Test report for

47 CFR Part 15 Subpart B

ICES-Gen, ICES-003

The RvA is signatory to ILAC - MRA

Product name	: Simcenter SCADAS Recorder
Applicant	: Siemens Industry Software Netherlands BV
FCC ID	: 2AF88-SCR2E1
IC	: 28364-SCR2E1

Test report No. : P000393365 001 Ver 2.0

Laboratory information

Accreditation

Kiwa Nederland B.V. complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L248 and is granted by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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The Industry Canada company number for Kiwa Nederland B.V. is: 4173A. The CABID is NL0001.

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Documentation

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Testing Location

Test Site	Kiwa Nederland B.V.
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.5	21-06-2024	First draft	PvW
v1.0	06-08-2024	Final release	PvW
V2.0	21-08-2024	Added reference to variants	PvW

Table of Contents

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.109 (a)	ICES-003 Table 2	Radiated spurious emissions < 1GHz	3.1	Pass
15.109 (a)	ICES-003 Table 4	Radiated spurious emissions > 1GHz	3.1	Pass
15.107 (c)	ICES-003 Table 1	AC power-line conducted emissions	3.2	Pass

Decision rule: Pass/Fail decisions are based on measurement results without taking into account measurement uncertainty.

1 General Description

1.1 Applicant

Client name:	Siemens Industry Software Netherlands BV
Address:	Weidehek 53, Breda, the Netherlands
Zip code:	4824 AT
Telephone:	076 5736363
E-mail:	Tom.schrijer@siemens.com
Contact name:	Mr. Tom Schrijer

1.2 Manufacturer

Manufacturer name:	Siemens Industry Software Netherlands BV
Address:	Weidehek 53, Breda, the Netherlands
Zip code:	4824 AT
Telephone:	076 5736363
E-mail:	Tom.schrijer@siemens.com
Contact name:	Mr. Tom Schrijer

1.3 Tested Equipment Under Test (EUT)

Product name:	LMS SCADAS Recorder
Brand name:	Siemens LMS
FCC ID:	2AF88-SCR2E1
IC:	28364-SCR2E1
Product description:	Data acquisition system
Model(s):	SCR2E09 SCR2E01 SCR2E02 SCR2E05
Batch and/or serial No.	29170717
Software version:	--
Hardware version:	--
Date of receipt:	29-03-2017
Tests started:	16-04-2024
Testing ended:	17-06-2024

1.3.1 Auxiliary items

AUX1

Product name:	Power supply for EUT
Brand name:	MeanWell
Product type:	AC/DC supply
Model(s):	GST160A24-R7B
Batch and/or serial No.	SC265Y2917
Remarks:	Connects to EUT

AUX2

Product name:	Notebook
Brand name:	HP
Product type:	Probook
Model(s):	--
Batch and/or serial No.	--
Remarks:	Used to program memory stick with test mode firmware

1.4 Product specifications of Equipment under test

TX frequencies	802.11b/g/n: 2400 – 2483.5 MHz 802.11n/a/ac: 5150 – 5250 MHz
RX frequencies	802.11b/g/n: 2400 – 2483.5 MHz 802.11n/a/ac: 5150 – 5250 MHz
Equipment class	Class A

Disclaimer: above info is declared by the applicant

1.5 Environmental conditions

Test date	16-04-2024	17-04-2024	02-05-2024
Ambient temperature	19.5°C	20.5°C	22.0°C
Humidity	39.0%	35.0%	47.2%

1.6 Measurement standards

- ANSI C63.4:2014

1.7 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart B
- ICES-003 Issue 7
- ICES-Gen Issue 2

1.8 Observation and remarks

The manufacturer replaced the rechargeable batteries of the EUT since these were expired.
The manufacturer added a ferrite on the AC cable of the AC/DC adapter in order to reduce AC conducted emissions.
The EUT had loads representative of normal loads on one port of each type of ports.
The EUT is tested in normal use orientation.

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.8 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Kiwa Nederland B.V. accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.8 *"Applicable standards".*

All tests are performed by:

Name : P. van Wanrooij, BASc and ing. L.F. Diaz, under supervision of P. van Wanrooij

Review of test methods and report by:

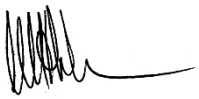
Name : ing. Maaz H. Khan

The above conclusions have been verified by the following signatory:

Date : 22-08-2024

Name : ing. M.H. Khan

Function : Test Engineer

Signature : 

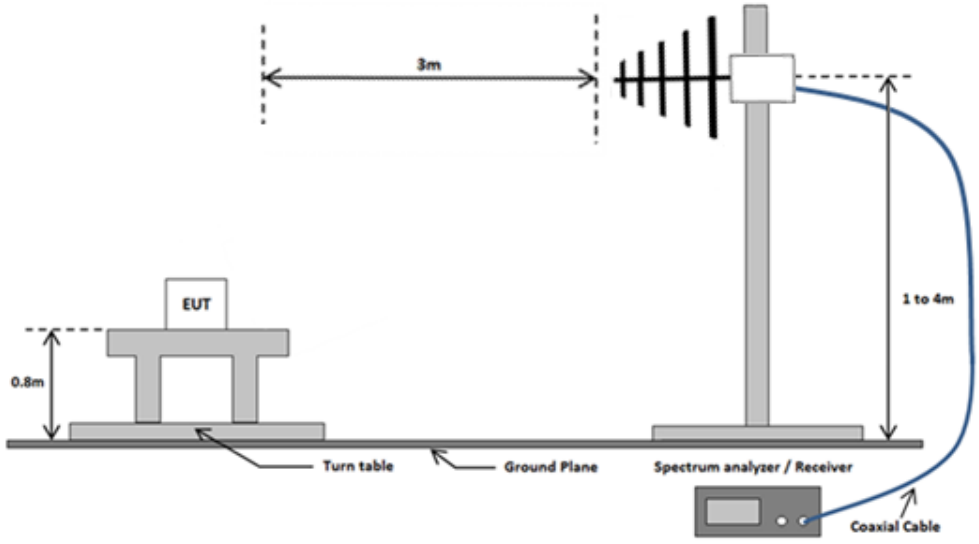
2 Test configuration of the Equipment Under Test

2.1 Test mode

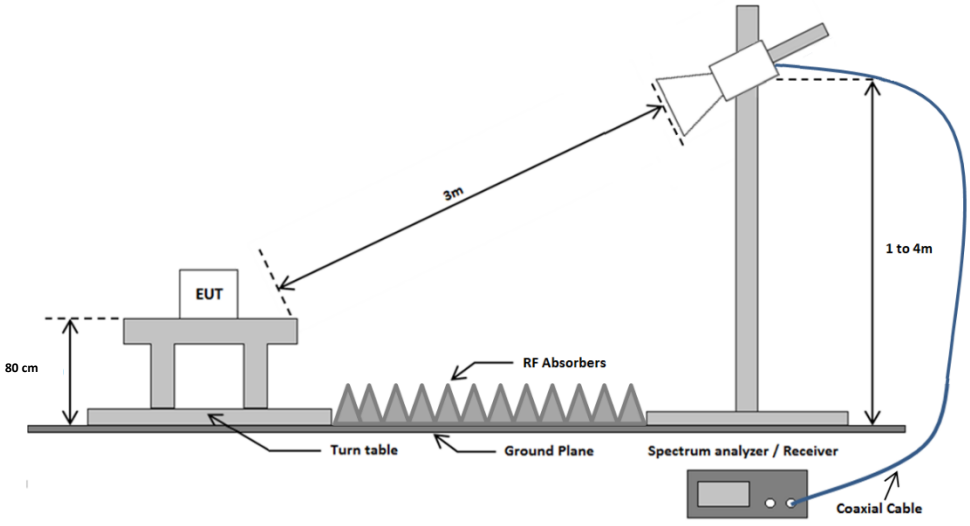
The EUT is tested in normal operating mode.

