

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

Product name : Hable One
Applicant : Hable One BV

Test report No. : P000133072 005 v1.00

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).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001.

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The Industry Canada company number for Telefication is: 4173A.

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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	26-08-2022	First draft	RvB
v1.00	05-09-2022	Release version	RvB

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Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.109	ICES-003 Table 2	Radiated spurious emissions	3.1	Pass
15.107	ICES-003 Table 1	Conducted spurious emissions on AC mains	3.2	Pass

1 General Description

1.1 Applicant

Client name:	Hable One BV
Address	Torenallee, 20 Eindhoven, The Netherlands
Zip code:	5671 BC
Telephone:	+31 687595573
E-mail:	ayushman@iamhable.com
Contact name:	Mr. T. Ayushman

1.2 Manufacturer

Manufacturer name:	Hable One BV
Address:	Torenallee, 20 Eindhoven, The Netherlands
Zip code:	5671 BC
Telephone:	+31 687595573
E-mail:	ayushman@iamhable.com
Contact name:	Mr. T. Ayushman

1.3 Tested Equipment Under Test (EUT)

Product name:	Hable One
Brand name:	Hable
Product type:	Wireless phone keyboard
Variant model(s):	--
Software version:	--
Hardware version:	--
Date of receipt	27-07-2022
Tests started:	17-08-2022
Testing ended:	17-08-2022

1.4 Product specifications of Equipment under test

TX Frequency range (MHz):	BLE: 2400 – 2483.5 MHz
RX frequency range (MHz):	BLE: 2400 – 2483.5 MHz
Antenna type:	Chip
Antenna Gain:	0 dBi
Type of modulation:	According Bluetooth spec.

1.5 Environmental conditions

Test date	01-08-2022	02-08-2022	04-08-2022
Ambient temperature	23.9°C	24.2°C	23.7°C
Humidity	59.5%	56.9%	64.2%

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 §15.107
- FCC Part 15 Subpart B §15.109
- ISED ICES-003, Issue 7

1.8 Modifications

None

1.9 Observation and remarks

The EUT is charged with a USB-C cable. This provided cable is max 15 cm in length.

No AC/DC adapter is supplied with the EUT. The AC power line conducted emission test is performed with a Samsung AC/DC adapter, model: EP-TA200.

1.10 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. R. van Barneveld

Review of test methods and report by:

Name : P. van Wanrooij, BASc

The above conclusions have been verified by the following signatory:

Date : 05-09-2022

Name : P. van Wanrooij

Function : Test Engineer

Signature :



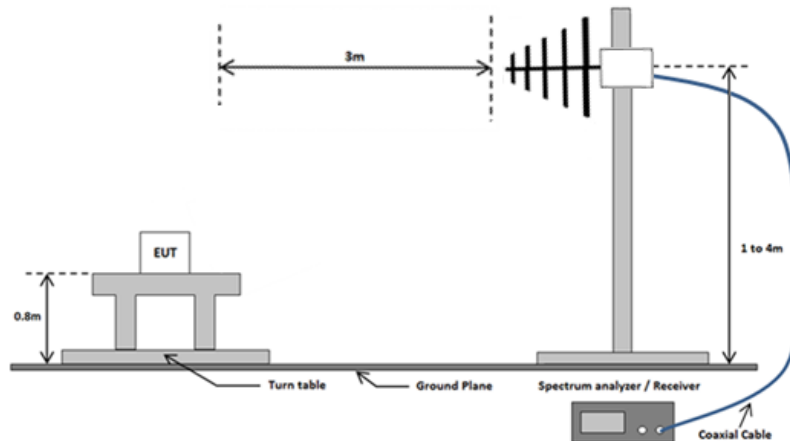
2 Test configuration of the Equipment Under Test

2.1 Test mode

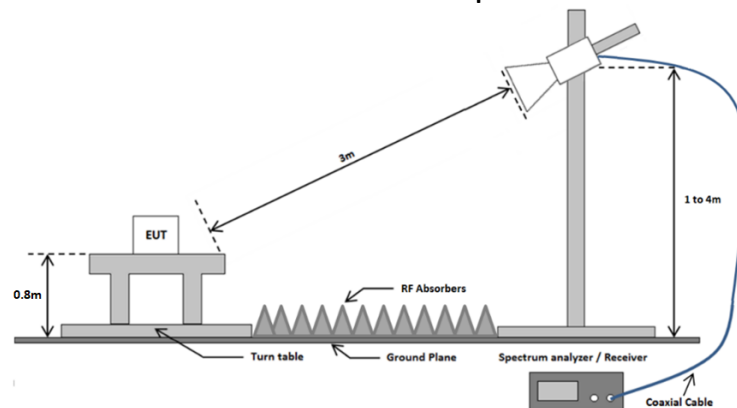
The EUT has been tested in normal (charging) operation.

