

FCC Test report for parts 15.107, 15.109

Product name : Luminaire controller
Applicant : Flashnet SA
FCC ID : XMR2021BG770AGL

Test report No. : P000191762 02 Ver 2.00

Laboratory information

Accreditation

Telefication 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 L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherlands.

Testing Location

Test Site	Kiwa Telefication BV
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
v0.50	15-09-2022	First draft	PS
v1.00	20-09-2022	First release	PS
V2.00	26-09-2022	Second release: • Peak emissions tables added • On page 8, table height > 1 GHz corrected • On page 6, reference to subparts C changed to subparts B • Remark added in section 1.8	PS

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Summary of Test results

FCC	Description	Section in report	Verdict
15.109(a)	Radiated spurious emissions	3.1	Pass
15.107(a)	AC conducted emissions	3.2	Pass

1 General Description

1.1 Applicant

Client name:	Flashnet SA
Address:	Fundatura Harmanului 4A
Zip code:	500240 Brasov Romania
Telephone:	004 0735 206 031
E-mail:	mihaly.aniko@flashnet.ro
Contact name:	Ms Aniko MIHALY

1.2 Manufacturer

Manufacturer name:	Flashnet SA
Address:	Fundatura Harmanului 4A
Zip code:	500240 Brasov Romania
Telephone:	004 0735 206 031
E-mail:	mihaly.aniko@flashnet.ro
Contact name:	Ms Aniko MIHALY

1.3 Tested Equipment Under Test (EUT)

Product name:	Luminaire controller
Brand name:	inteliLIGHT
FCC ID:	XMR2021BG770AGL
IC :	--
Product type:	FRE-220-NEMA-NB1-M1-G
Model(s):	0001
Batch and/or serial No.	4226
Software version:	V4
Hardware version:	--
Date of receipt	06-07-2022
Tests started:	22-07-2022
Testing ended:	22-07-2022

1.4 Product specifications of Equipment under test

Frequency bands:	LTE Cat M1: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66 LTE Cat NB1: B1/B2/B3/B4/B5/B8/B12/B13/B17/B18/B19/B20/B25/B28/B66
Antenna type	FPC (Flexible Printed Circuit)
Antenna gain	1.5 dBi (1730 MHz); 1.2 dBi (830 MHz)
Type of modulation:	OFDM (64 QAM)
Emission designator	1M12G7D (NBIoT); 1M11G7D (LTE)

1.5 Environmental conditions

Test date	22-07-2022
Ambient temperature	21.2°C
Humidity	59.9%

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 §15.107(a)
- FCC Part 15 Subpart B §15.109(a)

1.8 Observation and remarks

Radiated emissions have been measured up to 2 GHz since the highest generated frequency in the device (in idle mode) is in the range 108 – 500 MHz

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.7 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. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.7 *"Applicable standards"*.

All conducted tests are performed by:

Name : ing P.A. Suringa

Review of test methods and report by:

Name : ing R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 30-09-2022

Name : ing R. van Barneveld

Function : Test Engineer

Signature :

A handwritten signature in blue ink, consisting of a large, stylized 'R' followed by a horizontal line.

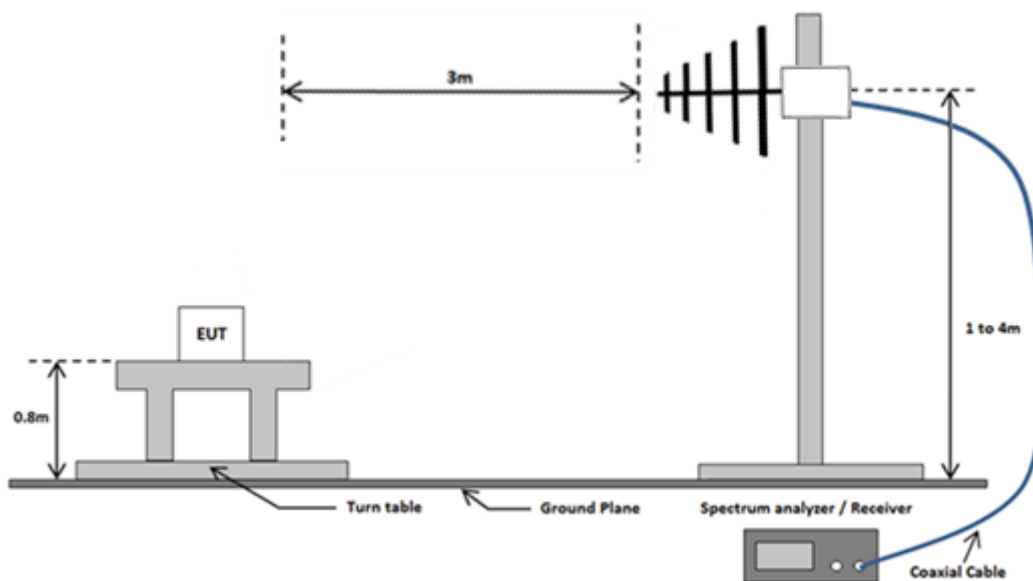
2 Test configuration of the Equipment Under Test

