Test report for

47 CFR Part 15 Subpart B

ICES-003

The RvA is signatory to ILAC - MRA

Product name	: Chirp 2/Chirp+ 2/ECHO+/PRO2/ PRO+2
Applicant	: Deeper, UAB
FCC ID	: 2AHKO-CRP
IC	: 21307-CRP

Test report No. : P000486402 001 V1.00

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).

Kiwa Nederland B.V. 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 Kiwa Nederland B.V. is: 4173A. The CABID is NL0001.

Kiwa Nederland B.V. is a registered Conformity Assessment body (CAB) under the Japan-EC MRA (Agreement on Mutual Recognition between Japan and the European Community). The registration number is: 201.

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 Kiwa Nederland B.V.

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
v0.50	12-02-2025	First draft	GG
v1.00	04-04-2025	Final release	GG

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

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

1 General Description

1.1 Applicant

Client name:	Deeper, UAB
Address:	Antakalnio g. 17;
Zip code:	10312 Vilnius, Lithuania
Telephone:	--
E-mail:	Evaldas.jakeliunas@deeper.eu
Contact name:	Evaldas Jakeliūnas

1.2 Manufacturer

Manufacturer name:	Deeper, UAB
Address:	Antakalnio g. 17;
Zip code:	10312 Vilnius, Lithuania
Telephone:	--
E-mail:	Evaldas.jakeliunas@deeper.eu
Contact name:	Evaldas Jakeliūnas

1.3 Tested Equipment Under Test (EUT)

Product name:	Chirp+ 2
Brand name:	Deeper
FCC ID:	2AHKO-CRP
IC:	21307-CRP
Product description:	Wireless sonar with GNSS and temperature sensor
Product types:	Chirp+2 (GNSS and temperature sensor) Chirp+2 (GNSS, no temperature sensor) Chirp 2 (no GNSS, only temperature sensor) Chirp 2 (no GNSS, no temperature sensor) PRO2 PRO+2
Model no.	DP4H11S10 DP4H12S10 DP4H13S10 DP4H23S10 DP6H13S10 DP6H13S11 DP6H23S10 DP5H13S10 DP5H23S10
Software version:	--
Hardware version:	--
Date of receipt	21-11-2024
Tests started:	10-02-2025
Testing ended:	26-03-2025

1.4 Product specifications of Equipment under test

Tx Frequency:	802.11b/g/n: 2400 – 2483.5 MHz
Rx frequency:	GPS: 1575 MHz 802.11b/g/n: 2400 – 2483.5 MHz
Antenna type and gain:	802.11b/g/n: Spiral monopole antenna (-2.3 dBi) GPS: Chip antenna
Type of modulation:	802.11b/g/n: GFSK and OFDM
Emission designator	802.11b: 11M4G1D 802.11g: 17M1G1D 802.11n: 18M3G1D

Disclaimer: above info is declared by the applicant

The EUT is considered as a Class B device.

1.5 Environmental conditions

Test date	10-02-2025	26-03-2025
Ambient temperature	21.3 °C	21.1 °C
Humidity	23.2 %	35.5 %

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

1.8 Observation and remarks

This is an additional report, because of changes to the GPS receiver, USB-C and antenna orientation updates should be read in conjunction with:
210200772, P000197855 and P000117944 test reports.
Tests only performed on variants.
The EUT was in normal operating mode and oriented with the front to the antenna.
Chirp uses a smaller battery and Pro uses a larger battery the worst case however results are with smaller battery, for this reason all battery test results are reported.

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. 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 1.7 *"Applicable standards".*

All tests are performed by:

Name : C. Brinkman (under supervision of Ing. A. Mostert)

Review of test methods and report by:

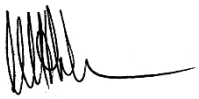
Name : ing. P. Suringa

The above conclusions have been verified by the following signatory:

Date : 20-05-2025

Name : ing. M.H. Khan

Function : Test Engineer

Signature : 

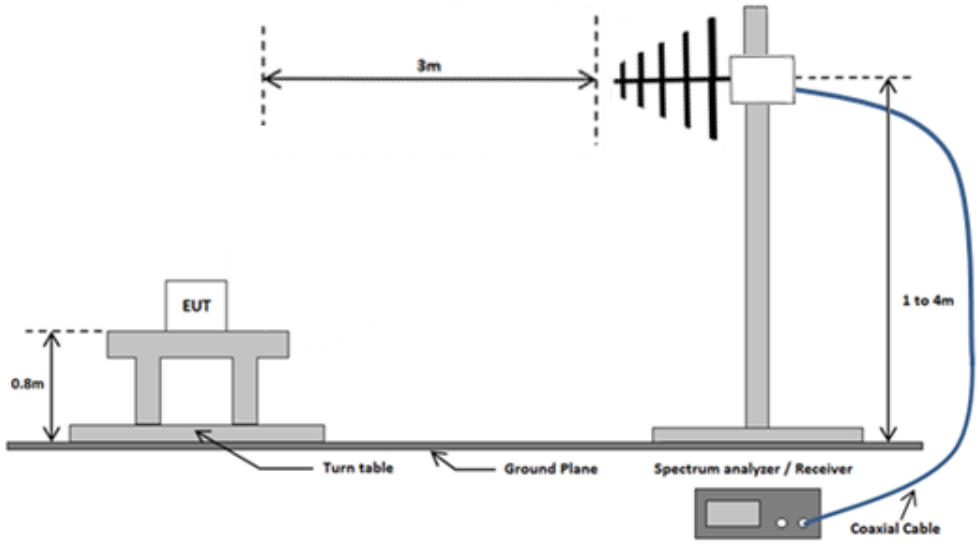
2 Test configuration of the Equipment Under Test

