

FCC Test report for parts 15.107, 15.109, ICES-003

Product name : 95-1300-0200
Applicant : TMSi BV

Test report No. : P000207337 002 Ver 2.00

Laboratory information

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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	15-11-2022	First draft	KK
v1.00	09-12-2022	Final version	KK
v2.00	17-01-2023	Section 1.8, additional remarks has been added	KK

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Summary of Test results

FCC part 15B	ISED	Description	Section in report	Verdict
15.109 (b)	ICES 003	Radiated spurious emissions	3.1	Pass
15.107 (b)	ICES 003	Conducted spurious emissions on AC mains	3.2	Pass

1 General Description

1.1 Applicant

Client name:	TMSi BV
Address	Zutphenstraat 57, Oldenzaal Netherlands
Zip code:	7575 EJ
Telephone:	+31 541216643
E-mail:	sake.kroondijk@tmsi.com
Contact name:	Sake Kroondijk

1.2 Manufacturer

Manufacturer name:	TMSi BV
Address:	Zutphenstraat 57, Oldenzaal Netherlands
Zip code:	7575 EJ
Telephone:	+31 541216643
E-mail:	sake.kroondijk@tmsi.com
Contact name:	Sake Kroondijk

1.3 Tested Equipment Under Test (EUT)

Product name:	95-1300-0200
Brand name:	TMSi BV
Product type:	EEG amplifier
Model(s):	-
Batch and/or serial No.	-
Software version:	1.0
Hardware version:	V2-Rev2
Date of receipt	11-10-2022
Tests started:	21-10-2022
Testing ended:	28-10-2022

1.4 Product specifications of Equipment under test

Tx Frequency:	BLE: 2402 – 2480 MHz
Rx frequency:	BLE: 2402 – 2480 MHz
Antenna type:	Ceramic chip antenna
Antenna gain:	1.86 dBi
Type of modulation:	GFSK

1.5 Environmental conditions

Test date	21-10-2022
Ambient temperature	20.7 C°
Humidity	56.3 %

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
- FCC Part 15 Subpart B §15.109
- ICES-003 Issue 7

1.8 Observation and remarks

The EUT is considered class B equipment. The EUT has been tested with all the possible ports connected to the ancillary equipment including the USB-C port and trigger connectors.

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 : Koray Korcum, MSc

Review of test methods and report by:

Name : Roy van Barneveld

The above conclusions have been verified by the following signatory:

Date : 21-02-2023

Name : R. van Barneveld

Function : Test engineer

Signature :



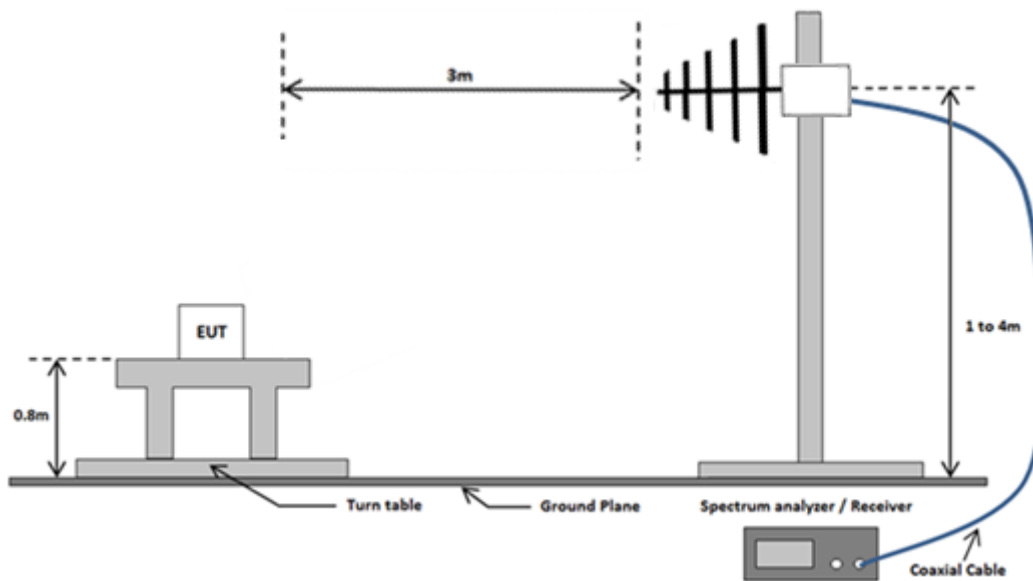
2 Test configuration of the Equipment Under Test