2.2 Test setups

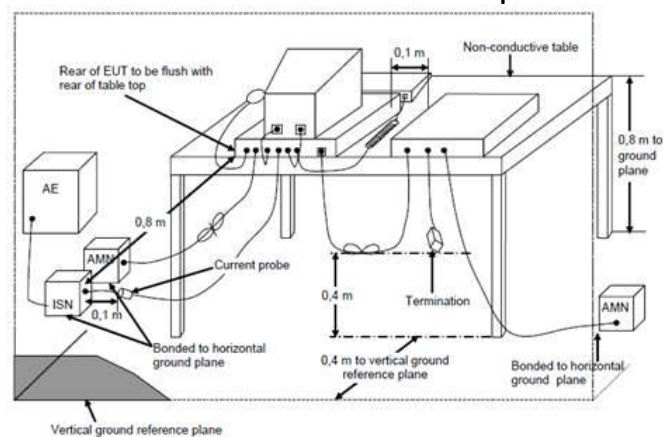
Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



Conducted emissions test setup



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	ESCI	114161	02-2022	02-2023	3.2
EMI Receiver	Rohde & Schwarz	ESR7	114534	01-2022	01-2023	3.1
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	--	--	3.1/3.2
Two line V-network	Rohde & Schwarz	ESH3-Z5	114379	07-2021	07-2022	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

Class B limits

Frequency (MHz)	Field strength (dB μ V/m)	Measurement distance(m)
30 -88	40	3
88 - 216	43.5	3
216 - 230	46	3
230-960	47	3
Above 960	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