2.1 Test mode

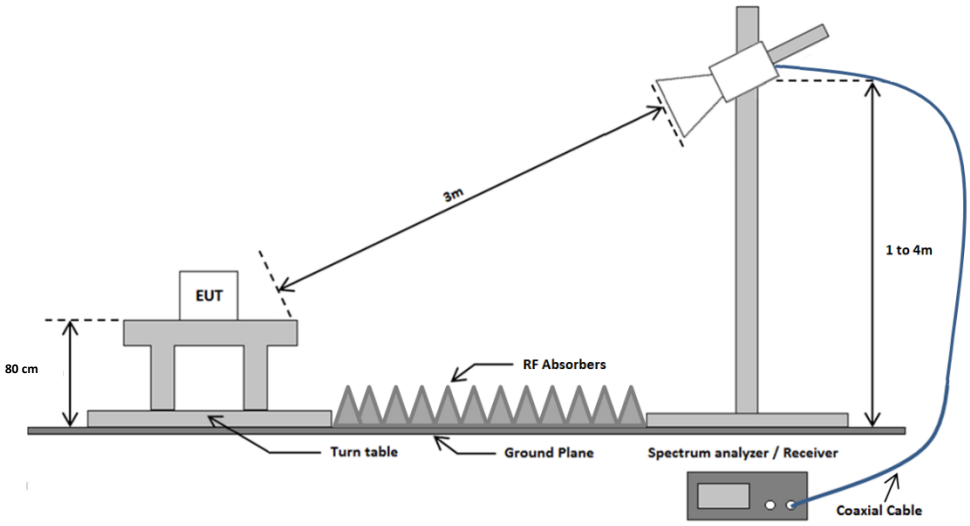
The EUT only uses 802.11b/g/n channel 1 (2412 MHz centre frequency) for communication. Other channels are not used by the device and the user is not able to change the channel.

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



2.3 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.31 and 15.109, ICES-003. 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	11-2024	11-2025	3.1
Spectrum Analyzer	Rohde & Schwarz	FSV3044	114923	10-2023	10-2025	3.1
1.1 GHz HPF	Wainwright	WHK1.1/15G-10EF	114679	03-2024	03-2026	--
3.0 GHz HPF	Wainwright	WHK3.0/18G-10EF	114682	09-2024	09-2025	3.1
7.0 GHz HPF	Wainwright	WHKX7.0/18G-8SS	114678	03-2024	03-2026	--
Biconical antenna + 6dB attenuator	EMCO	3109	107818	06-2022	06-2025	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436	07-2024	07-2027	--
Logperiodic antenna	EMCO	3147	114385	02-2021	02-2026	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2025	3.1
Horn antenna	FLANN-MICROWAVE	20240-25	114518	NA*	NA*	--
Horn antenna	Scientific atlanta	12A-26	114487	NA*	NA*	--
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114771	08-2024	08-2025	3.1
Preamplifier 18-40 GHz	Schwarzbeck	BBV-9721	115026	06-2024	06-2025	--
Semi-Anechoic Chamber	ETS Lindgren	SAR	114624	03-2023	03-2026	3.1
Test software	Raditeq	Radimation Version 2023.2.3	--	--	--	3.1
LISN /Two line V-network	Rohde & Schwarz	ENV 216	114379	11-2023	11-2025	--

*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

Except for Class A digital devices, the field strength of radiated emissions from an unintentional radiator shall not exceed the field strength levels specified in the following tables.
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(a)

Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

ICES-003 tables 2

Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-230	200	46.0	3
230 -960	224	47.0	3
960-1000	500	54.0	3

ICES-003 tables 4

Frequency (GHz)	Field strength Average (dBµV/meter)	Field strength Peak (dBµV/m)	Measurement distance (meters)
1-18	54	74	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

30 MHz- 250 MHz with different GPS receiver

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Polarization
47.076	36.3	28	28	Vertical
62.497	39.6	37	40	Vertical
106.33	42.9	39.8	43.5	Vertical
164.897	41.9	38.8	43.5	Horizontal
218.97	40.1	36.7	36.7	Vertical

250 MHz – 1GHz with different GPS receiver

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak limit (FCC) (dBµV/m)	Quasi-Peak limit (ICES) (dBµV/m)	Polarization
272.145	30.4	26	46	47	Horizontal
312.525	34.7	32.3	46	47	Vertical
437.535	47.2	45.9	46	47	Vertical
719.994	42.9	39.5	46	47	Vertical

30 MHz- 250 MHz Chrip2+ with different GPS receiver and larger battery.

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Polarization
62.576	18.3	7.5	40	Vertical
73.739	15.4	3.5	40	Horizontal
105.096	20.8	9.4	43.5	Vertical

250 MHz- 1 GHz Chrip2+ with different GPS receiver and larger battery.

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak limit (FCC) (dBµV/m)	Quasi-Peak limit (ICES) (dBµV/m)	Polarization
271.468	17.3	6.5	46	47	Horizontal
600.004	40	36.1	46	47	Vertical
720.023	41.1	36.8	46	47	Vertical

1 GHz- 18 GHz Chrip2+ with different GPS receiver and larger battery.

Frequency (GHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average limit (dBµV/m)	Polarization
2.459	41	74	28.3	54	Horizontal
9.539	54.5	74	42.5	54	Horizontal

30 MHz- 250 MHz PRO2+ with different GPS receiver and larger battery.

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Polarization
63.488	16.3	5	40	Horizontal
68.113	15.4	3.9	40	Vertical
168.016	31.1	18.6	43.5	Vertical