2.1 Test mode

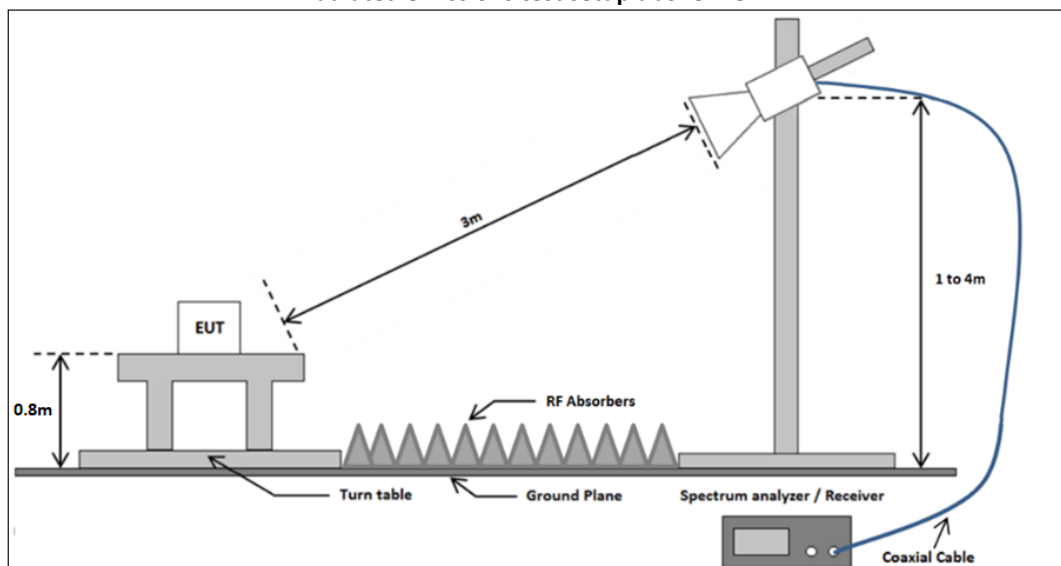
The EUT was tested in idle (stand by) mode.