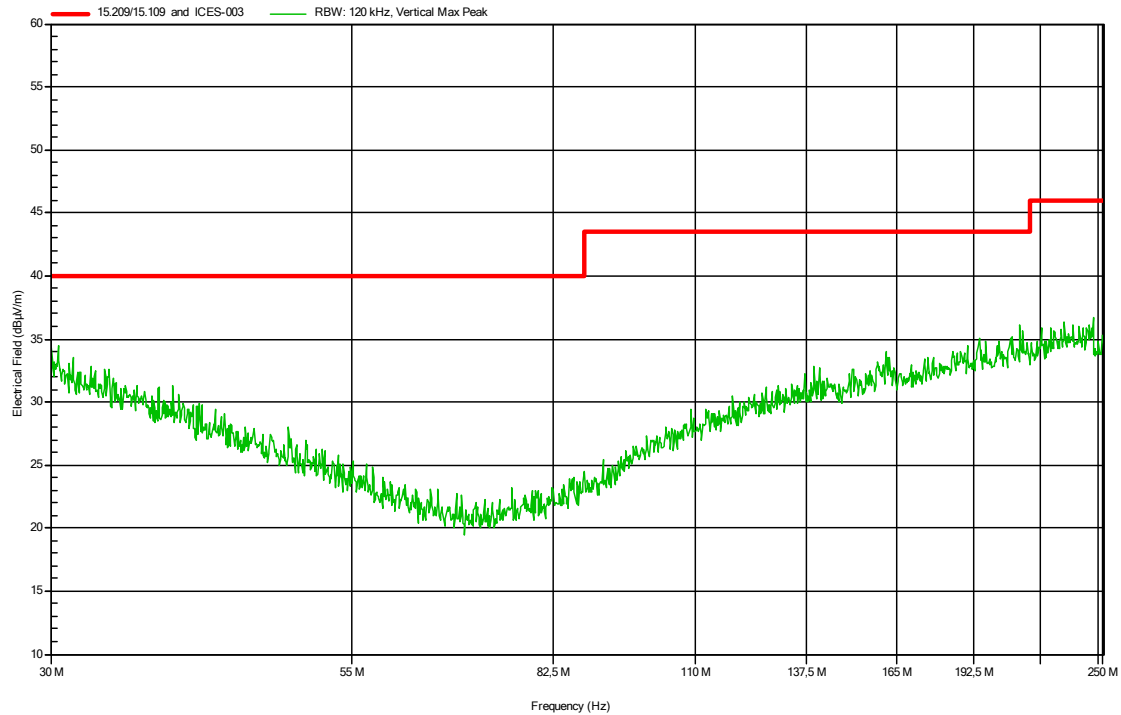
3.1.5 Measurement Uncertainty

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

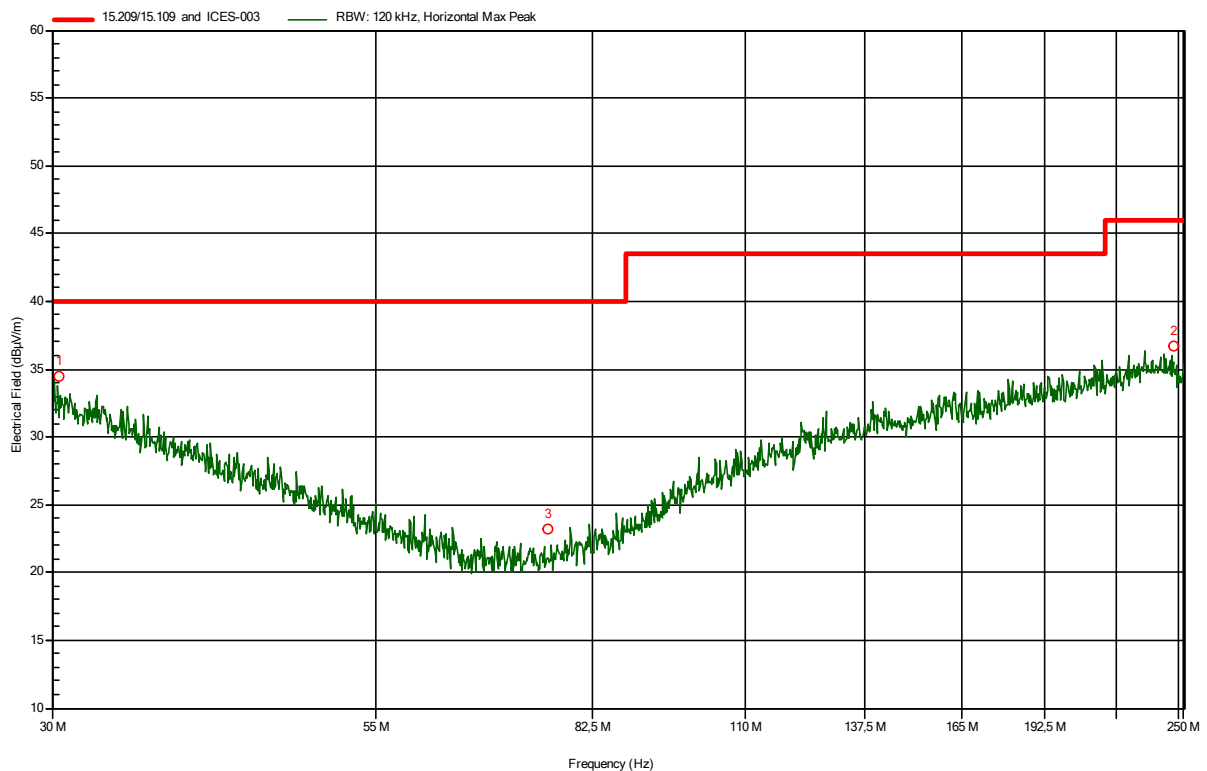
3.1.6 Plots of the Radiated Spurious Emissions Measurement