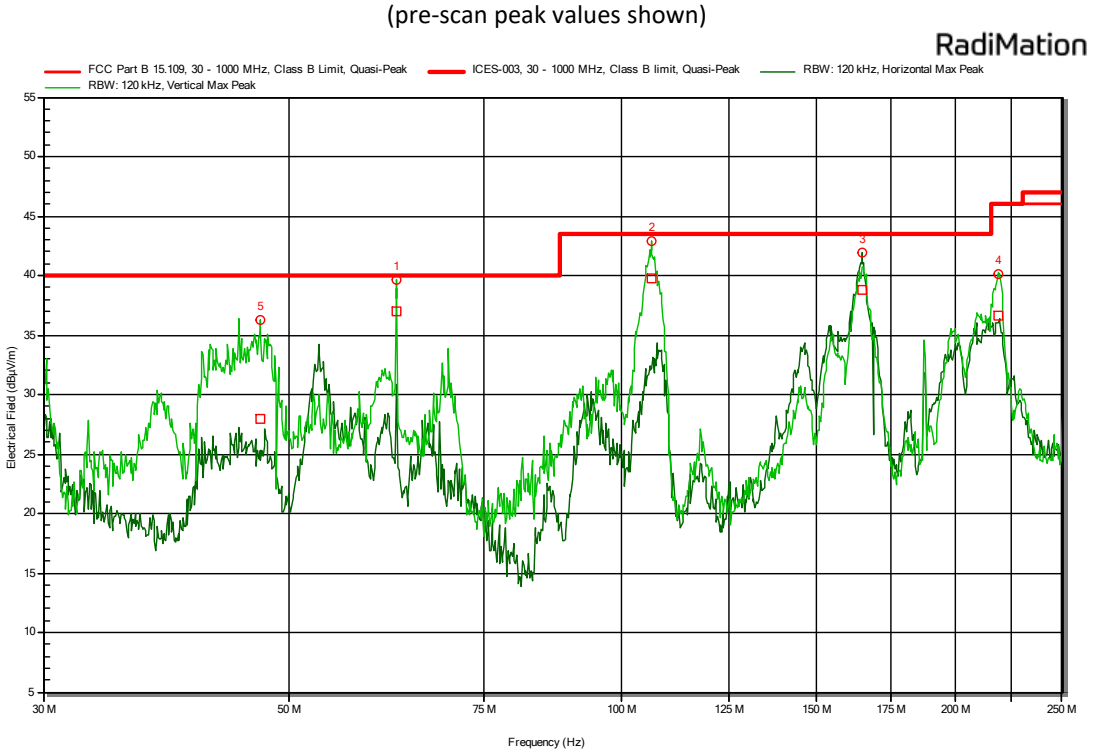
250 MHz- 1 GHz PRO2+ with different GPS receiver and larger battery.

Frequency (MHz)	Peak (dBµV/m)	Quasi-peak (dBµV/m)	Quasi-Peak limit (FCC) (dBµV/m)	Quasi-Peak limit (ICES) (dBµV/m)	Polarization
269.796	18.1	6.5	46	47	Horizontal
457.036	26.3	15.4	46	47	Vertical
832.565	32	21	46	47	Vertical

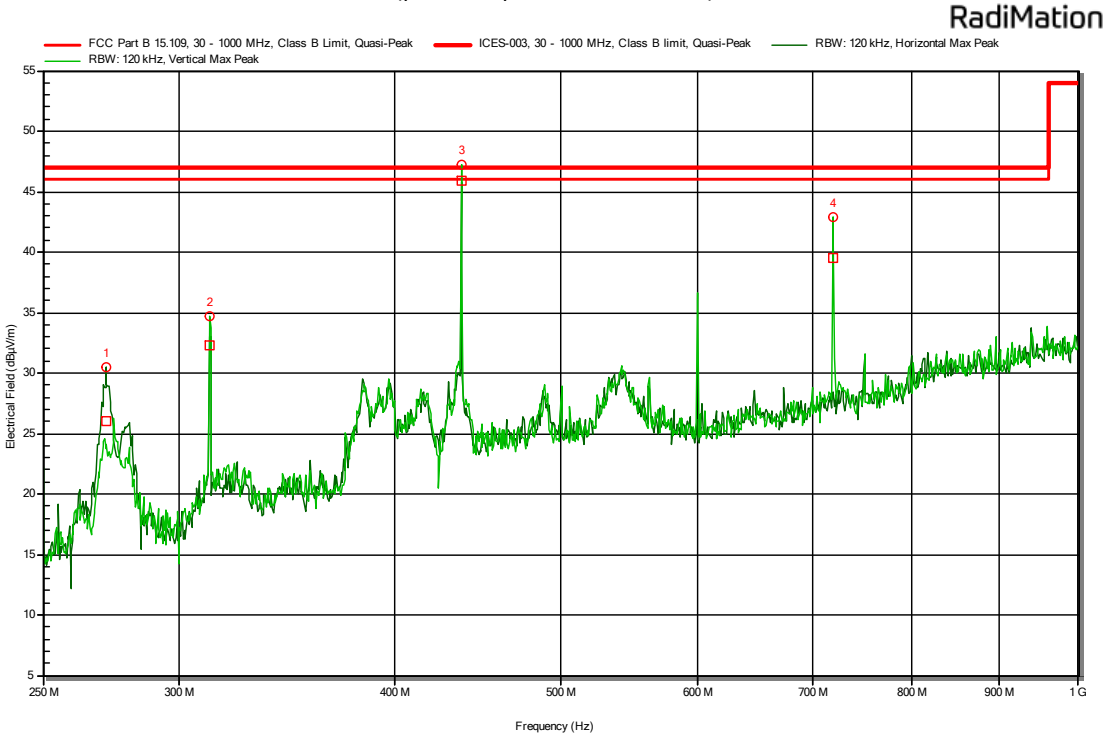
The results of the radiated emission tests are depicted in the table above. A selection of plots is provided on the next pages