2.2 Test setups

2.2.1 Radiated emissions test setup 30 MHz - 1 GHz

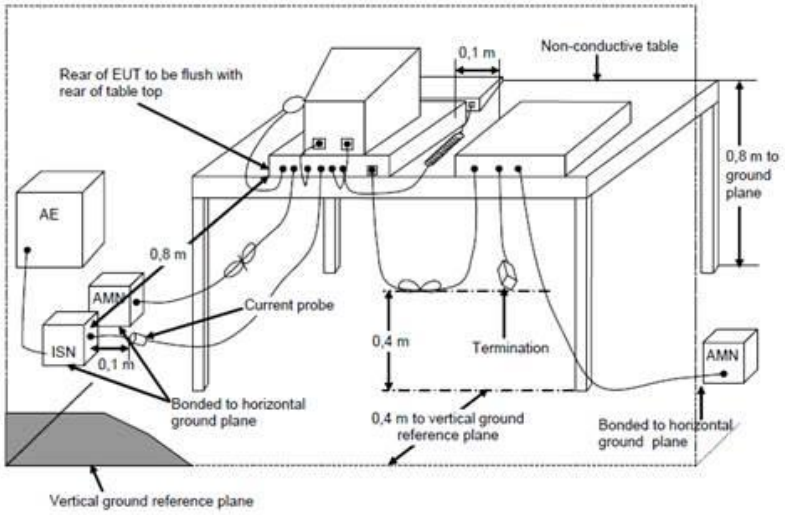


2.2.2 Radiated emissions test setup above 1 GHz



2.2.3 AC Power line conducted emissions test setup

Emissions test at AC mains



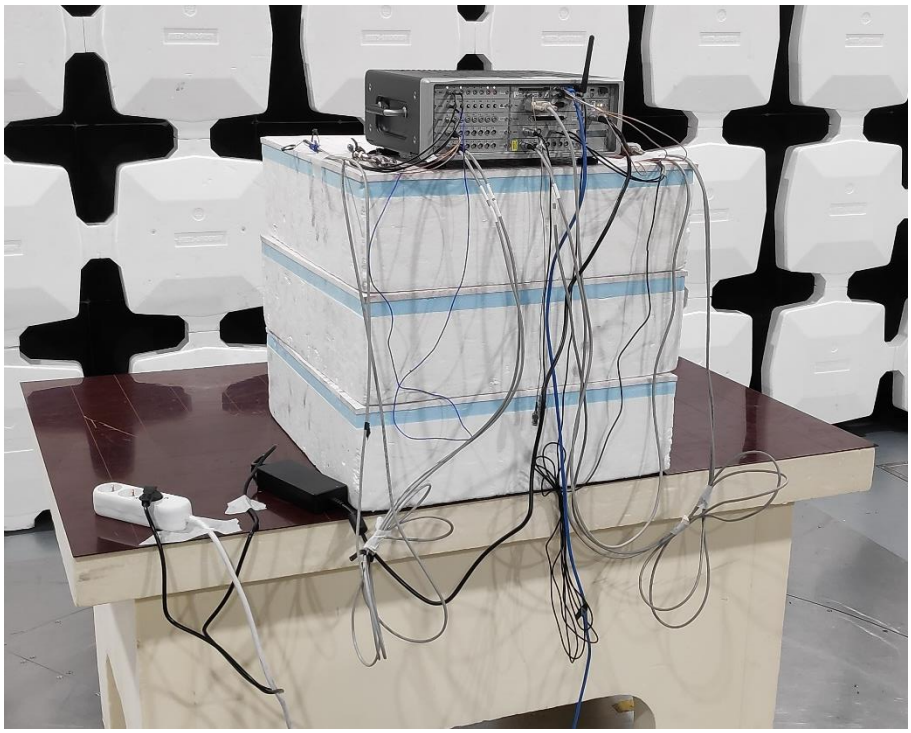


Figure 1. EUT and auxiliary setup

List of used cables					
Number	**Function**	**From**	**To**	**Length**	**Remarks**
1	AC Power	mains 120Vac 60 Hz	AUX1	< 3m	Has a Würth click ferrite (model 742 758 15) on the cable
2	24 Vdc power	AUX1	EUT	< 3m	-
3	Ethernet	Communication board	AUX2	5m	Shielded cable
4	Signal cable	--	V8E	<3m	--
5	Signal cable	--	VC8E	<3m	--
6	Signal cable	--	VD8E	<3m	--
7	Signal cable	--	V24	<3m	2 cables connected to V24
8	Signal cable	Resistor	VB8-II	<3m	2 cables connected to VB8-II
9	Signal cable	--	Communication board	<3 m	Connected to port T1
10	Signal cable	--	Communication board	<3 m	Connected to port T2
11	Signal cable	--	Communication board	<3 m	Connected to port OUT
12	Signal cable	--	Communication board	<3 m	Connected to port CAN
13	Antenna cable	GPS input	GPS antenna	5m	--
14	Signal cable	--	FR4	<3m	--
15	Signal cable	--	WFI2	<3m	Connected to port 1
16	Signal cable	--	WFI2	<3m	Connected to port CLK
17	Signal cable	--	WFI2	<3m	Connected to port TRG
18	Signal cable	Resistor	VB8-III-RT	<3m	2 cables connected to VB8-III-RT

2.3 Test methodology

The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.31, 15.107 and 15.109, ICES-003 and ICES-Gen. The test methods, which have been used, are based on ANSI C63.4-2014.

2.4 Equipment modifications.

No modifications have been made to the equipment.

2.5 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESR7	114605	07-2022	07-2024	3.1, 3.2
Spectrum Analyzer	Rohde & Schwarz	FSV3044	114923	10-2023	10-2025	3.1
Biconical antenna + 6dB attenuator	EMCO	3146	107818	06-2022	06-2025	3.1
Logperiodic antenna	EMCO	3147	114385	02-2021	02-2026	3.1
Horn antenna	EMCO	3115	114607	01-2021	07-2024	3.1
Horn antenna	FLANN-MICROWAVE	20240-25	114518	NA*	NA*	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114690	08-2024	08-2025	3.1
Preamplifier 18-40 GHz	Schwarzbeck	BBV-9721	115026	06-2024	06-2025	3.1
Test software	Raditeq	Radimation Version 2023.2.3	TE 02008	--	--	3.1, 3.2
Semi-Anechoic Chamber	ETS Lindgren	SAR	114624	03-2023	03-2026	3.1
LISN /Two line V-network	Rohde & Schwarz	ENV 216	114379	11-2023	11-2025	3.2

*Note: Standard gain horn antennas do not need calibration

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2017 has been confirmed before testing.

NA= Not Applicable

2.6 Sample calculations

All formulas for data conversions and conversion factors are reported in chapter 4 of this test report.

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

The field strength of radiated emissions from a Class A digital device, as determined at a distance of 3 meters, shall not exceed the following:
On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified.
Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function.
When average radiated emission measurements are specified in this part, there is also a limit on the peak level of the emissions. Unless otherwise specified, the limit on peak emissions is 20 dB above the average limit.
The product under test shall comply with both the average and the peak limits.

ICES-003 Issue 7 section 3.2.2
The quasi-peak limits for the electric component of the radiated field strength emitted from ITE or digital apparatus, within 30 MHz to 1 GHz, for a measurement distance of 3m are presented in table below.
At and above 1 GHz, except for outdoor units of home satellite receiving systems, the ITE or digital apparatus shall comply with the limits specified in table below up to the frequency F_M, which shall be determined. The product under test shall comply with both the average and the peak limits.