2.1 Test mode

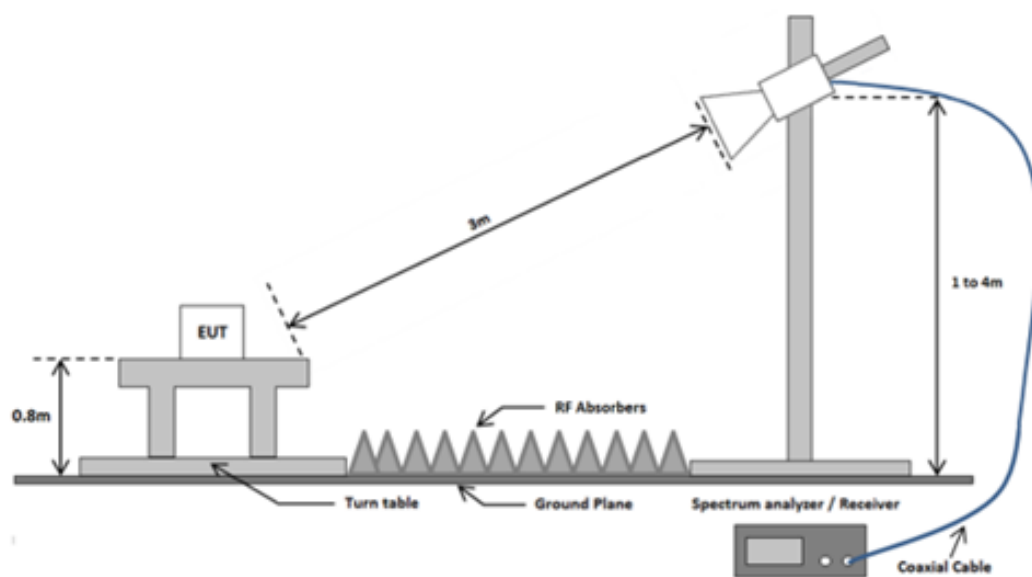
The EUT is tested in normal operating mode, with all ports connected.

2.2 Test setups

Radiated emissions test setup 30 MHz - 1 GHz

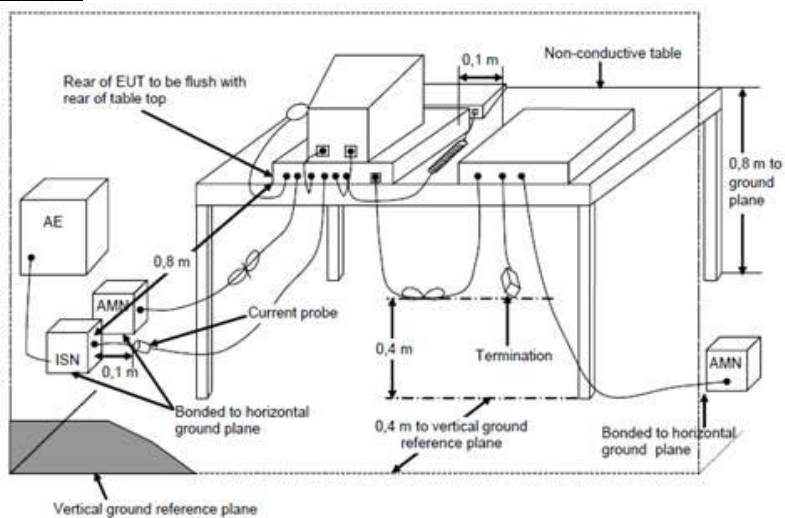


Radiated emissions test setup above 1 GHz



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.
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	03-2022	03-2023	3.1
EMI Receiver	Rohde & Schwarz	ESR7	114534	04-2022	04-2023	3.1 – 3.2
Test software	DARE	Radimation	--	-	-	3.1 – 3.2
Active loop antenna	EMCO	6502	TE11171	01-2022	01-2024	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436 + 114254	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	TE11175	01-2022	01-2023	3.1
Two line V-network	Rohde & Schwarz	ESH3-Z5	114379	07-2021	07-2022	3.2

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

15.109 (b)

The field strength of radiated emissions from a Class A digital device shall not exceed the following:

Frequency of emission (MHz)	Field strength at 3m (dBμV/m)
30 – 88	49.5
88 – 216	54.0
216 – 960	56.9
960 and above	60.0

15.109 (b)

The field strength of radiated emissions from a Class B digital device shall not exceed the following:

Frequency of emission (MHz)	Field strength at 3m (dBμV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
960 and above	54.0

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

9 kHz – 30 MHz: According to ANSI C63.4-2014, section 5.4.2 and 8.2.3

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

9 kHz to 30 MHz: IRN 026 – Method 10

30 MHz to 1 GHz: IRN 026 – Method 1

1 GHz to 18 GHz: IRN 026 – Method 2

18 to 26.5 GHz: IRN 026 – Method 3

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

Peak Table

Measured peaks Horizontal 30 – 1000 MHz Low channel

Frequency (MHz)	Polarization	Height (m)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Quasi-Peak Difference (dB)
35,509	Vertical	1	36,8	40	-3,2