3.1.7 Plots of the Radiated Spurious Emissions Measurement with different GPS receiver

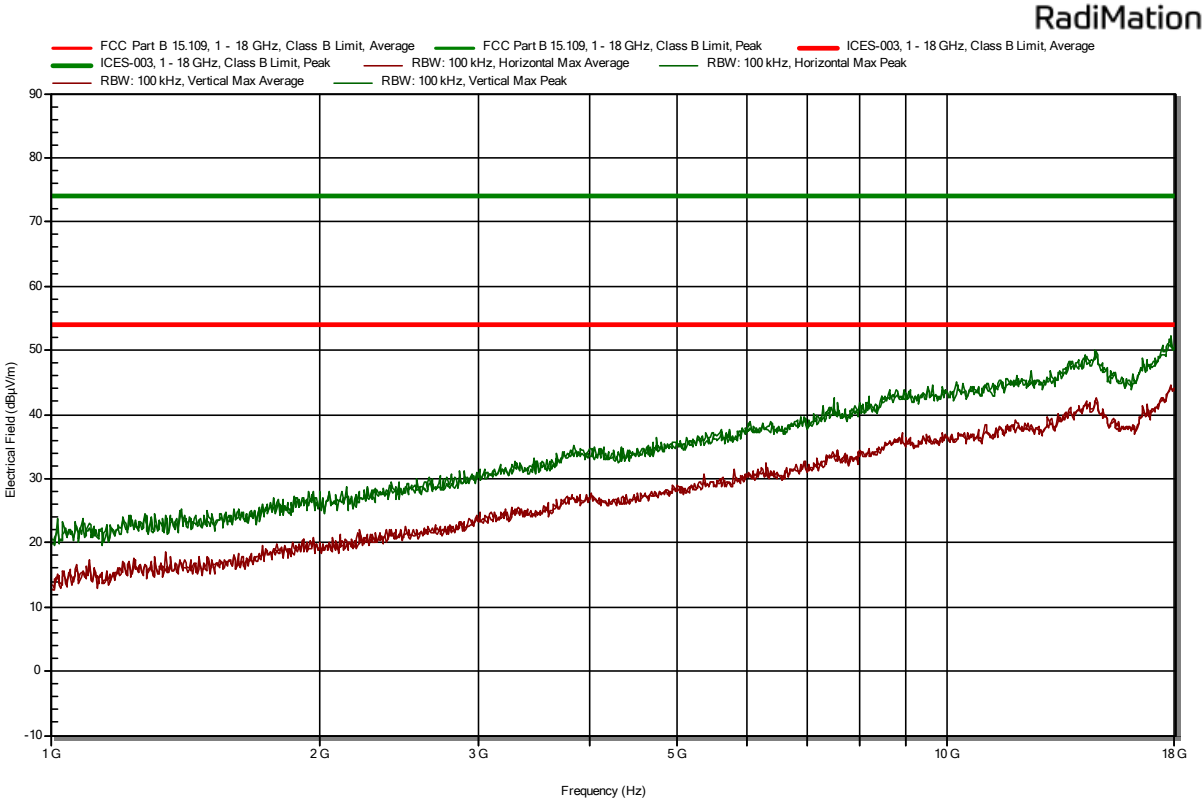
Plot 1: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 30 – 250 MHz
(pre-scan peak values shown)



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

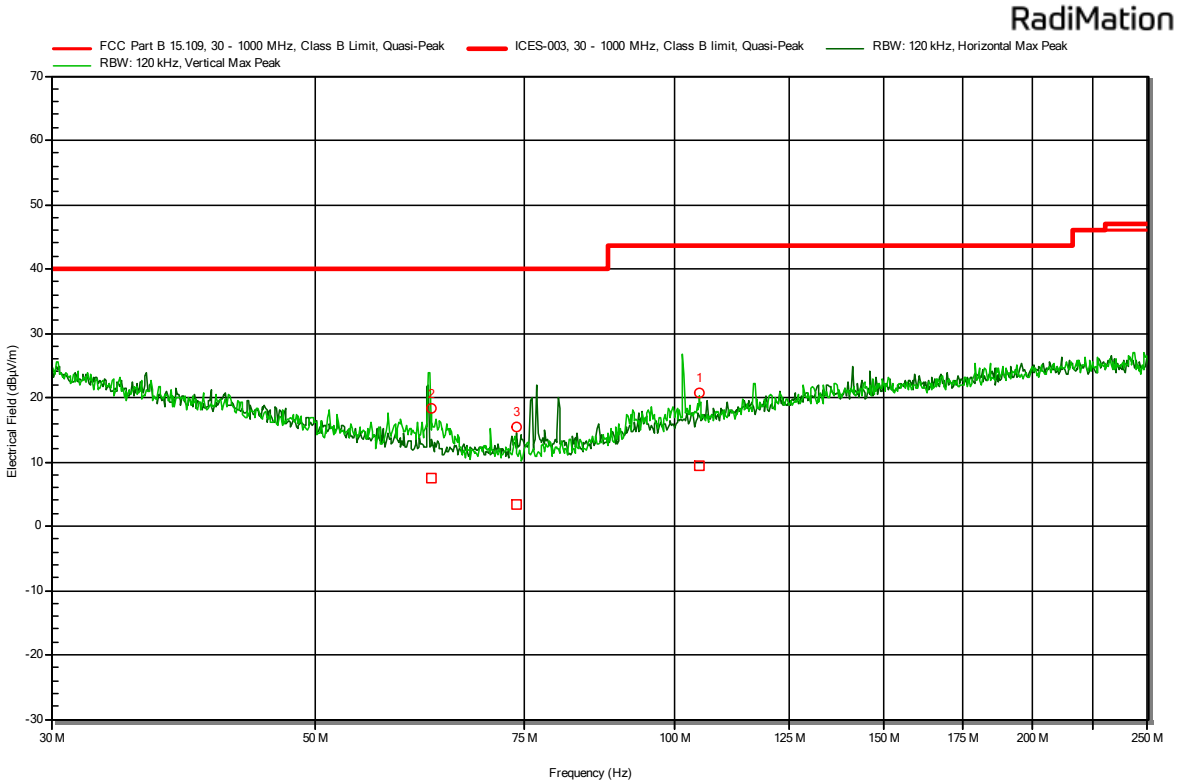


Plot 3: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 1-18 GHz (peak and average values shown)