30 -250 MHz

Vertical polarization

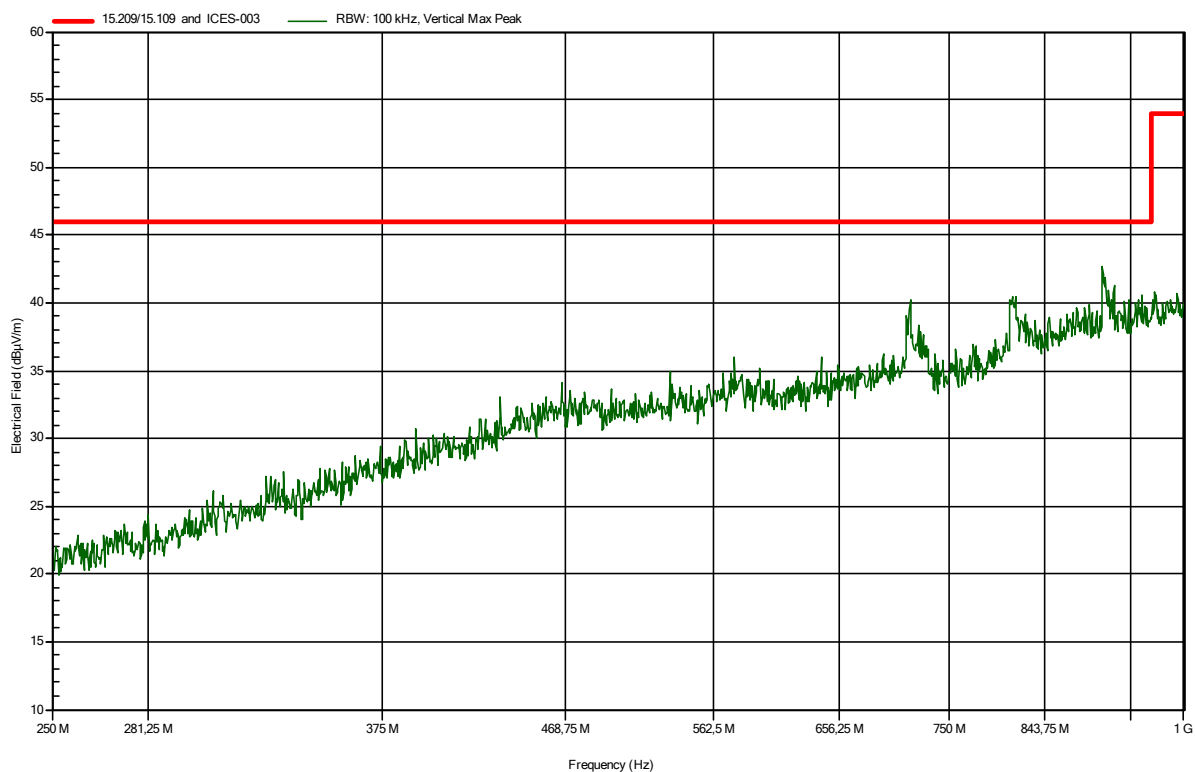


Horizontal polarization

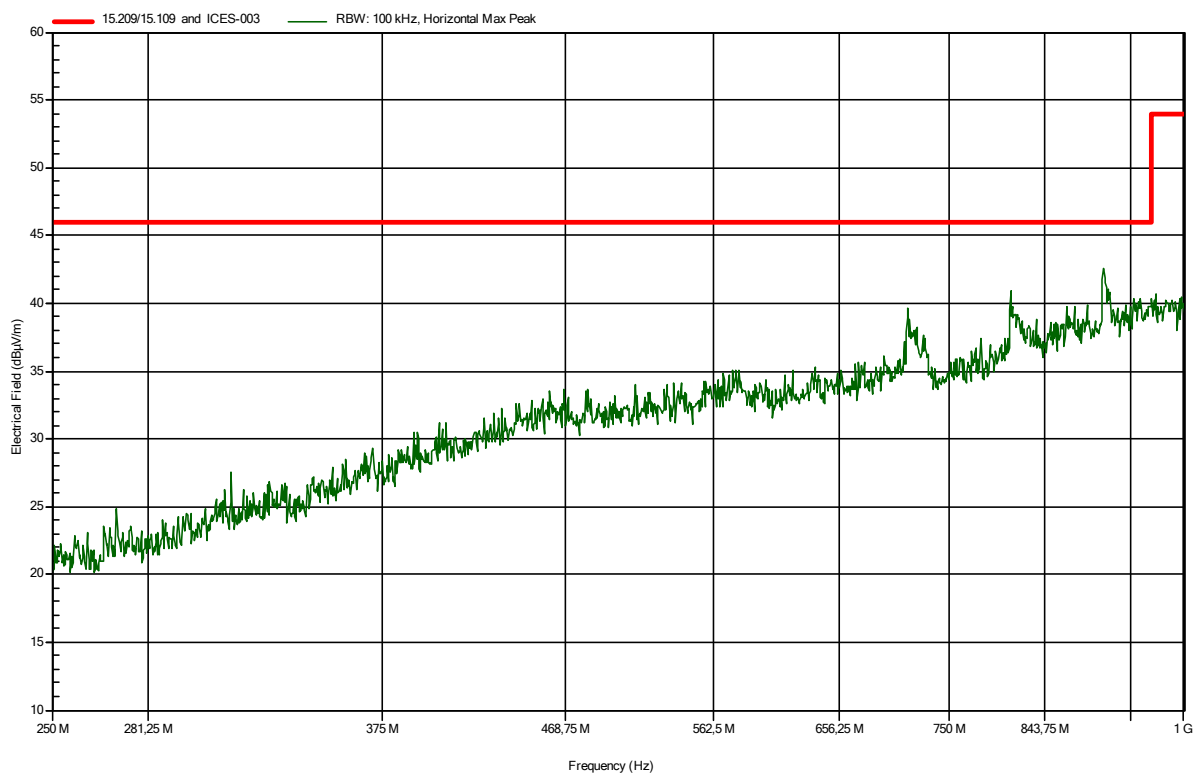


250 -1000 MHz

Vertical polarization

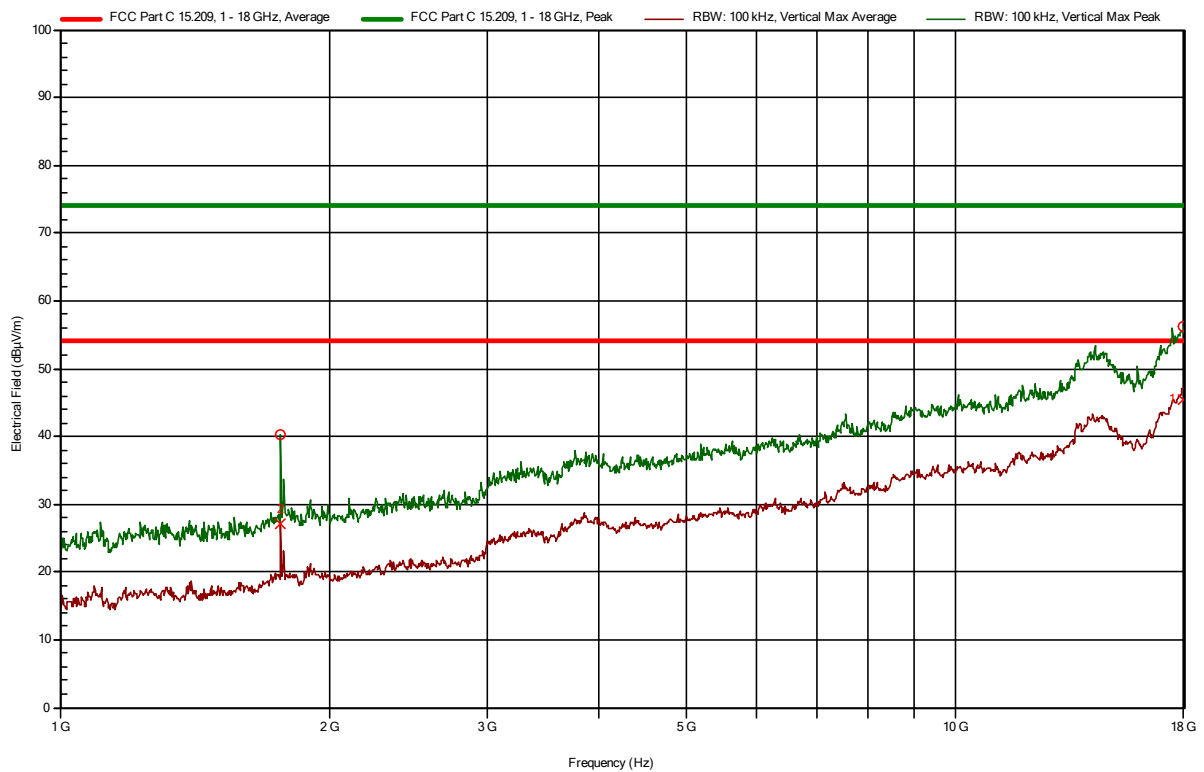


Horizontal polarization

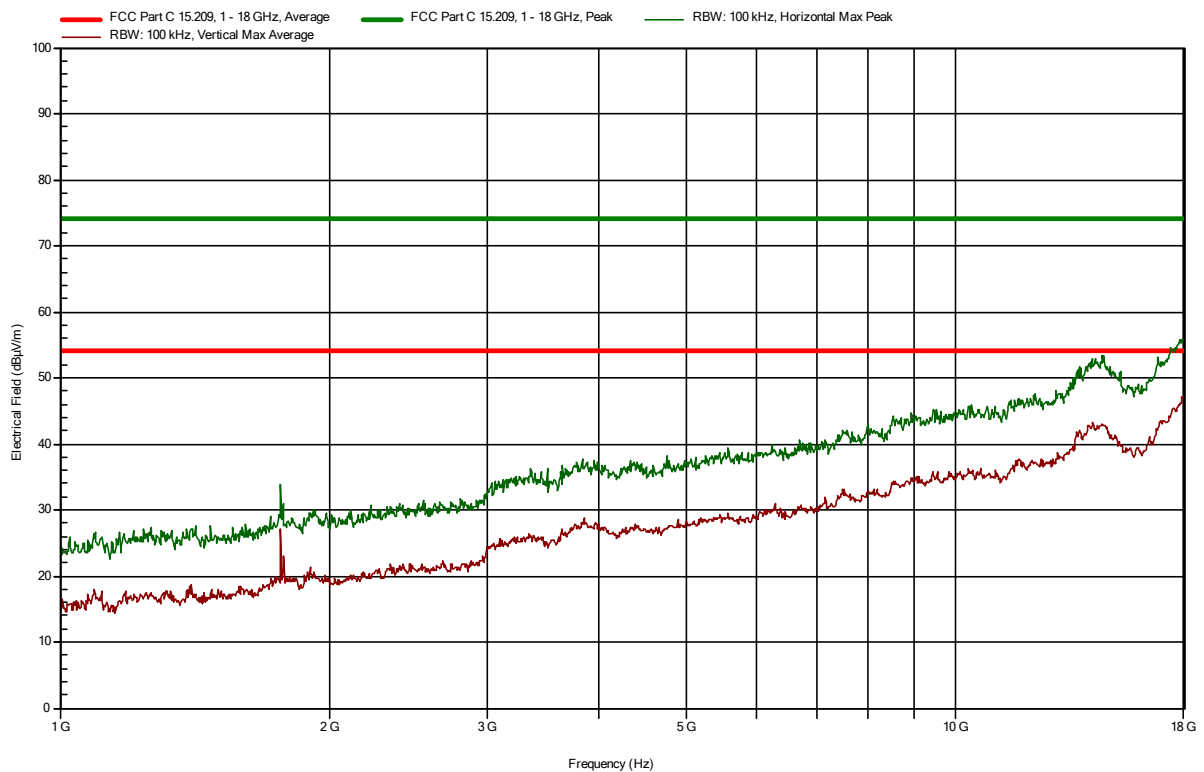


1 -18 GHz

Vertical polarization



Horizontal polarization



3.1.7 Peak table

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
17,962 GHz	56,3 dB μ V/m	74 dB μ V/m	45,4 dB μ V/m	54 dB μ V/m	Pass	305 degrees	3 m	Vertical
1,763 GHz	40,4 dB μ V/m	74 dB μ V/m	27 dB μ V/m	54 dB μ V/m	Pass	51 degrees	2,5 m	Vertical
1,011 GHz	25,1 dB μ V/m	74 dB μ V/m	13,5 dB μ V/m	54 dB μ V/m	Pass	340 degrees	4 m	Vertical
30,44 MHz	34,4 dB μ V/m	40 dB μ V/m	--	--	Pass	223 degrees	4 m	Vertical
244,885 MHz	36,7 dB μ V/m	46 dB μ V/m	--	--	Pass	138 degrees	3,5 m	Vertical
75,898 MHz	23,2 dB μ V/m	40 dB μ V/m	--	--	Pass	223 degrees	2 m	Vertical