FCC 15.109(b)

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	90	40.0	10
88-216	150	43.5	10
216-960	210	46.0	10
Above 960	300	54.0	10

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	316	50.0	3
88-216	473	53.5	3
216-960	630	56.9	3
Above 960	1584	64.0	3

ICES-003 tables 2, 4

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	50.0	3
88-216	54.0	3
216-230	56.9	3
230 -960	57.0	3
960 – 1000	60.0	3

Frequency (MHz)	Field strength Peak (dBµV/m)	Field strength Average (dBµV/m)	Measurement distance (meters)
At and above 1 GHz	80	60	3

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2.1 and 2.2.2 of this report.

3.1.4 Test procedure

30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3

30 MHz to 1 GHz: IRN 441 – Method 1
1 GHz to 18 GHz: IRN 441 – Method 2
18 to 26.5 GHz: IRN 441– Method 3

In case of handheld and/or body-worn equipment, the EUT's orientation (X, Y, Z) was varied in order to ensure that maximum emission amplitudes were attained. In all other cases the associated cabling and the EUT orientation was varied for maximum emissions.

The spectrum was examined from 30MHz to the highest measurement frequency according to the table below. Final radiated emission measurements were made at 3m distance.

Highest internal frequency (F_X) [i]	Highest measurement frequency (F_M)
$F_X \leq 108$ MHz	1 GHz
108 MHz < $F_X \leq 500$ MHz	2 GHz
500 MHz < $F_X \leq 1$ GHz	5 GHz
$F_X > 1$ GHz	5 x F_X up to a maximum of 40 GHz
i. F_X is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.	

The 6 highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

3.1.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB
18 – 26.5 GHz	Horizontal	±4.9 dB
	Vertical	±4.9 dB

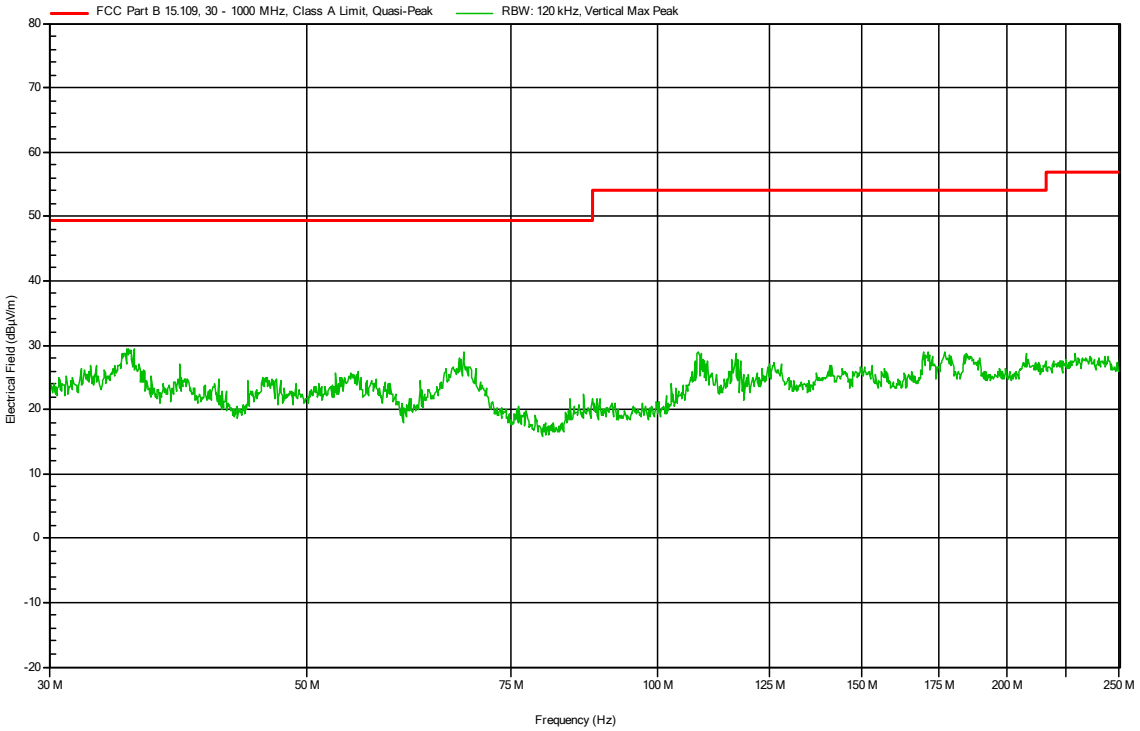
3.1.6 Test results

Frequency	Peak @3m	Quasi-Peak @3m	Quasi-Peak Limit @3m	Polarization	Height	Status
340,79 MHz	45,1 dBµV/m	44,2 dBµV/m	56,9 dBµV/m	Horizontal	1 m	Pass
375,004 MHz	45,6 dBµV/m	43,4 dBµV/m	56,9 dBµV/m	Horizontal	1 m	Pass
551,581 MHz	42,1 dBµV/m	35 dBµV/m	56,9 dBµV/m	Horizontal	1 m	Pass

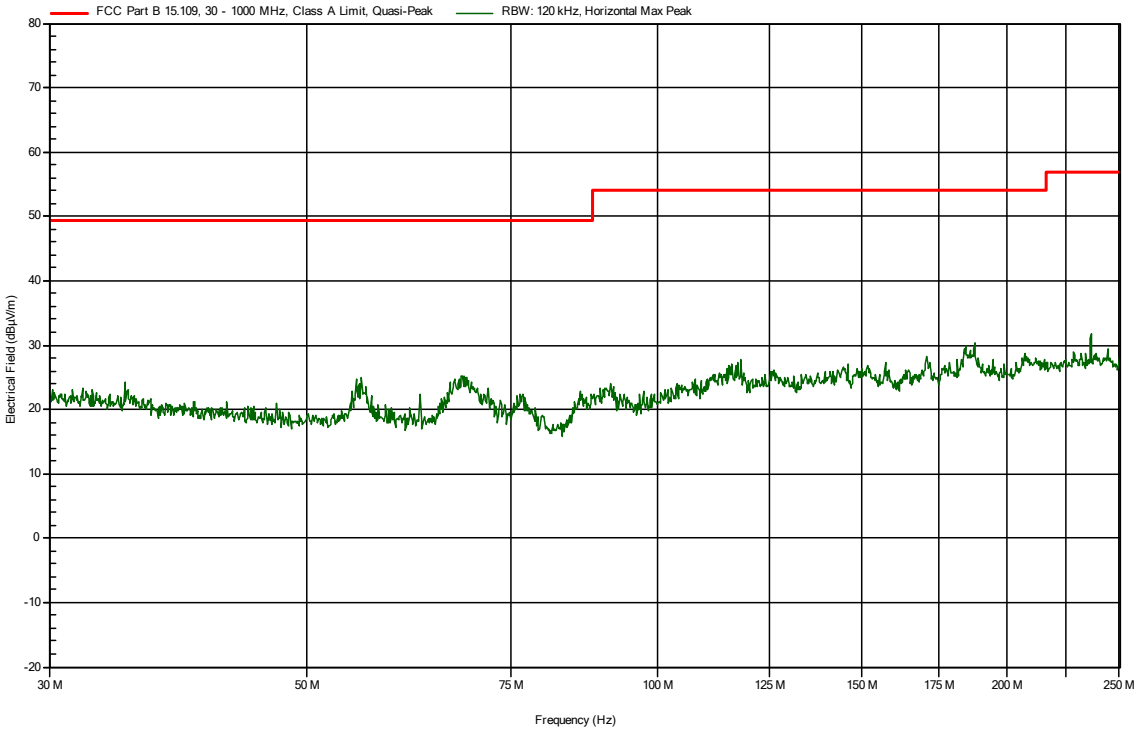
Frequency	Average @3m	Average Limit @3m	Peak @3m	Peak Limit @3m	Polarization	Height	Status
1,499 GHz	30,2 dBµV/m	60 dBµV/m	37,1 dBµV/m	80 dBµV/m	Vertical	1 m	Pass
1,249 GHz	31,4 dBµV/m	60 dBµV/m	36,3 dBµV/m	80 dBµV/m	Vertical	2,5 m	Pass