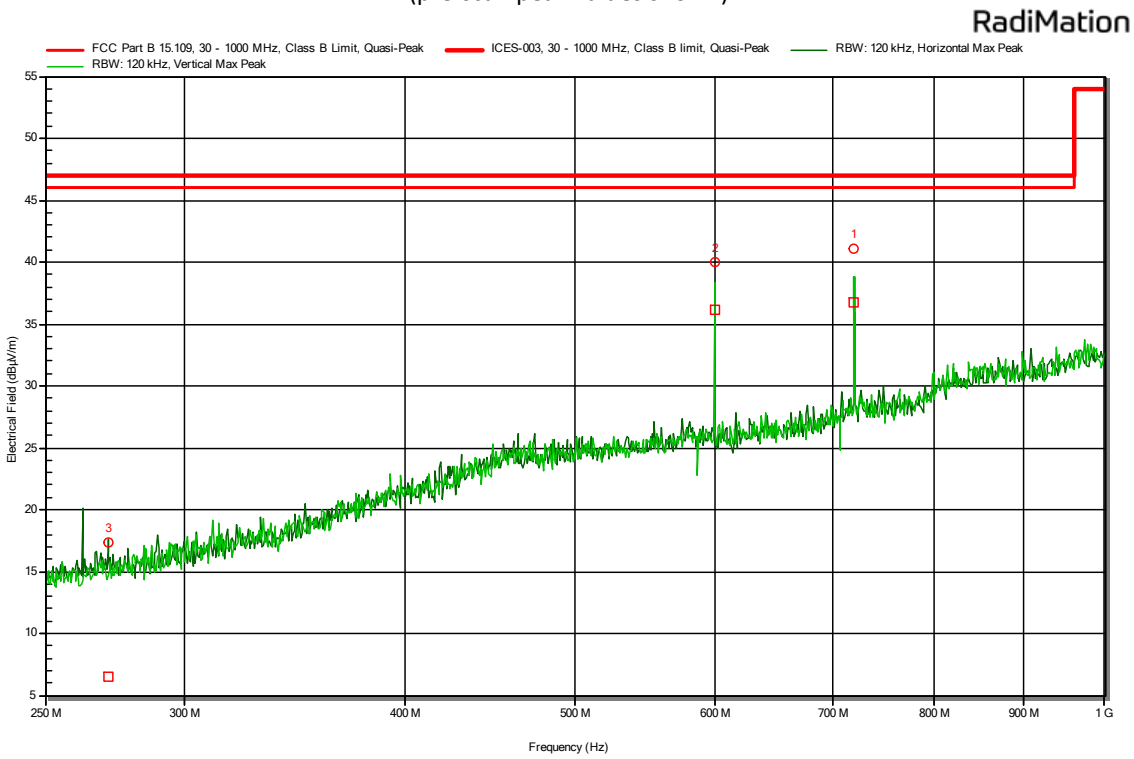


3.1.8 Plots of the Radiated Spurious Emissions Measurement Chirp 2+

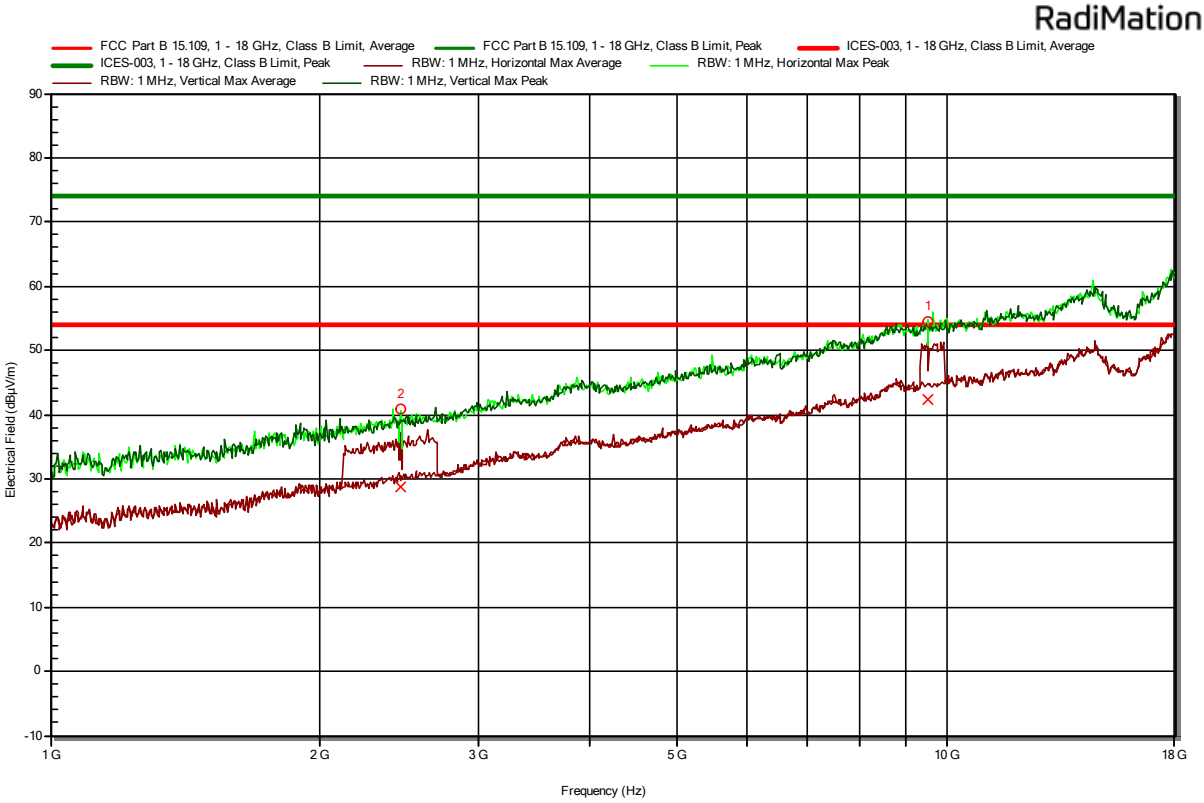
Plot 1: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 30 – 250 MHz
(pre-scan peak values shown)



