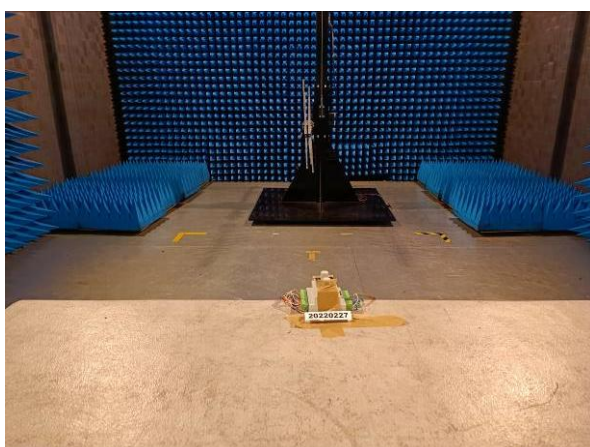
Conducted emission



Radiated emission 30-200 MHz



Radiated emission 30-200 MHz



Radiated emission 200-1000 MHz

10 Appendix B: Equipment list

Conducted emission LISN 150 kHz to 30 MHz

Description	Brand	Model	Serial	ID	Last calibration	Calibration interval
Test site conducted emission, Anderson	DARE!! Measurements	-	-	1572	-	-
EMI Receiver	R&S	ESIB26	100348	1691	2022-03-30	1 year
LISN 50 Ohm / 50 uH + 5 Ohm, 3~, 16 A, incl. 10 dB Att.	Schwarzbeck+Minicircuits	NSLK 8126 + BW- N10W5	506+-	1607+1791	2020-06-30	3 years
Extension cord for power plugs	DARE!!	-	-	1645	-	-
Power source	California Instruments	5001IX	55707	1325	2019-08-20	3 years
Cable RF-coaxial, CE LISN Anderson (EMC)	Huber + Suhner	RG142	-	1226	2022-04-29	1 year

Radiated emission semi anechoic chamber 30 MHz to 1 GHz

Description	Brand	Model	Serial	ID	Last calibration	Calibration interval
Anechoic room, semi	Siepel	Hermes 3	-	1494	2021-05-19	3 years
EMI Receiver	R&S	ESU8	100428	1556	2022-02-17	1 year
Antenna mast	DARE!! Instruments	Raditower	-	1496	-	-
Turn table	DARE!! Development	Raditurn	-	1367	-	-
Antenne 30 MHz – 200 MHz	Rohde & Schwarz	HK116	827601/014	1386	2021-03-19	2 years
Antenne 200 MHz – 1 GHz	Schwarzbeck	VULP 9118B	9118B-815	7396	2021-07-19	2 years
Power source	California Instruments	5001IX	55707	1325	2019-08-20	3 years
Cable RF-coaxial, set, RE Cavendish (EMC)	-	-	-	1478	2022-05-09	1 year

11 Appendix C: Abbreviations

List of used abbreviations in this report:

Abbreviation	Explanation
EMC	Electromagnetic compatibility
FCC	Federal Communications Commission
EUT	Equipment under test
SAC	Semi-anechoic chamber
FAC	Full-anechoic chamber
PK	Peak (detector)
QP	Quasi-peak (detector)
AV	Average (detector)
AMN	Artificial mains network
SA	Spectrum analyser
RC	Test receiver