Measured peaks Horizontal 30 – 1000 MHz Middle channel

Frequency (MHz)	Polarization	Height (m)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Quasi-Peak Difference (dB)
950,284	Horizontal	1,5	42,3	46	-3,7
917,508	Horizontal	1,5	41,6	46	-4,4

Measured peaks Horizontal 1 – 18 GHz Low channel

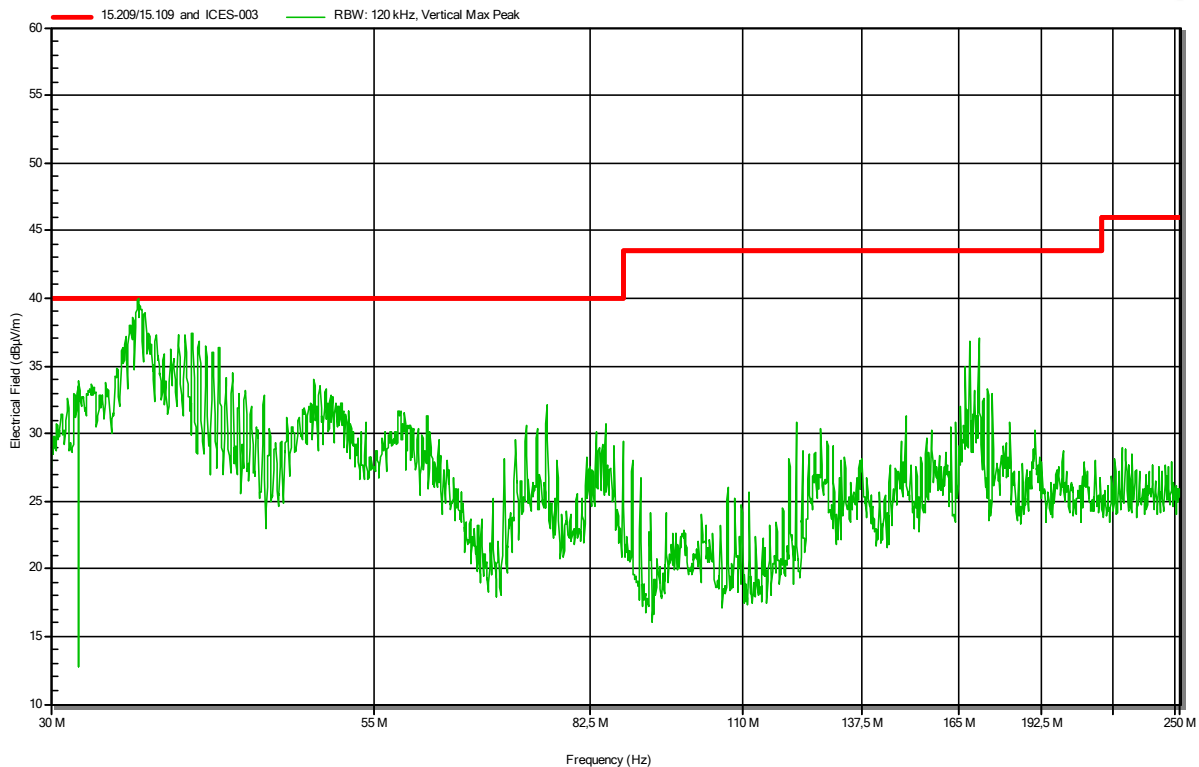
Frequency (MHz)	Polarization	Height (m)	Peak (dB μ V/m)	Average (dB μ V/m)	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)	Peak Difference (dB)	Average Difference (dB)
1733,125	Horizontal	3,5	39,7	25,3	74	54	-34,3	-28,7
2402,5	Horizontal	2,5	42,4	26,4	74	54	-31,6	-27,6
17870	Horizontal	2.5	57.2	46.6	74	54	-16.8	-7.4