2.2 Test setups

Radiated emissions test setup 30 MHz - 1 GHz

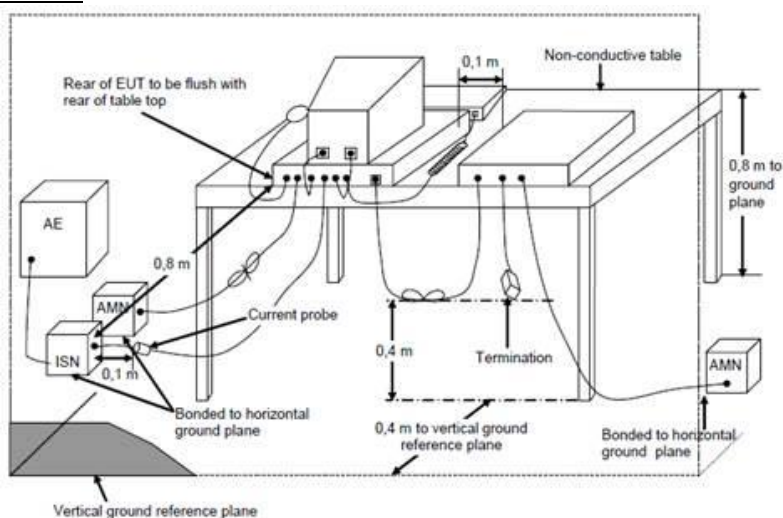


Radiated emissions test setup above 1 GHz



Conducted emissions test setup

Emissions test at AC mains



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESR7	114534	01-2022	01-2023	3.1, 3.2
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	03-2022	03-2023	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436 + 114254	03-2021	03-2024	3.1
Logperiodic antenna	EMCO	3147	114385	03-2021	03-2024	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.1
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114690	01-2022	01-2023	3.1
Test software	Raditeq	Radimation Version 2021.1.9	TE 02008	--	--	3.1
Two line V-network	Rohde & Schwarz	ENV 216	114379	07-2021	07-2023	3.2

2.4 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

15.109(a)

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance(m)
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	3

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 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 026 – Method 1