The results of the radiated emission tests are depicted in the table above. A selection of plots is provided on the next pages

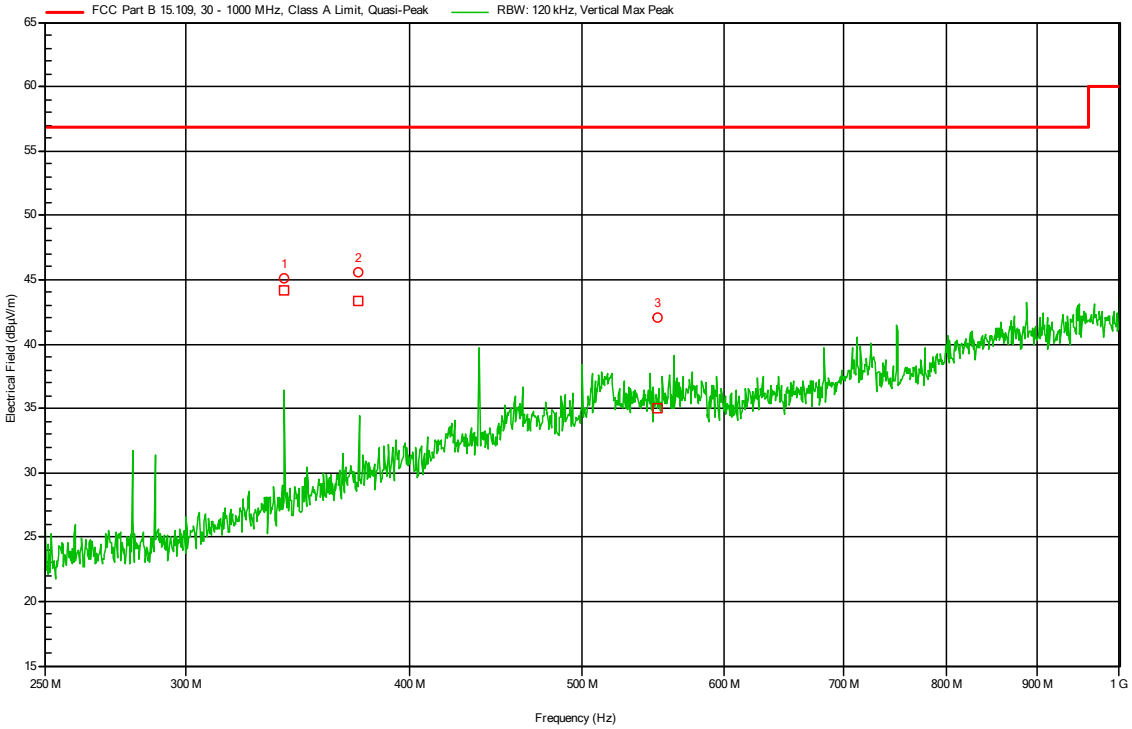
3.1.7 Plots of the Radiated Spurious Emissions Measurement



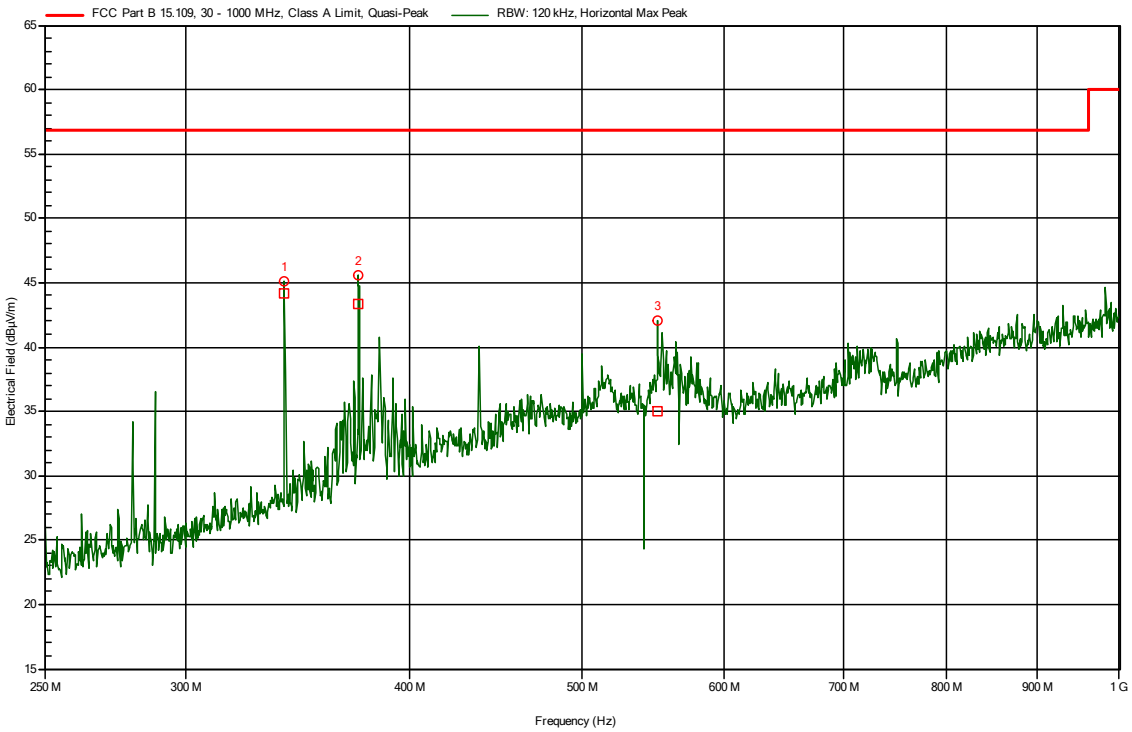
Plot 1a: radiated emissions of the EUT, Antenna vertical, in the range 30 – 250 MHz
(pre-scan peak values shown)



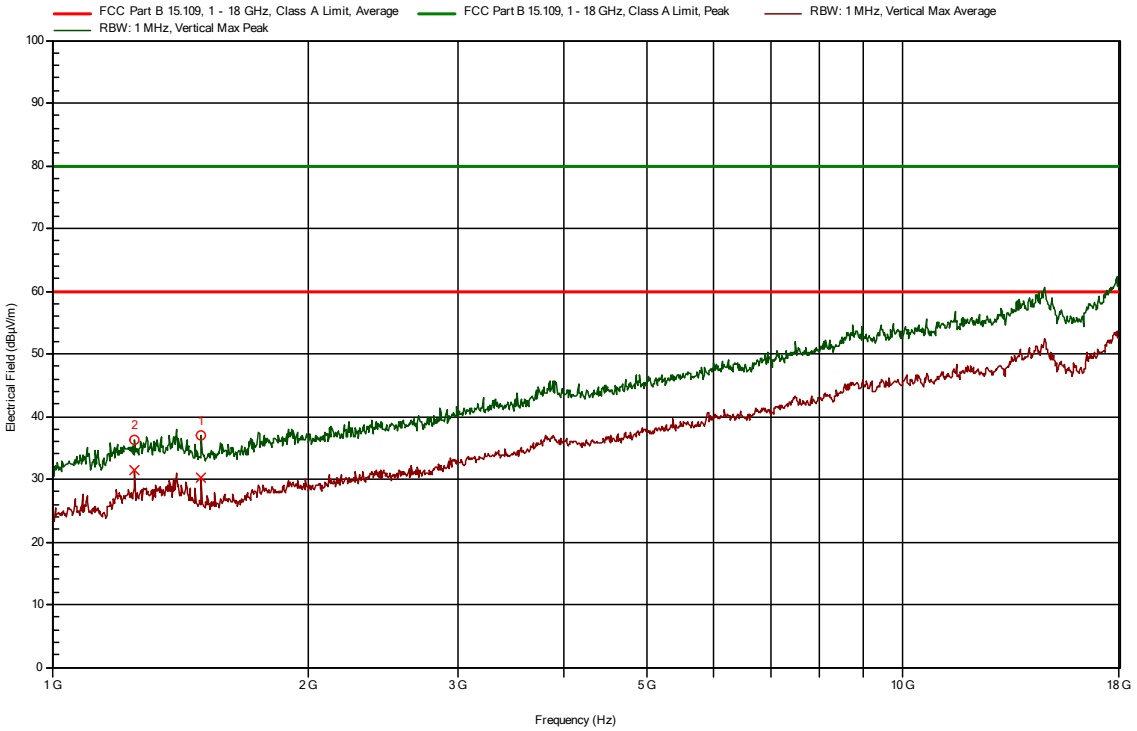
Plot 1b: radiated emissions of the EUT, Antenna horizontal, in the range 30 – 250 MHz
(pre-scan peak values shown)