3.1.6 Plots of the Radiated Spurious Emissions Measurement

30 MHz to 250 MHz

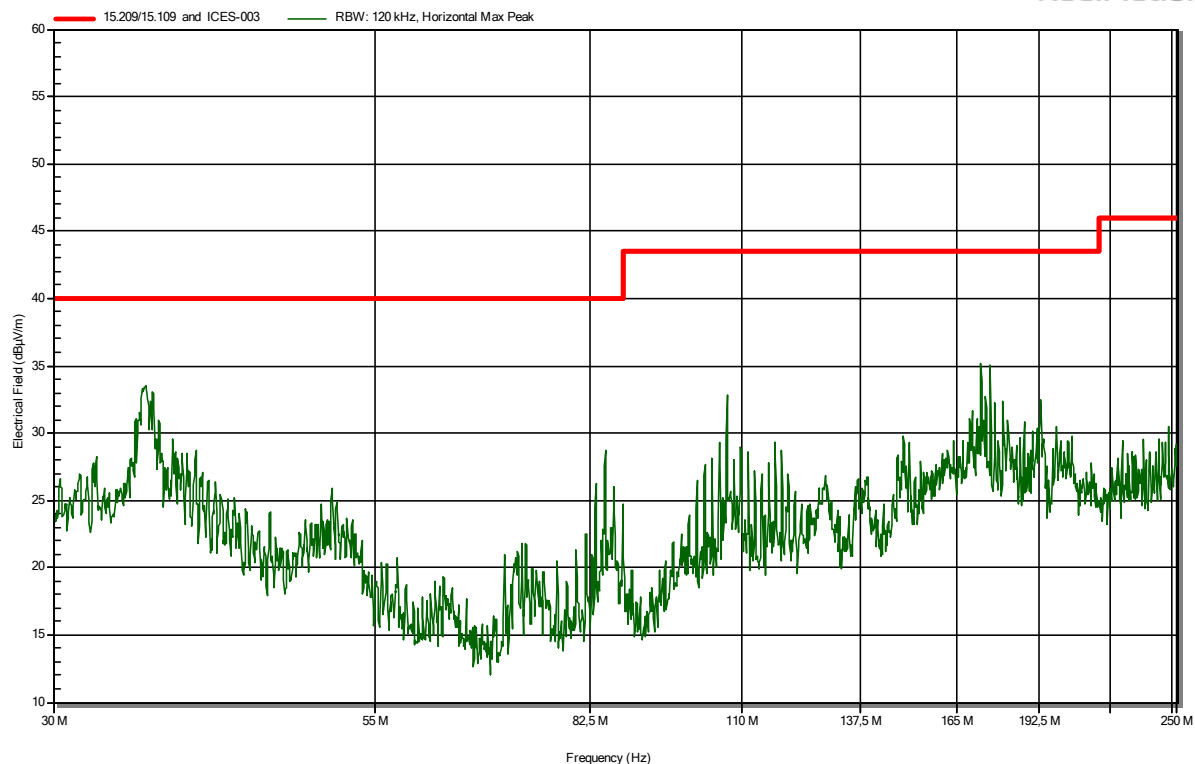
Vertical polarization

RadiMation