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

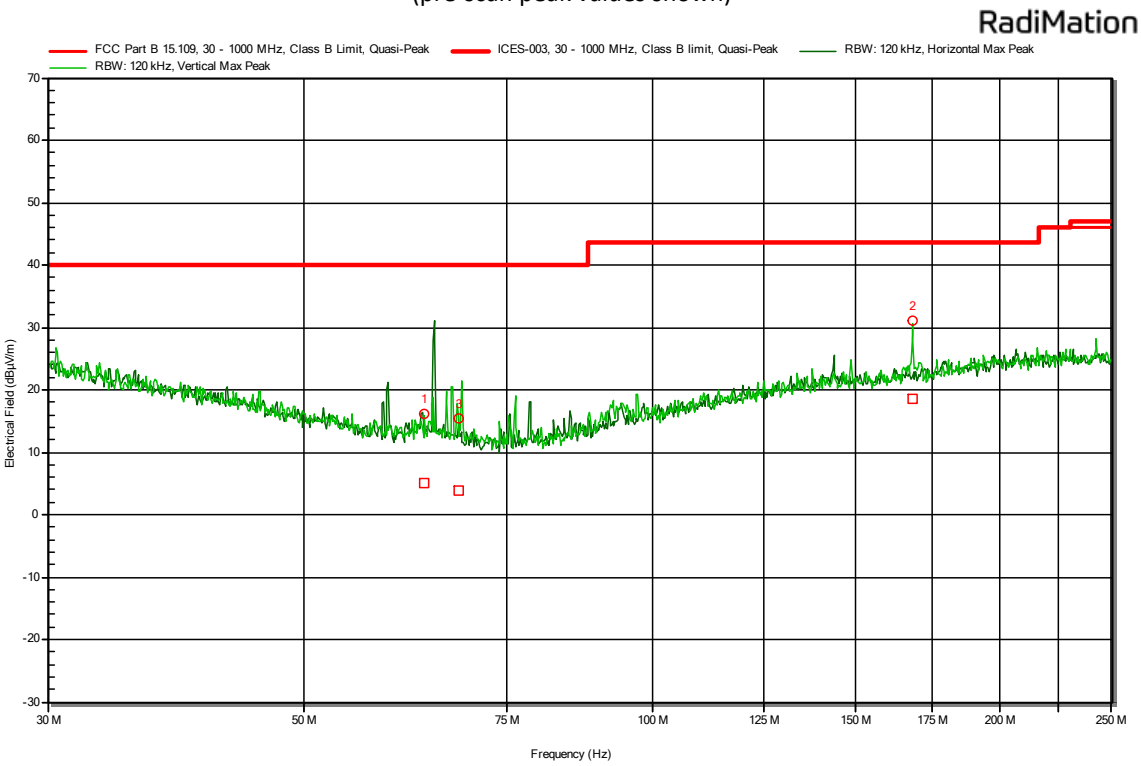


Plot 3: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 1-18 GHz (peak and average values shown)