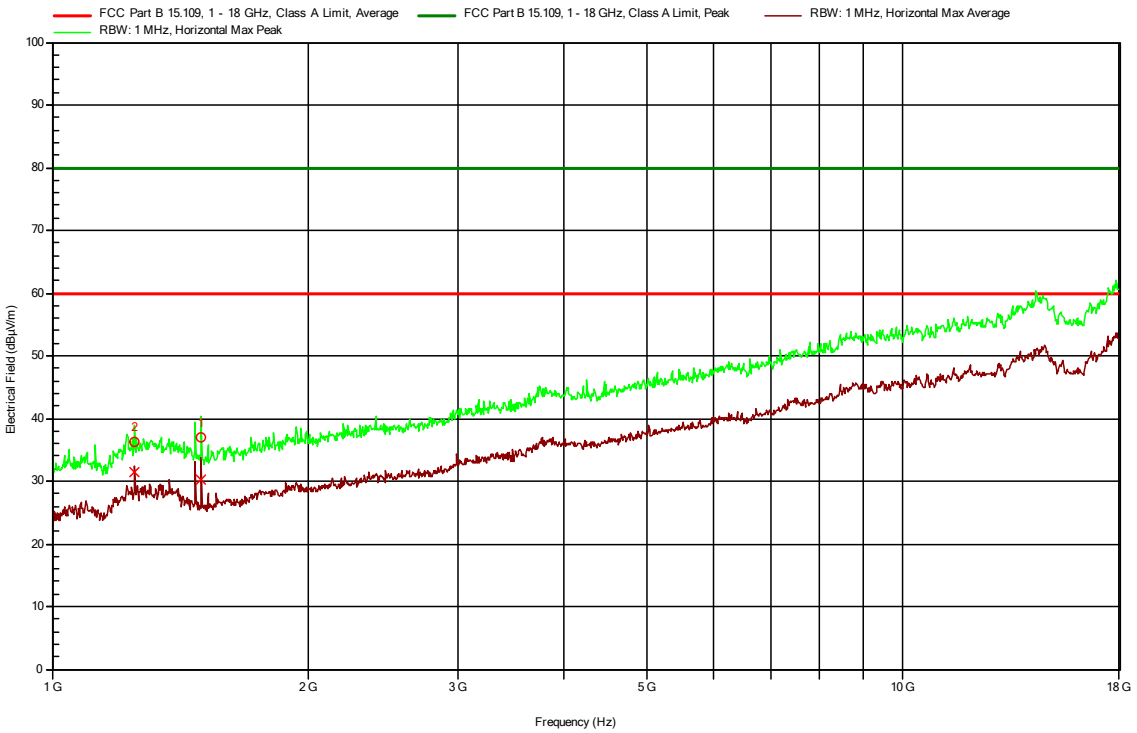
Plot 2a: radiated emissions of the EUT, Antenna vertical, in the range 250-1000 MHz
(pre-scan peak values shown)



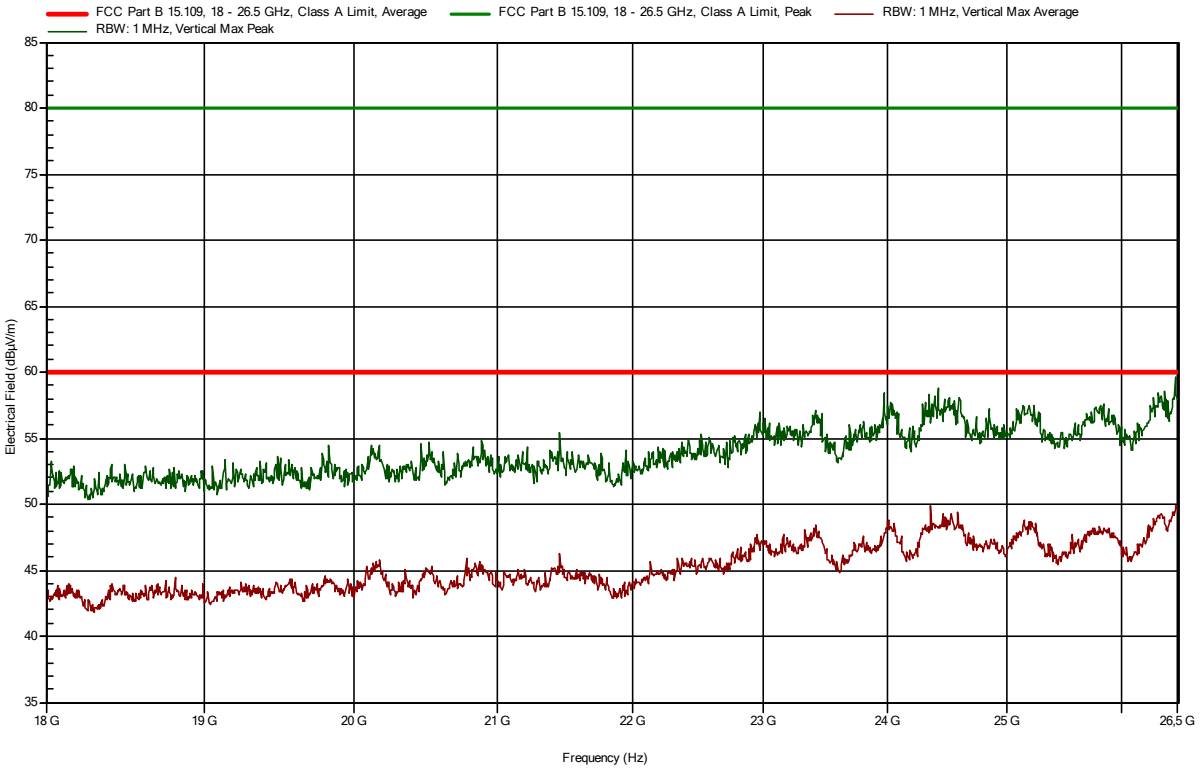
Plot 2b: radiated emissions of the EUT, Antenna horizontal, in the range 250-1000 MHz
(pre-scan peak values shown)