Horizontal polarization

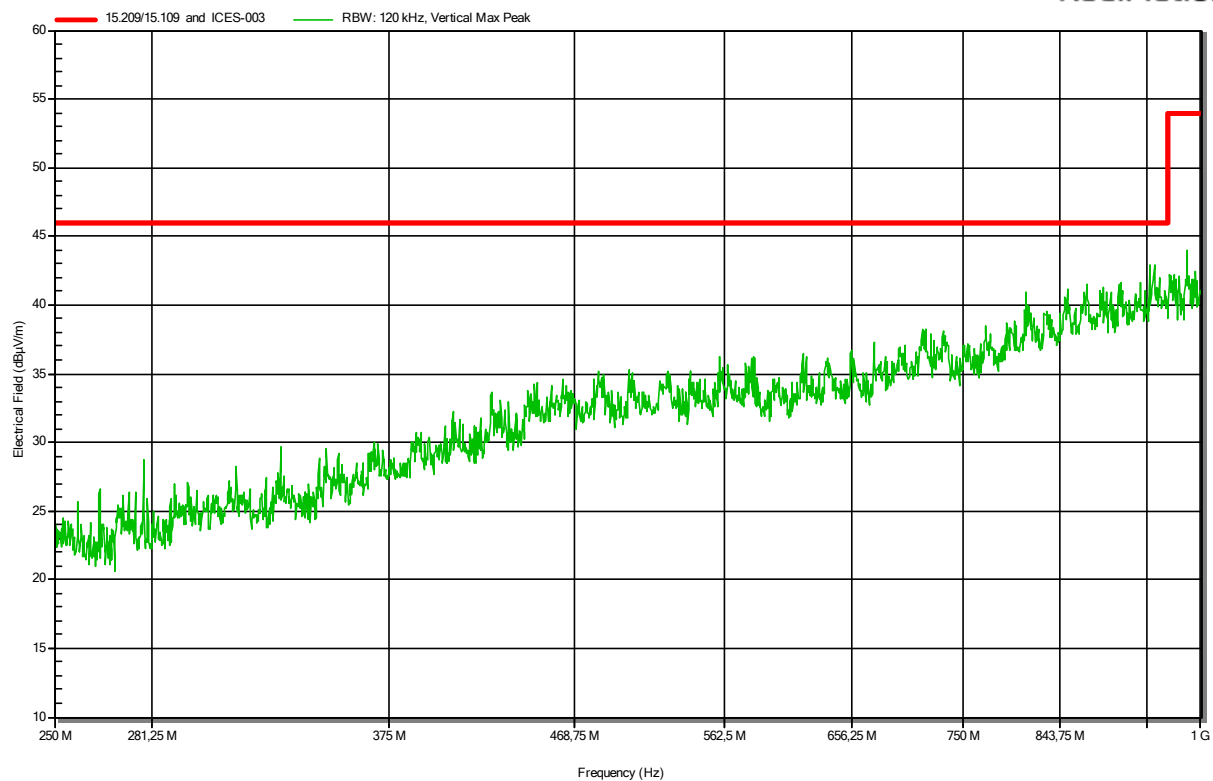
RadiMation



250 MHz to 1000 MHz

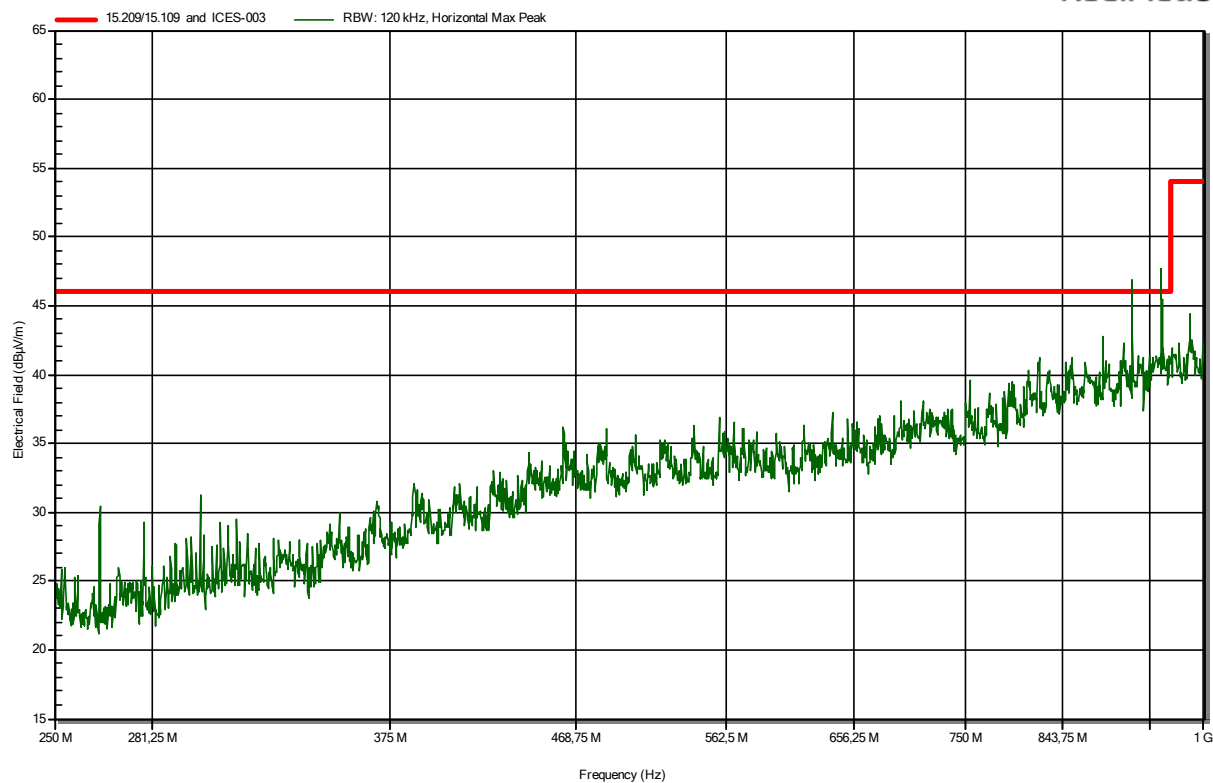
Vertical polarization