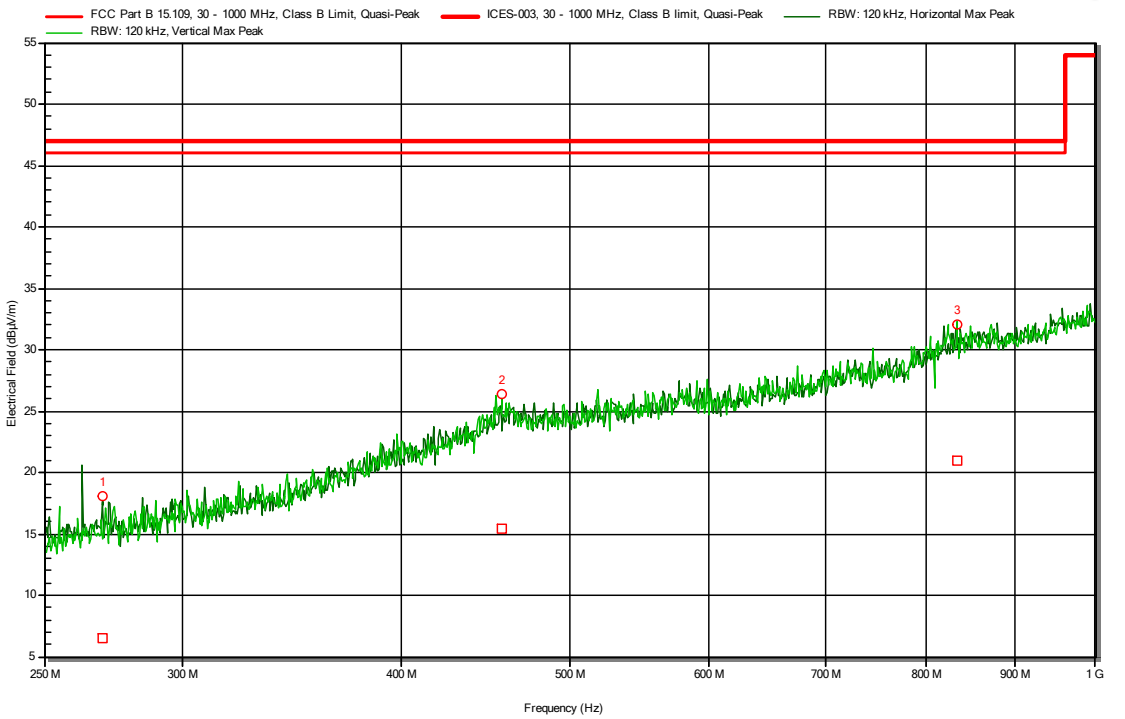


3.1.9 Plots of the Radiated Spurious Emissions Measurement PRO 2+

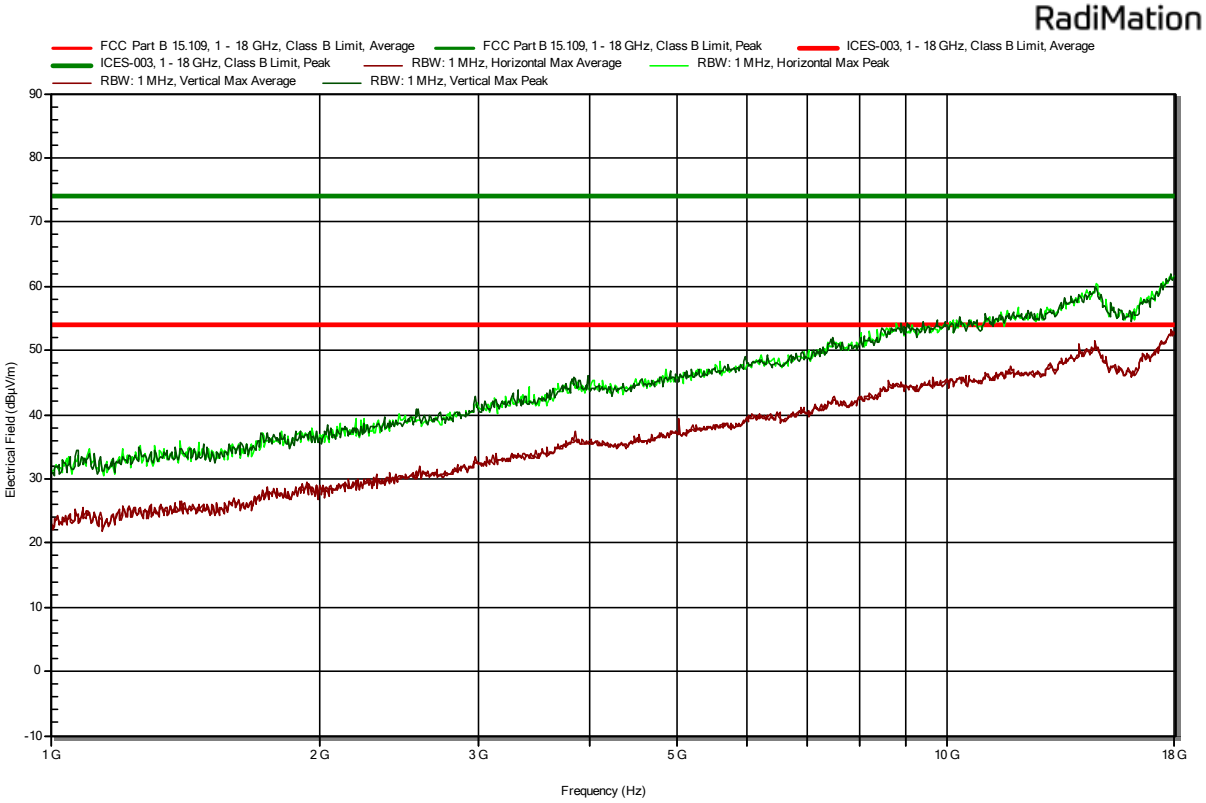
Plot 1: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 30 – 250 MHz (pre-scan peak values shown)



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



Plot 3: radiated emissions of the EUT, Antenna vertical & horizontal, in the range 250-1000 MHz
(pre-scan peak values shown)



4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.
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: 107818 EMCO 3109	Cable loss (dB) Id: 114928	Attenuator ID:114525 Hewlett Packet	Corr. (dB)
30	13.5	1.8	6	21.3
100	9.2	2.7	6	17.9
150	12.6	3.2	6	21.8
200	13.6	3.6	6	23.2
250	15.2	4.3	6	25.5

Frequency (MHz)	AF (dB/m) ID: 114385 EMCO LPDA	Cable loss (dB) Id: 114928	Corr. (dB)
250	11.8	4.3	16.1
300	13	5.1	18.1
350	14.2	5.8	20.0
400	15.6	7.3	22.9
450	17.1	7.9	25.0
500	17.3	8.0	25.3
550	17.7	8.0	25.7
600	18.4	7.7	26.1
650	19.2	7.5	26.7
700	19.7	7.7	27.4
750	20.3	7.9	28.2
800	21.4	8.2	29.6
850	22.0	8.7	30.7
900	22.1	8.9	31.0
950	22.6	9.2	31.8
1000	22.5	9.6	32.1

Frequency (MHz)	AF (dB/m) 114607 Emco 3115 SN: 9412-4377	Gain (dB) 114690 µComp Nordic MCNA-40-0010800-25-10P	Cable loss (dB) 114691	Corr. (dB)
1000	23.6	45.1	2.1	-19.4
2000	27.1	44.7	3.3	-14.3
3000	30.5	44.2	4.2	-9.5
4000	32.7	43.5	4.9	-5.9
5000	33.2	43.1	5.6	-4.3
6000	34.6	43.0	6.3	-2.1
7000	35.2	42.9	6.4	-1.3
8000	37.0	43.3	7.2	0.9
9000	38.1	43.3	7.9	2.7
10000	38.2	43.0	8.2	3.4
11000	38.3	42.9	8.7	4.1
12000	39.1	42.6	9.0	5.5
13000	39.2	43.6	9.8	5.4
14000	41.1	44.3	9.7	6.5
15000	40.2	44.4	10.4	6.2
16000	37.5	44.3	10.8	4.0
17000	41.1	44.5	11.4	8.0
18000	44.0	44.9	11.4	10.5