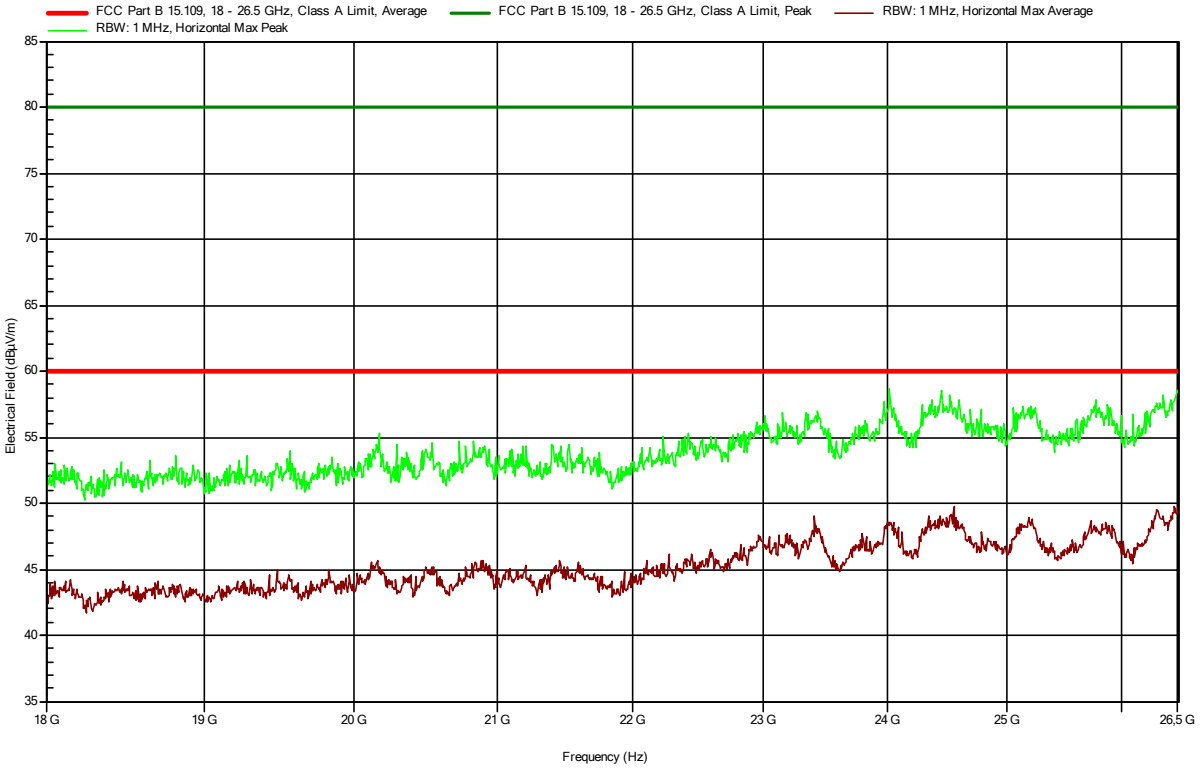
Plot 3a: radiated emissions of the EUT, Antenna vertical, in the range 1-18 GHz
(peak and average values shown)



Plot 3b: radiated emissions of the EUT, Antenna horizontal, in the range 1-18 GHz
(peak and average values shown)



Plot 4a: radiated emissions of the EUT, Antenna vertical, in the range 18 – 26.5 GHz
(peak and average values shown)



Plot 4b: radiated emissions of the EUT, Antenna horizontal, in the range 18 – 26.5 GHz
(peak and average values shown)

3.2 AC Power-line conducted emissions

3.2.1 Limit

§ 15.107 (b)
For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

ICES-003 Issue 7 section 3.2.1

The ITE or digital apparatus shall comply with the conducted emission limits specified in table below at its AC mains power terminals. The product under test shall comply with both the quasi-peak and the average limits.

Where the product under test is powered through an external device (for example, through an external power supply, or by means of a device providing power over Ethernet to the product under test), the conducted emission limits apply at the AC mains power terminals of the external device, while this is powering the product under test: see ICES-Gen.

Frequency of Emission (MHz)	Conducted Limit (dBµV) Quasi-Peak	Conducted Limit (dBµV) Average
0.15 – 0.5	79	66
0.5 – 5	73	60
5 - 30	73	60

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2.3 of this report.