RadiMation



Horizontal polarization

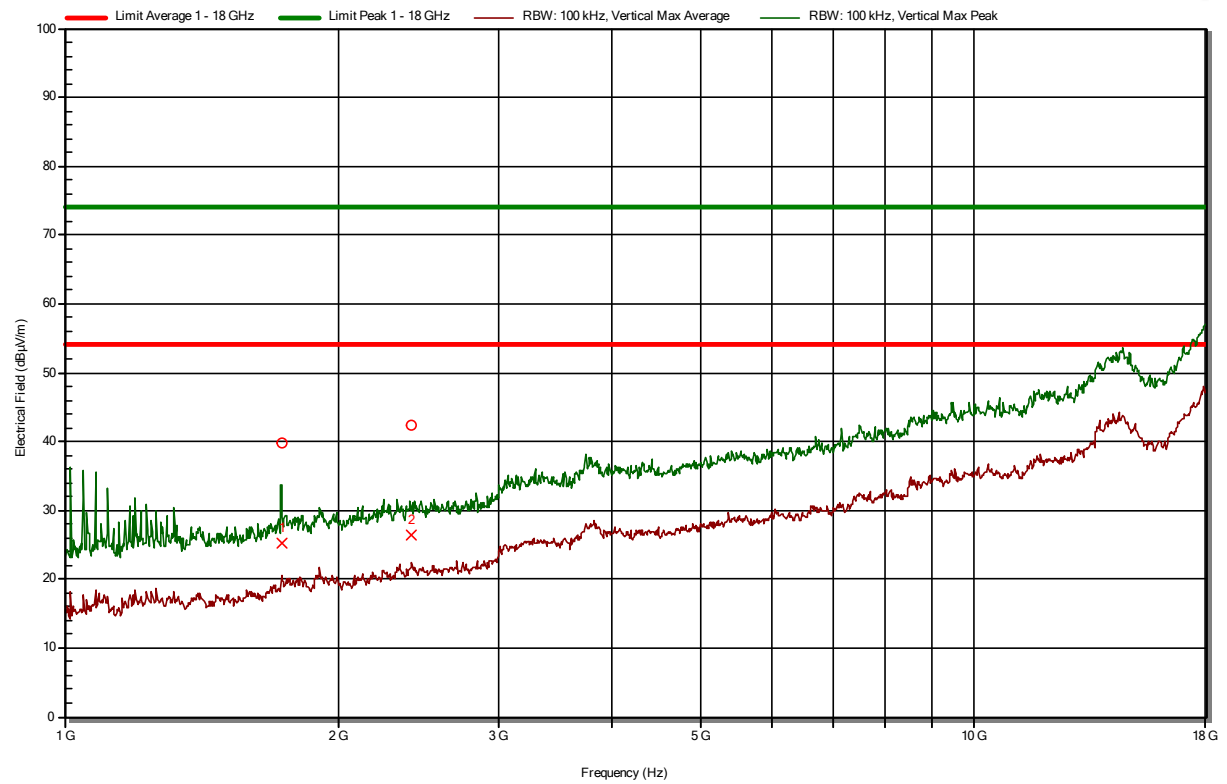
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1 GHz to 18 GHz