1 GHz to 18 GHz: IRN 026 – Method 2

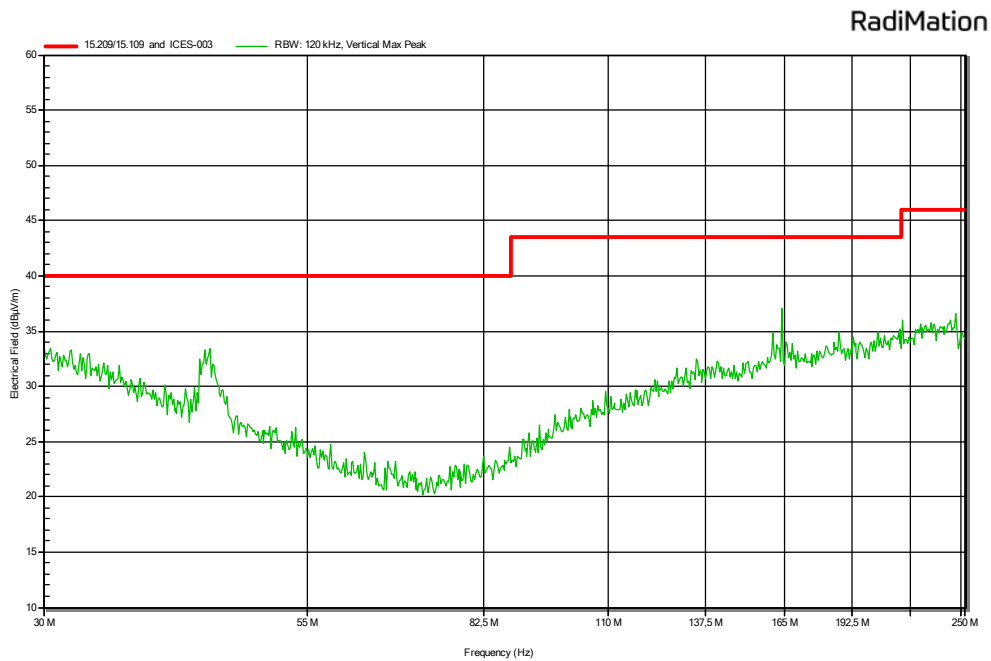
3.1.5 Measurement Uncertainty

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

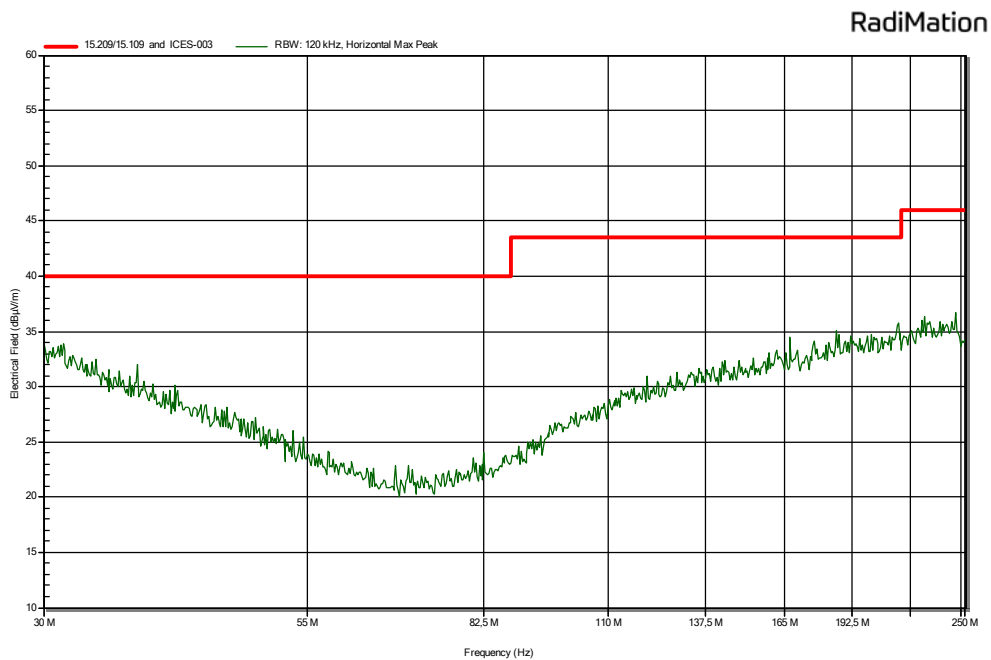
3.1.6 Plots of the Radiated Spurious Emissions Measurement