Frequency (MHz)	AF (dB/m) Kiwa ID: 114518 Flann 20240-25 SN: 163703	Gain (dB) Kiwa ID: Schwarzbeck BBV 9721	Cable loss (dB) 114691	Corr. (dB)
18000	31.3	34.5	11.4	8.2
19000	31.5	34.9	11.2	7.8
20000	31.7	34.1	11.6	9.2
21000	31.9	33.6	12.1	10.4
22000	32.1	33.6	12.4	10.9
23000	32.2	33.3	13.6	12.5
24000	32.3	32.3	13.5	13.5
25000	32.4	33.0	13.4	12.8
26000	32.5	32.9	13.7	13.3

Frequency (MHz)	AF (dB/m) Kiwa ID: 114487 Scientific Atlanta	Gain (dB) Kiwa ID: Schwarzbeck BBV 9721	Cable loss (dB) 114691	Corr. (dB)
26000	35.3	32.9	13.7	16.1
27000	35.4	32.6	14.9	17.7
28000	35.6	32.6	14.4	17.4
29000	35.9	32.9	14.6	17.6
30000	36.2	32.7	15.2	18.7
31000	36.1	32.9	14.9	18.1
32000	36.0	33.8	16.7	18.9
33000	36.2	34.8	16.8	18.2
34000	36.3	35.5	15.9	16.7
35000	36.4	35.5	17.5	18.4
36000	36.5	34.6	17.9	19.8
37000	36.6	33.6	18.2	21.2
38000	36.8	32.5	17.7	22.0
39000	37.0	32.1	17.7	22.6
40000	37.2	29.9	19.0	26.3

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

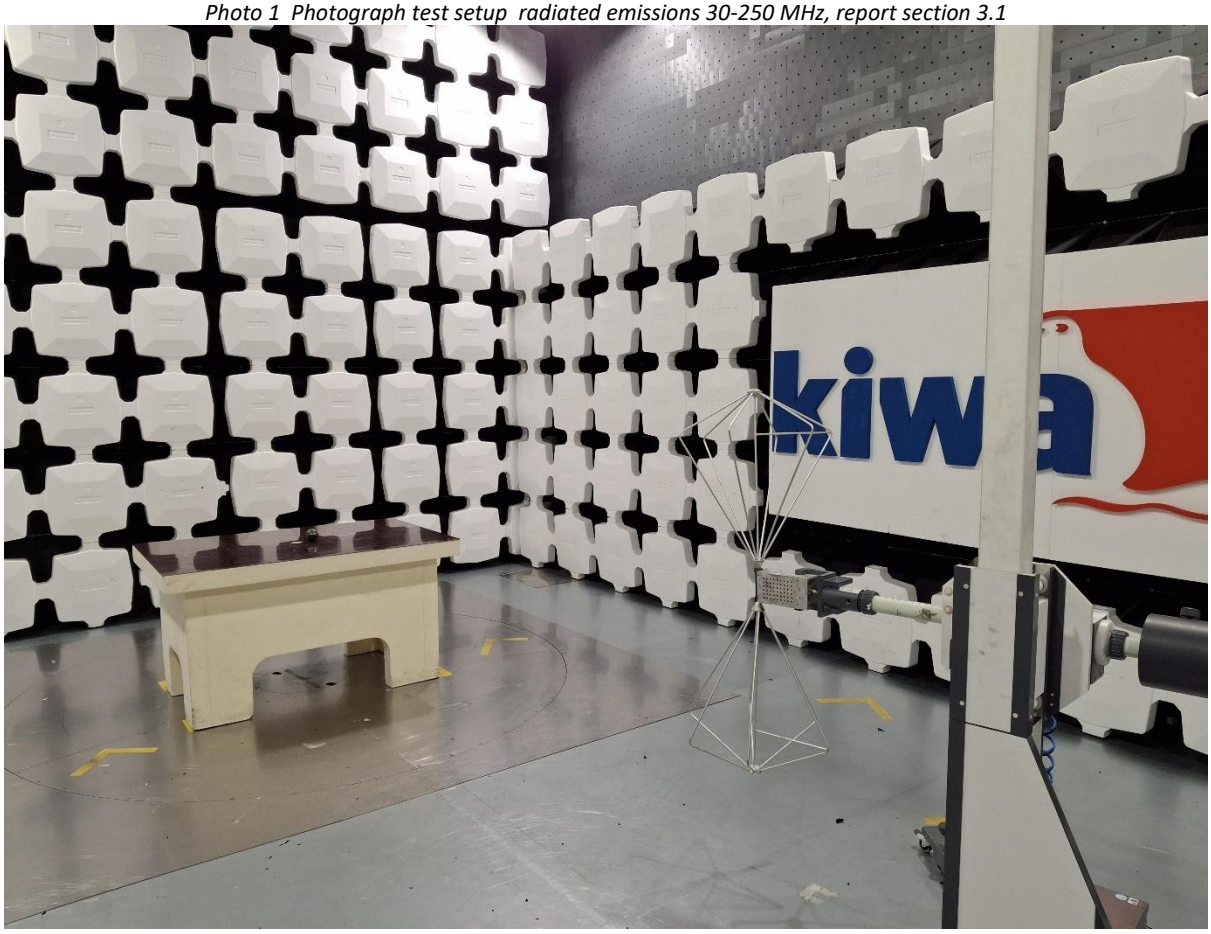


Photo 2 Photograph test setup radiated emissions 250-1000 MHz, report section 3.1

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

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