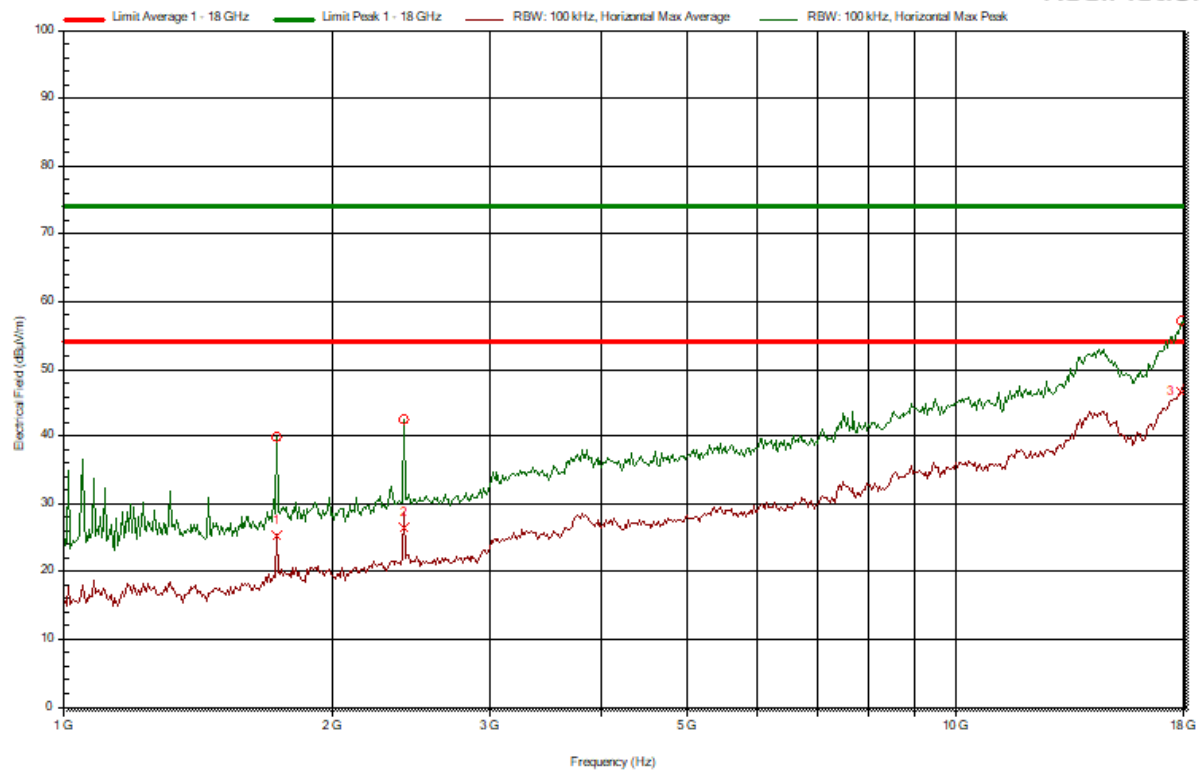
Vertical polarization

RadiMation



Horizontal polarization

RadiMation



3.2 Conducted emissions

3.2.1 Limit

According to 15.107(a), Class B

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-Peak	Average
0.15 – 0.50	66 to 56*	56 to 46*
0.50 – 5.0	56	46
5.0 - 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 Test results and plots of the AC mains conducted measurement

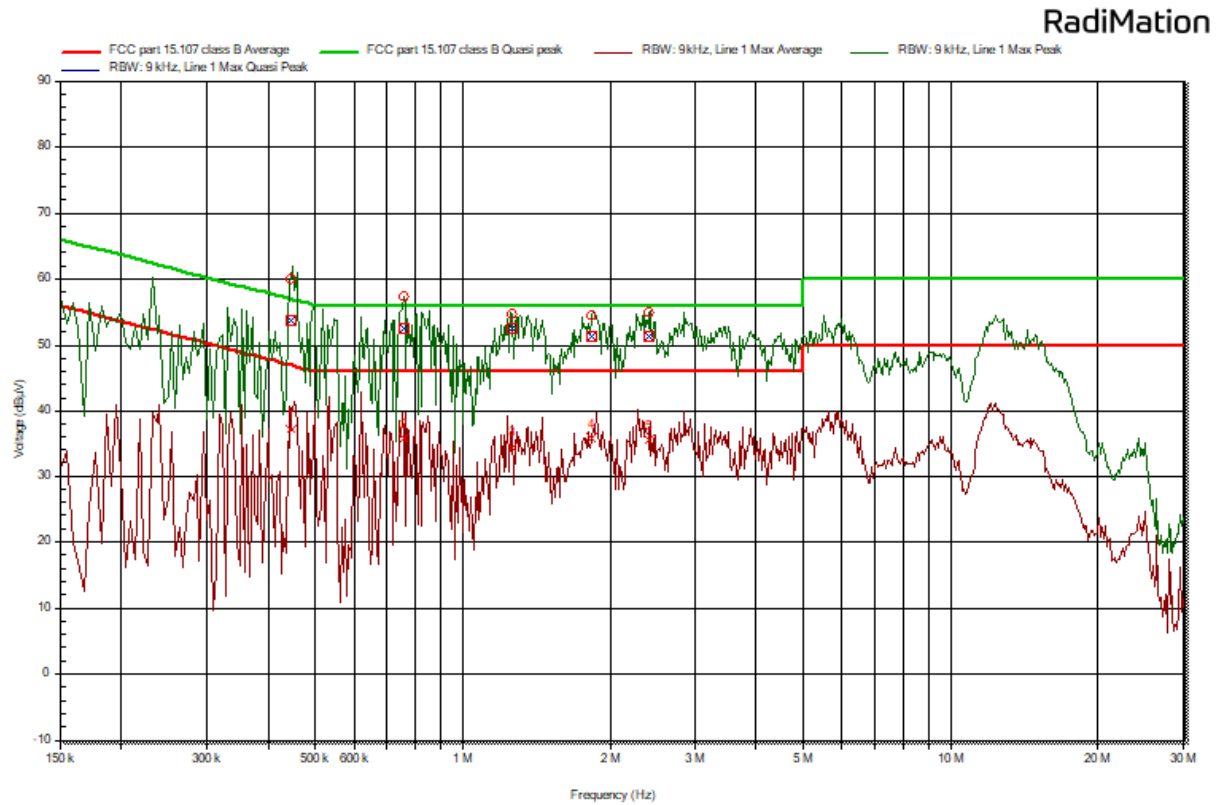
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3.2.6 Measurement uncertainty