30 -250 MHz

Vertical polarization



Horizontal polarization

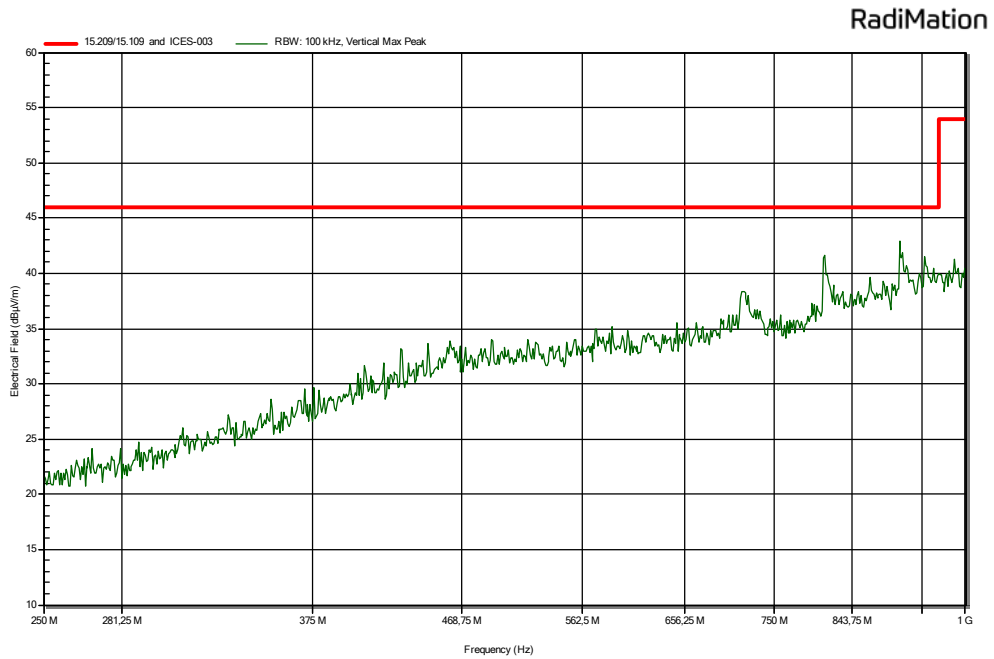


Peak emissions table

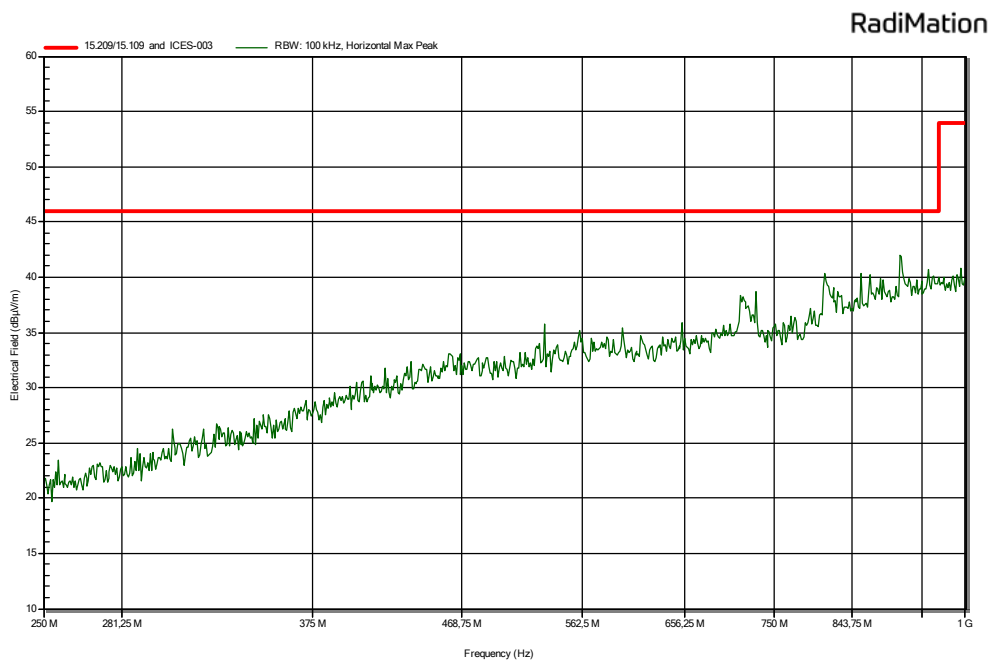
Frequency	Peak	Peak Limit	Angle	Height	Polarization
43,888 MHz	33,5 dB μ V/m	40 dB μ V/m	145 degrees	1 m	Vertical
163,623 MHz	35,4 dB μ V/m	43,5 dB μ V/m	221 degrees	1 m	Vertical
163,54 MHz	37,1 dB μ V/m	43,5 dB μ V/m	296 degrees	1 m	Vertical
166,703 MHz	34,4 dB μ V/m	43,5 dB μ V/m	139 degrees	2 m	Horizontal
37,178 MHz	32 dB μ V/m	40 dB μ V/m	358 degrees	1,5 m	Horizontal
243,785 MHz	36,3 dB μ V/m	46 dB μ V/m	139 degrees	4 m	Vertical

250 – 1000 MHz

Vertical polarization



Horizontal polarization



Peak emissions tables

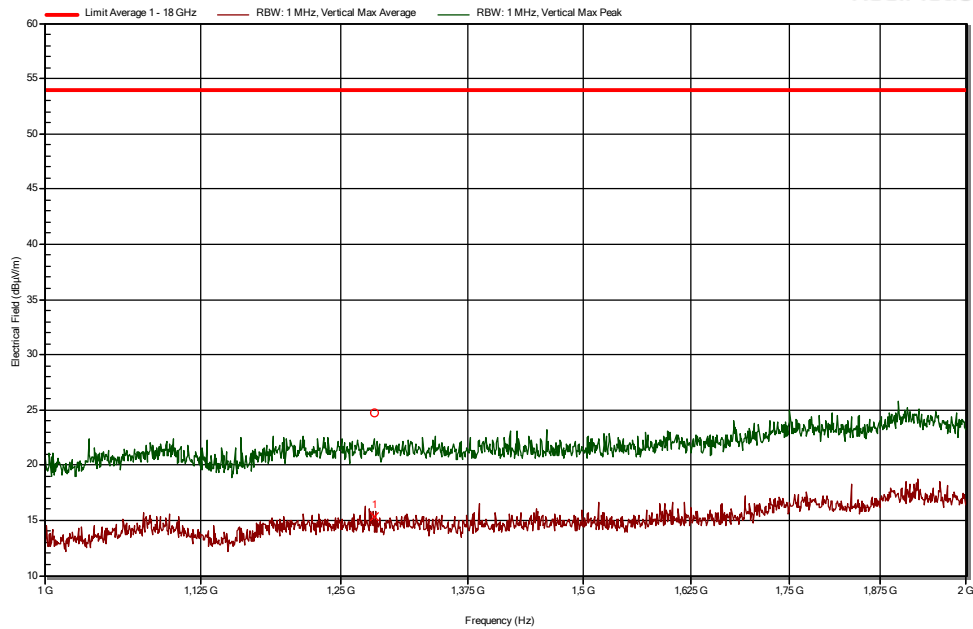
Frequency	Peak	Peak Limit	Angle	Height	Polarization
530,425 MHz	35,4 dB μ V/m	46 dB μ V/m	162 degrees	1 m	Horizontal
711,813 MHz	38,2 dB μ V/m	46 dB μ V/m	7 degrees	2,5 m	Horizontal
728,913 MHz	38,7 dB μ V/m	46 dB μ V/m	148 degrees	3 m	Horizontal
808,038 MHz	40,4 dB μ V/m	46 dB μ V/m	168 degrees	4 m	Horizontal
854,988 MHz	40,3 dB μ V/m	46 dB μ V/m	340 degrees	3,5 m	Horizontal
905,838 MHz	42 dB μ V/m	46 dB μ V/m	90 degrees	4 m	Horizontal