3.2.4 Test procedure

According to ANSI C63.4: 2014, section 13.3

IRN 439 – Method 1

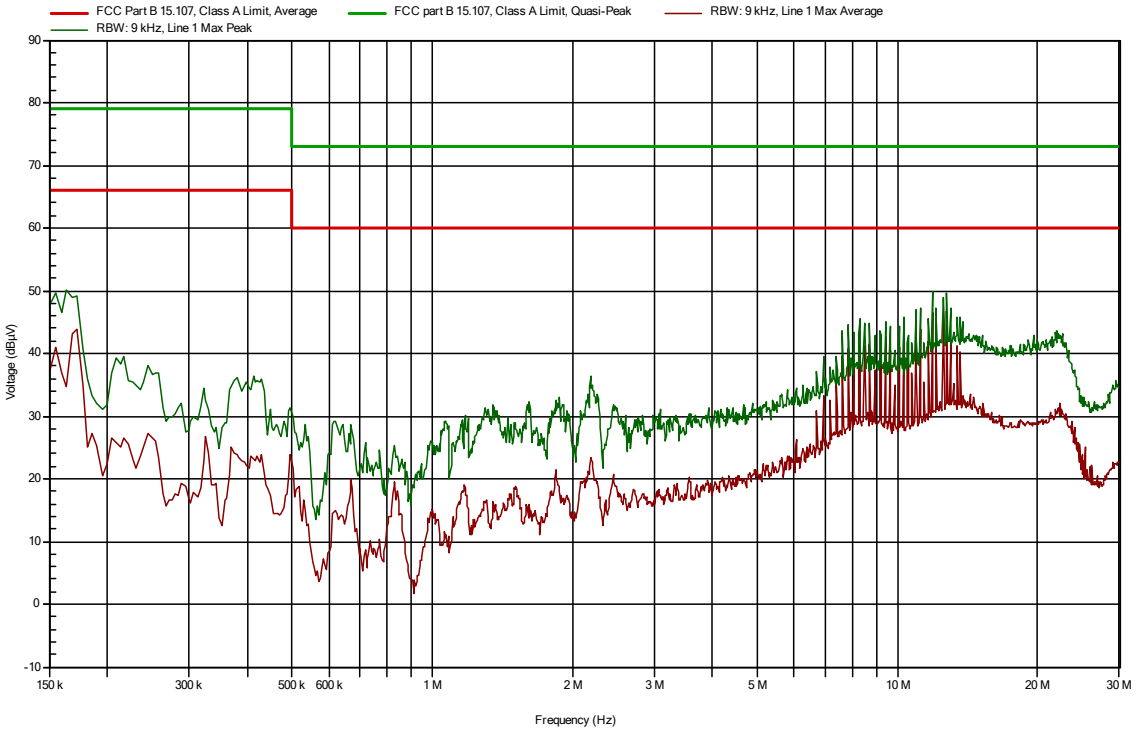
3.2.5 Measurement uncertainty

+/- 3.6 dB

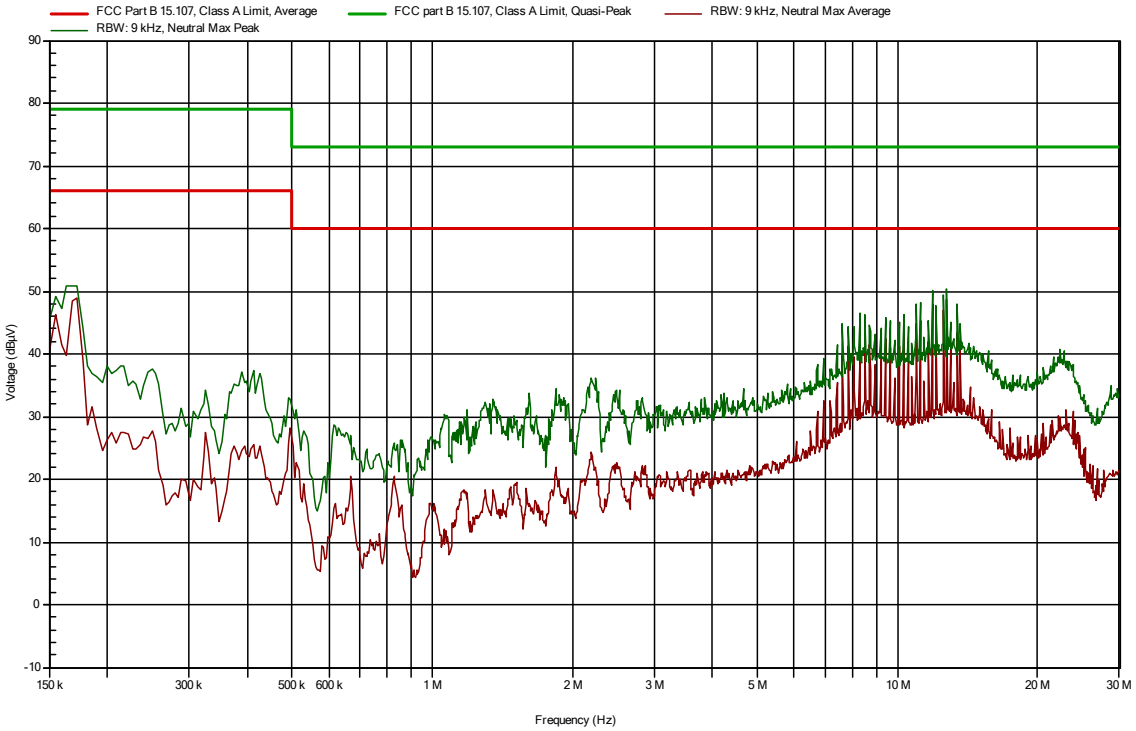
3.2.6 AC Power Line Conducted emission data of the EUT, results

No peaks were selected for final measurement

3.2.7 Plots of the AC mains conducted spurious measurement



Pre-scan plot with peak detector of the AC Power-line Conducted emissions on **Phase**



Pre-scan plot with peak detector of the AC Power-line Conducted emissions on **Neutral**

4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.

Conducted emission Measurement:

U_{lisn} (dBµV) = U (dBµV) + Corr. (dB)

Where:
U = Measuring receiver voltage
LISN insertion loss = Voltage division factor of LISN
Corr. = sum of single correction factors of used LISN, cables and pulse limiter.
Linear interpolation will be used for frequencies in between the values in the table.

Frequency (MHz)	**Voltage division LISN (db)**	**Cable loss (dB)**	**Corr. (dB)**
	114379 SN: 230000813 Rohde & Schwarz ENV 216	**TE 11134**	
0,15	9.7	0.02	9.72
0,2	9.68	0.03	9.71
0,3	9.68	0.03	9.71
0,5	9.69	0.08	9.77
0,7	9.69	0.25	9.94
0,8	9.69	0.25	9.94
1	9.68	0.11	9.79
2	9.7	0.15	9.85
3	9.71	0.21	9.92
5	9.72	0.21	9.93
7	9.76	0.25	10.01
8	9.77	0.25	10.02
10	9.77	0.29	10.06
15	9.84	0.34	10.18
20	9.88	0.37	10.25
25	9.97	0.43	10.4
30	10.08	0.45	10.53

Field Strength Measurement:

E (dBµV/m) = U(dBµV) + AF (dB/m) + Corr. (dB)

Where:
E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
CL = Cable loss

Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (MHz)	**AF (dB/m)** **ID: 114436** **VHA 9103 + BBA 9106** **SN: 9856**	**Cable loss (dB)** **Id: SAR cable**	**Corr. (dB)**
30	18.6	0.68	19.28
100	10.4	1.15	11.55
150	14.8	1.41	16.21
200	16.0	1.63	17.63
250	16.9	1.93	18.83

Frequency (MHz)	**Gain (dBi)** **ID: 114385** **EMCO LPDA** **SN: 9856**	**Cable loss (dB)** **Id: SAR cable**	**Corr. (dB)**
250	11.8	1.93	13.73
300	13	2.12	15.12
350	15.6	2.2	17.8
400	17.1	2.29	19.39
450	17.3	2.53	19.83
500	17.7	2.67	20.37
550	18.4	2.9	21.3
600	19.2	3.02	22.22
650	19.7	3.09	22.79
700	20.3	3.22	23.52
750	21.4	3.56	24.96
800	22	3.69	25.69
900	22.1	3.81	25.91
950	22.6	3.91	26.51
1000	22.5	4.3	26.8

Frequency (MHz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
1000	23,6	40,4	2,0	66
1500	25,1	40,5	2,4	68
2000	27,1	40,5	2,7	70,3
2500	28,6	40,7	3,2	72,5
3000	30,5	40,7	3,2	74,4
3500	31,2	40,7	3,4	75,3
4000	32,7	40,9	4,9	78,5
4500	32,4	40,9	4,4	77,7
5000	33,2	40,7	4,6	78,5
5500	34,0	40,5	4,5	79
6000	34,6	40,0	5,2	79,8
6500	34,3	39,4	5,9	79,6
7000	35,2	38,6	5,7	79,5
7500	36,4	39,2	5,9	81,5
8000	37,0	38,9	6,3	82,2
8500	37,5	38,4	6,4	82,3
9000	38,1	37,4	6,5	82
9500	37,8	37,0	7,1	81,9
10000	38,2	36,5	7,3	82
10500	38,1	36,7	7,6	82,4
11000	38,3	36,9	8,3	83,5
11500	38,5	37,6	8,1	84,2
12000	39,1	38,3	8,4	85,8
12500	38,7	38,5	8,3	85,5
13000	39,2	38,9	9,2	87,3
13500	40,5	40,2	8,3	89
14000	41,1	40,0	8,2	89,3
14500	41,4	40,1	8,2	89,7
15000	40,2	41,4	8,3	89,9
15500	37,9	41,4	8,6	87,9
16000	37,5	42,8	9,2	89,5
16500	38,6	42,3	8,8	89,7
17000	41,1	43,1	9,4	93,6
17500	42,7	43,2	9,4	95,3
18000	44,0	44,2	9,8	98

Frequency (MHz)	AF (dB/m) TE 00818 Flann 20240-25 SN: 163703	Gain (dB) TE 11131 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
18000	31,3	26,2	9,8	67,3
19000	31,5	26,1	9,6	67,2
20000	31,7	25,9	11	68,6
21000	31,9	24,3	10,7	66,9
22000	32,1	18,3	10,5	60,9
23000	32,2	18,9	10,8	61,9
24000	32,3	23,6	11,4	67,3
25000	32,4	24,5	11,6	68,5
26000	32,5	25,3	11,7	69,5