3.2 Conducted emissions

3.2.1 Limit

According to 15.107 (c)/ ICES-003 Table 1

Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Class B limits

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

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

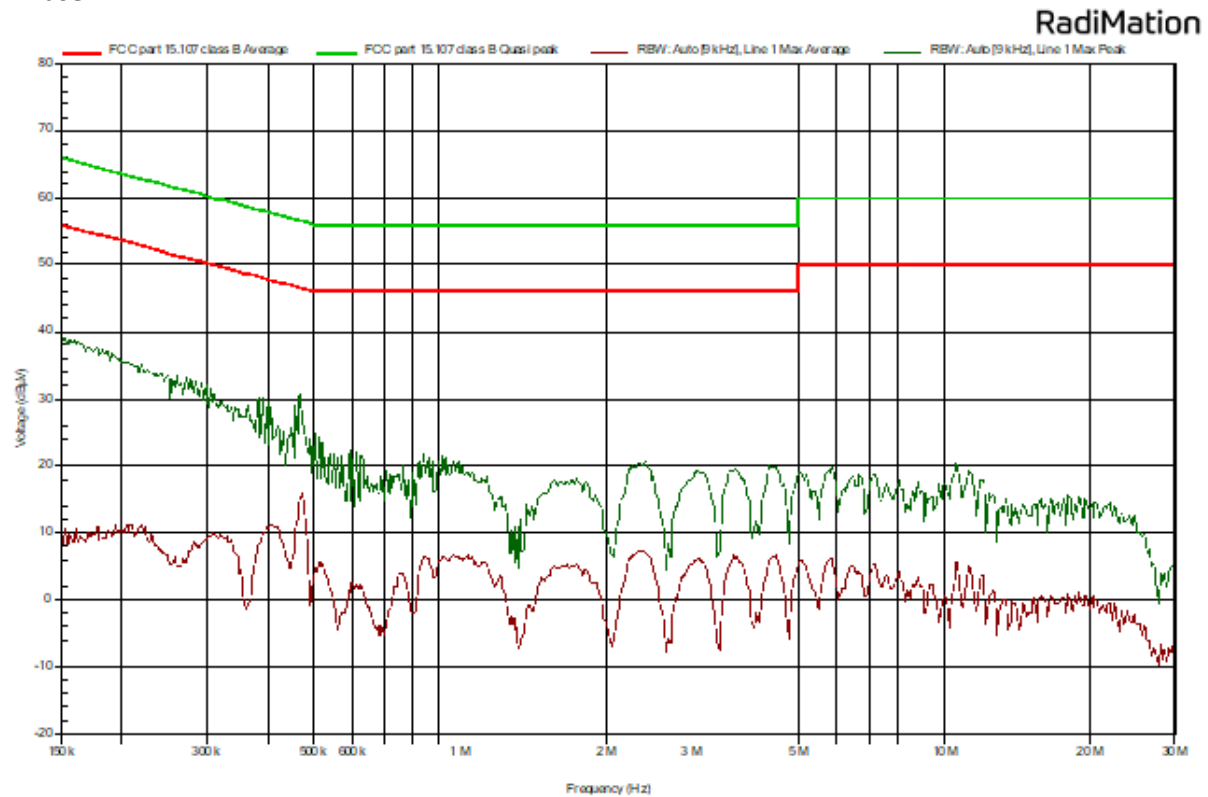
See next page.