Frequency	Peak	Peak Limit	Angle	Height	Polarization
445 MHz	33,6 dB μ V/m	46 dB μ V/m	354 degrees	1 m	Vertical
865,113 MHz	39,6 dB μ V/m	46 dB μ V/m	129 degrees	4 m	Vertical
904,863 MHz	41,9 dB μ V/m	46 dB μ V/m	171 degrees	4 m	Vertical
939,925 MHz	41,4 dB μ V/m	46 dB μ V/m	35 degrees	1,5 m	Vertical
982,113 MHz	41,5 dB μ V/m	54 dB μ V/m	7 degrees	1 m	Vertical
808,413 MHz	41,7 dB μ V/m	46 dB μ V/m	122 degrees	2,5 m	Vertical

1 – 2 GHz

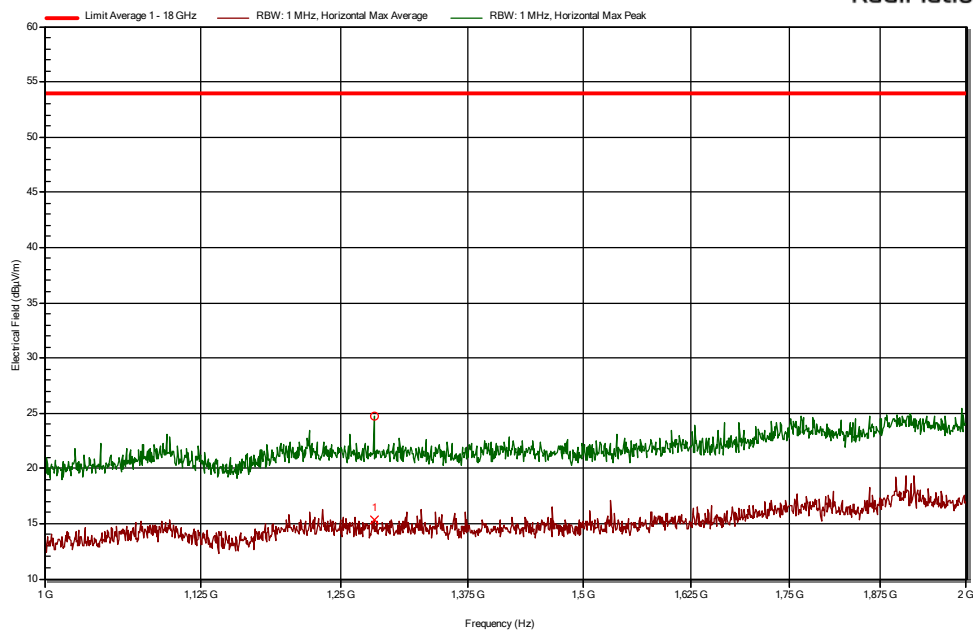
Vertical polarization

RadiMation



Horizontal polarization

RadiMation



Peak emissions table

Frequency	Peak	Average	Average Limit	Angle	Height	Polarization
1,281 GHz	24,8 dB μ V/m	15,4 dB μ V/m	54 dB μ V/m	48 degrees	1 m	Horizontal
1,041 GHz	20,4 dB μ V/m	12,6 dB μ V/m	54 dB μ V/m	182 degrees	1 m	Horizontal
1,096 GHz	23,1 dB μ V/m	12,9 dB μ V/m	54 dB μ V/m	9 degrees	3,5 m	Horizontal
1,666 GHz	24,1 dB μ V/m	13,9 dB μ V/m	54 dB μ V/m	137 degrees	2,5 m	Horizontal
1,686 GHz	24,1 dB μ V/m	16,4 dB μ V/m	54 dB μ V/m	201 degrees	2 m	Horizontal
1,859 GHz	24,7 dB μ V/m	14,9 dB μ V/m	54 dB μ V/m	18 degrees	1 m	Horizontal
1,992 GHz	25,4 dB μ V/m	15,1 dB μ V/m	54 dB μ V/m	10 degrees	1,5 m	Horizontal