+/- 3.6 dB

3.2.7 Plots of the AC mains conducted spurious measurement

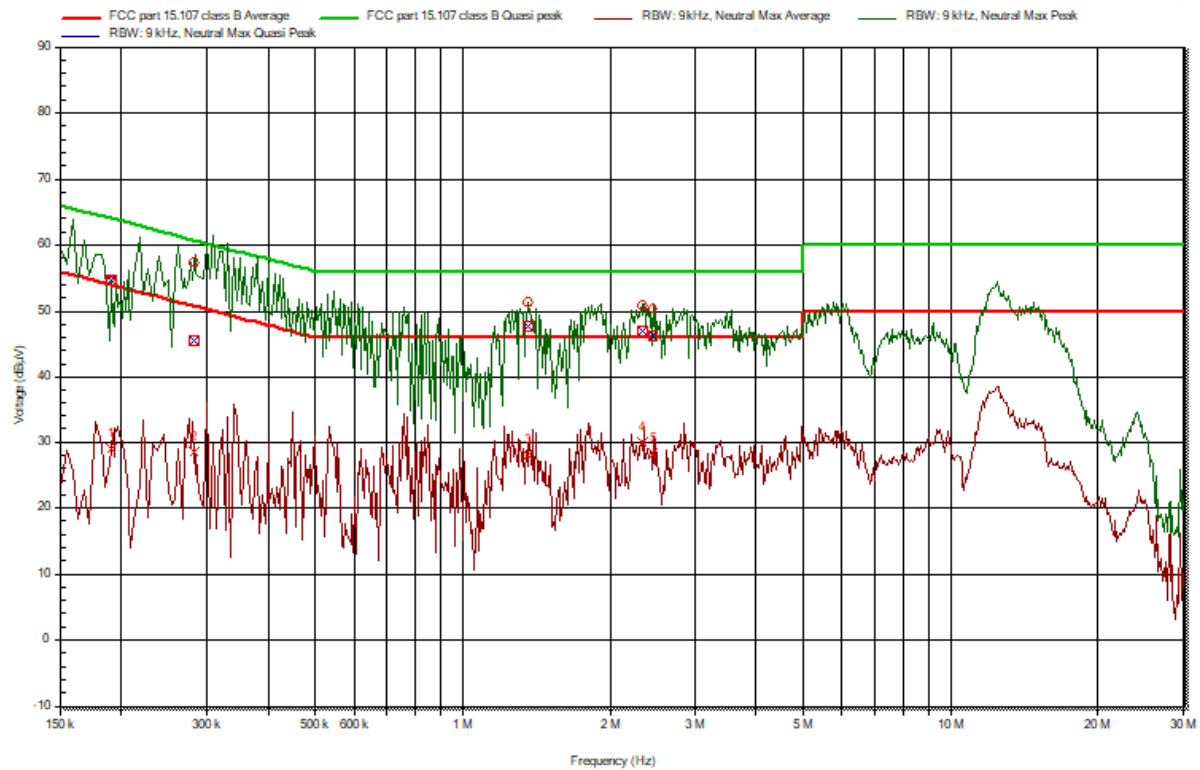
Phase



Frequency	Peak	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
444,3 kHz	59,9 dBμV	37,1 dBμV	47 dBμV	53,6 dBμV	57 dBμV	Pass
755,7 kHz	57,3 dBμV	35,7 dBμV	46 dBμV	52,4 dBμV	56 dBμV	Pass
1,261 MHz	54,8 dBμV	34,3 dBμV	46 dBμV	52,6 dBμV	56 dBμV	Pass
1,837 MHz	54,4 dBμV	35,7 dBμV	46 dBμV	51,3 dBμV	56 dBμV	Pass
2,401 MHz	54,9 dBμV	35,4 dBμV	46 dBμV	51,2 dBμV	56 dBμV	Pass

Neutral

RadiMation



Frequency	Peak	Average	Average Limit	Quasi-Peak	Quasi-Peak Limit	Status
190,95 kHz	54,4 dBμV	29 dBμV	54 dBμV	54,7 dBμV	64 dBμV	Pass
283,2 kHz	57,2 dBμV	28,5 dBμV	50,7 dBμV	45,5 dBμV	60,7 dBμV	Pass
1,36 MHz	51,4 dBμV	28 dBμV	46 dBμV	47,6 dBμV	56 dBμV	Pass
2,338 MHz	50,8 dBμV	29,8 dBμV	46 dBμV	47 dBμV	56 dBμV	Pass
2,449 MHz	50,5 dBμV	28,1 dBμV	46 dBμV	46,3 dBμV	56 dBμV	Pass