5 Photograph test setup

5.1 Photograph test setup Radiated Emissions

Photo 1 Photograph test setup radiated emissions 30-250 MHz, report section 3.1

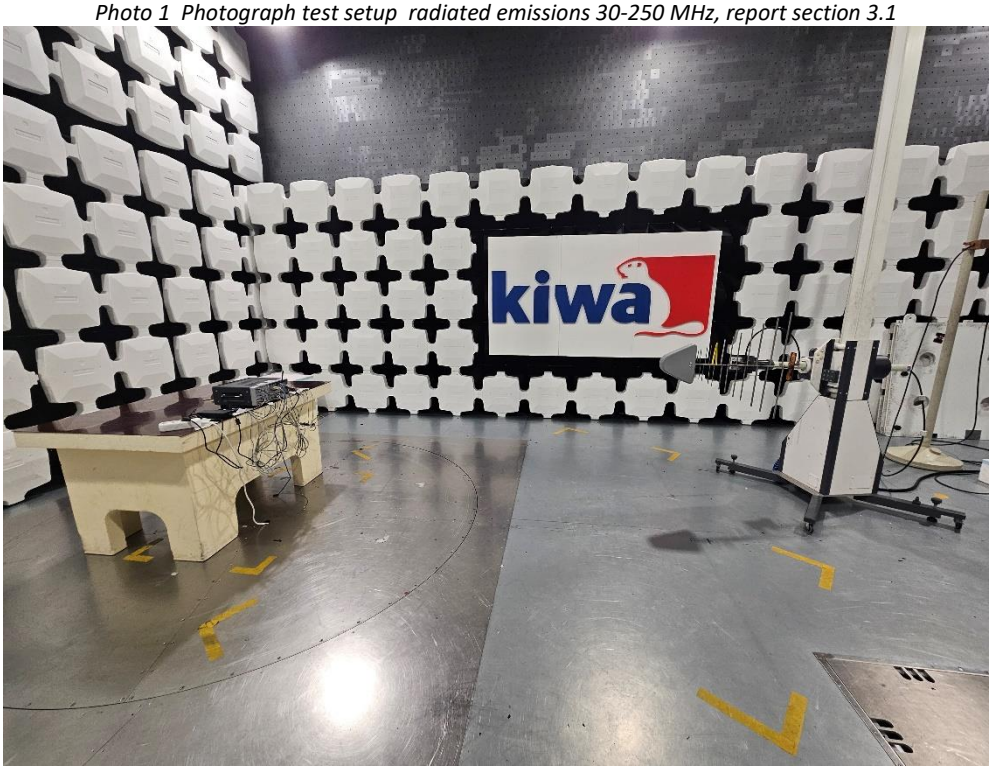


Photo 2 Photograph test setup radiated emissions 250-1000 MHz, report section 3.1

Photo 3 Photograph test setup radiated emissions 1-18 GHz, report section 3.1

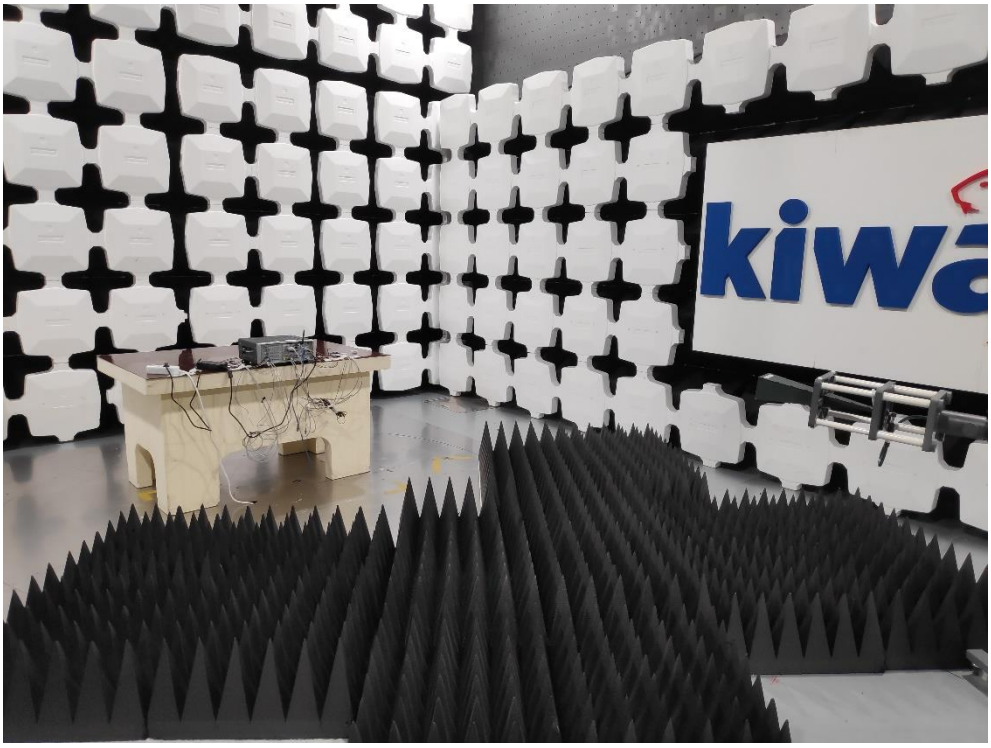


Photo 4 Photograph test setup radiated emissions 18 – 26.5 GHz, report section 3.1

5.2 Photograph test setup, AC Power Line Conducted emissions

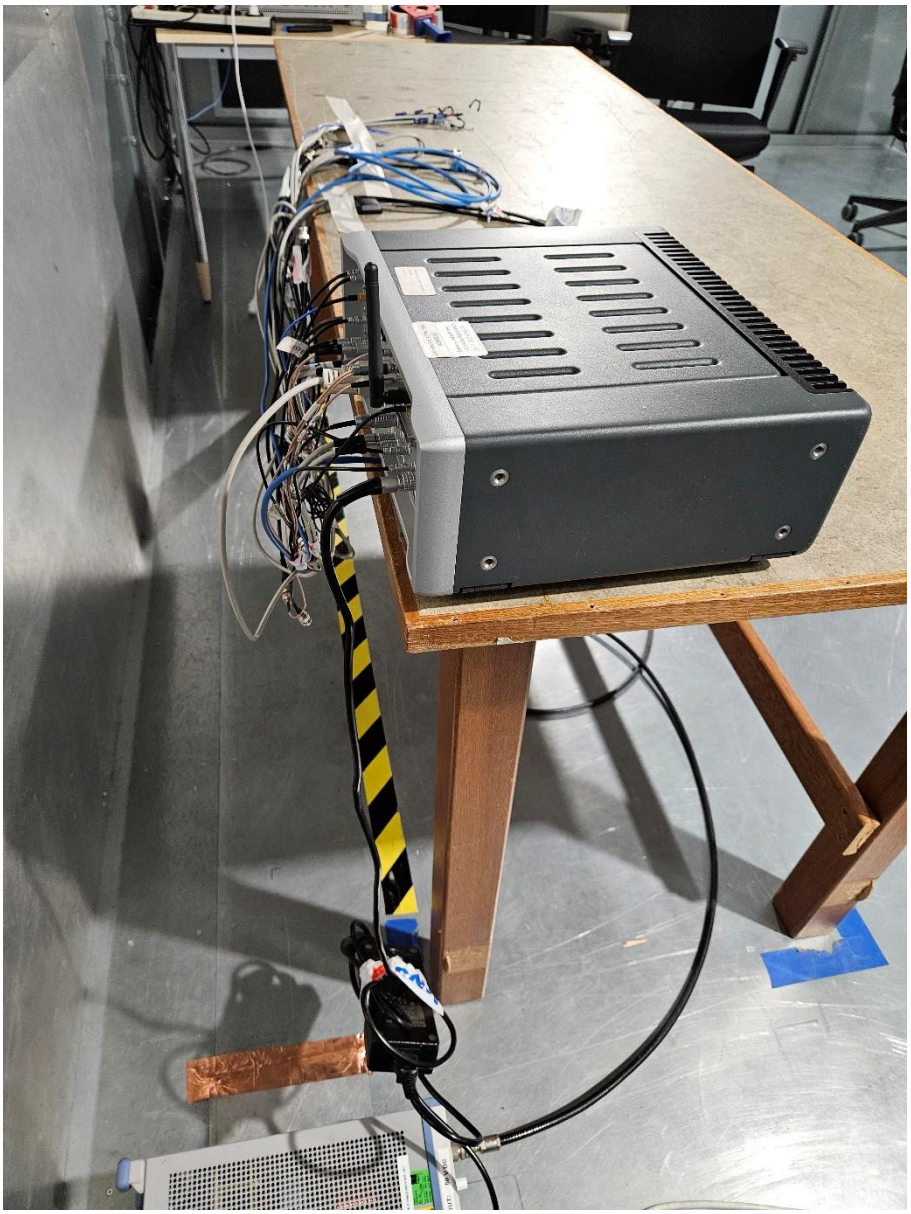


Photo 4: Photographs AC Power Line conducted emission, report section 3.3

<<END OF REPORT>>