3.2.6 Measurement uncertainty

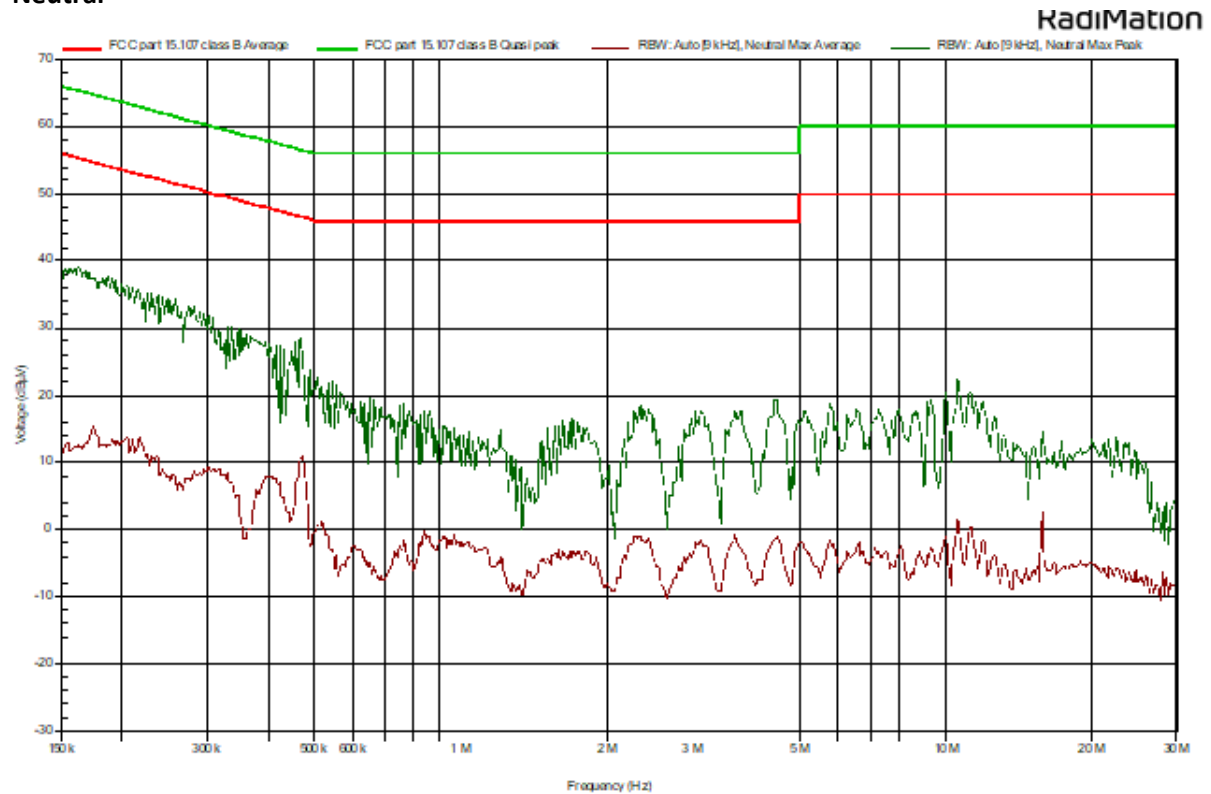
+/- 3.6 dB

3.2.7 Plots of the AC mains conducted spurious measurement

Phase



Neutral



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)	Insertion Loss Pulse limiter (dB)	Cable loss (dB)	Corr. (dB)
	TE 00208 SN: 892785/004 Rohde & Schwarz ESH3-Z5	TE 00756 SN: 5SM03153 Rohde & Schwarz ESH3-Z2	TE 11134	
0,15	0,09	9,87	0,02	9,98
0,2	0,1	9,87	0,03	10,0
0,3	0,1	9,87	0,03	10,0
0,5	0,1	9,87	0,08	10,05
0,7	0,12	9,87	0,25	10,24
0,8	0,12	9,87	0,25	10,24
1	0,13	9,87	0,11	10,11
2	0,16	9,87	0,15	10,18
3	0,19	9,87	0,21	10,27
5	0,26	9,88	0,21	10,35
7	0,36	9,89	0,25	10,5
8	0,39	9,89	0,25	10,53
10	0,46	9,91	0,29	10,66
15	0,77	9,93	0,34	11,04
20	0,95	9,96	0,37	11,28
25	1,12	9,99	0,43	11,54
30	1,1	10,04	0,45	11,59

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)
	TE 00967 Chase CBL6112A SN: 2308	Id: SAR cable	
30	18,6	0,68	19,28
100	10,7	1,15	11,85
150	10,6	1,41	12,01
200	9,3	1,63	10,93
250	12,6	1,93	14,53
300	13,3	2,12	15,42
350	14,6	2,2	16,8
400	15,5	2,29	17,79
450	16,9	2,53	19,43
500	17,5	2,67	20,17
550	18,4	2,9	21,3
600	18,8	3,02	21,82
650	19,2	3,09	22,29
700	19	3,22	22,22
750	19,8	3,56	23,36
800	19,7	3,69	23,39
900	20,4	3,81	24,21
950	20,8	3,91	24,71
1000	21,2	4,3	25,5

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	66,0
1500	25,1	40,5	2,4	68,0
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	79,0
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	82,0
9500	37,8	37,0	7,1	81,9
10000	38,2	36,5	7,3	82,0
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	89,0
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	98,0

End of Report