3.2 AC power line conducted emissions

3.2.1 Limit

According to 15.107 (a)

(a) Except for Class A digital devices, for equipment 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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.2.4 Test procedure

According to ANSI C63.4: 2014, section 13.3

IRN 029 – Method 1

3.2.5 Peak table of the AC power line emission measurement

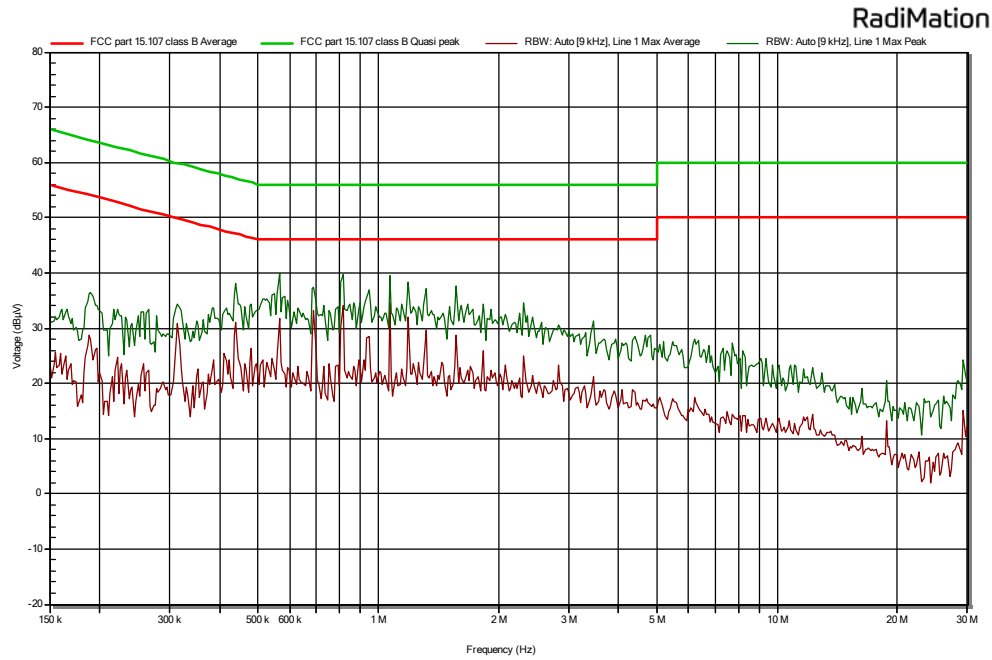
Frequency	Peak	Average	Average Limit	LISN
439,339 kHz	38,2 dB μ V	31,1 dB μ V	47,1 dB μ V	Phase
563,422 kHz	39,9 dB μ V	31,7 dB μ V	46 dB μ V	Phase
687,482 kHz	37,5 dB μ V	33,1 dB μ V	46 dB μ V	Phase
814,188 kHz	39,7 dB μ V	34,1 dB μ V	46 dB μ V	Phase
1,065 MHz	39,6 dB μ V	34,7 dB μ V	46 dB μ V	Phase
1,188 MHz	38,4 dB μ V	31,9 dB μ V	46 dB μ V	Phase

3.2.6 Measurement uncertainty

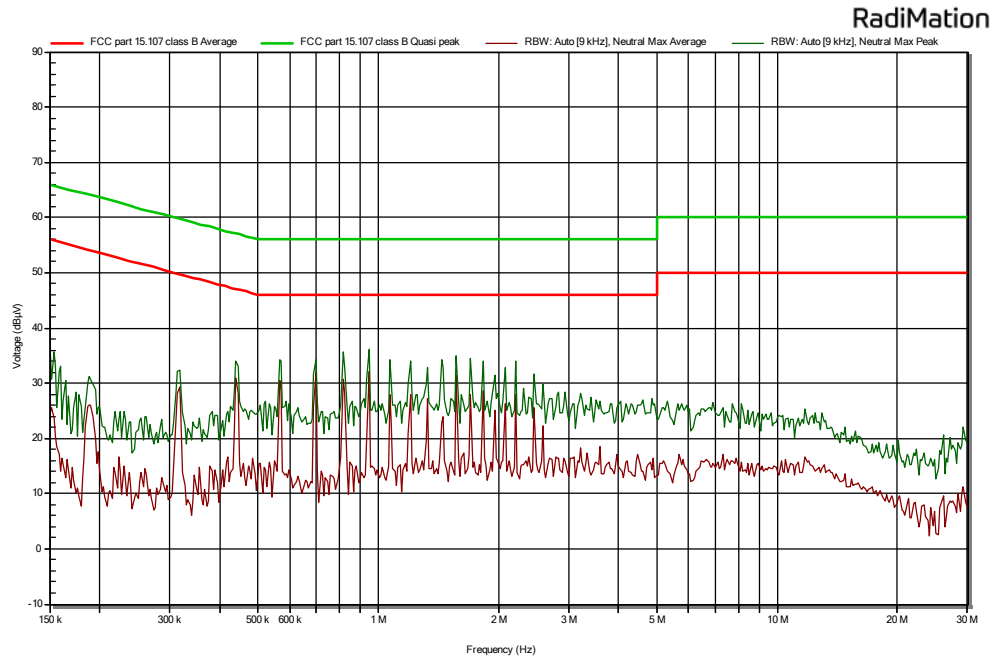
+/- 3.6 dB

3.2.7 Plots of the AC mains conducted spurious measurement

Phase 110 Vac



Neutral 110 Vac



4 Sample calculations

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

Conducted emission Measurement:

$$U_{\text{lisn}} (\text{dB}\mu\text{V}) = U (\text{dB}\mu\text{V}) + \text{Corr. (dB)}$$

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 Rohde & Schwarz ENV216	TE 11134	
0,15	9.6	0,02	9.62
0,3	9.6	0,03	9.63
0,5	9.6	0,08	9.68
0,7	9.7	0,25	9.95
1	9.6	0,11	9.71
3	9.6	0,21	9.81
5	9.6	0,21	9.81
7	9.7	0,25	9.95
10	9.7	0,29	9.99
15	9.7	0,34	10.04
20	9.8	0,37	10.17
22	9.6	0,39	9.99
24	9.6	0,43	10.03
30	9.6	0,45	10.05

Field Strength Measurement:

$$E \text{ (dB}\mu\text{V/m)} = U \text{ (dB}\mu\text{V)} + AF \text{ (dB/m)} + \text{Corr. (dB)}$$

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)	Cable loss (dB)	Corr. (dB)
	Id: 114436 Schwarzbeck VHA9103+BBA9106 SN: 9856	Id: SAR cable	
30	18,64	0,68	19,32
100	10,43	1,15	11,58
150	14,76	1,41	16,17
200	16,04	1,63	17,67
250	16,89	1,93	18,82

Frequency (MHz)	AF (dB/m)	Cable loss (dB)	Corr. (dB)
	Id: 114385 EMCO 3147 SN: 9104-1031	Id: SAR cable	
250	11,8	1,93	13,73
300	13	2,12	15,12
350	14,2	2,2	16,4
400	15,6	2,29	17,89
450	17,1	2,53	19,63
500	17,3	2,67	19,97
550	17,7	2,9	20,6
600	18,4	3,02	21,42
650	19,2	3,09	22,29
700	19,7	3,22	22,92
750	20,3	3,56	23,86
800	21,4	3,69	25,09
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)	Gain (dB)	Cable loss (dB)	Corr. (dB)
	TE 00531 Emco 3115 SN: 9412-4377	TE 11132 Miteq JS4-18004000-30-8P-A1	TE 01315	
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)	Gain (dB)	Cable loss (dB)	Corr. (dB)
	TE 00818 Flann 20240-25 SN: 163703	TE 11131 Miteq JS4-18004000-30-8P-A1	TE 01315	
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

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