EMC Test Report

Flashnet SA

FRE-220-NEMA-T-NB1-M1-G

47 CFR Part 15B Class B Digital Device
Effective Date October 2024
Test Date: 21st March 2025
Report Number: 03-14953-5-25 Issue 02
Supersedes Report Number: 03-14953-5-25 Issue 01

The testing was carried out by Kiwa Electrical Compliance, an independent test house, at their test facility located at:

Kiwa Electrical Compliance
Arnolds Court
Arnolds Farm Lane
Mountnessing
Essex
CM13 1UT
U.K.

www.Kiwa.com

Telephone: +44 (0) 1277 352219

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF communiqué dated April 2017).

Arnolds Court, Arnolds Farm Lane, Mountnessing, Brentwood Essex, CM13 1UT

Certificate of Test 14953-5

The equipment noted below has been fully tested by Kiwa Electrical Compliance and, where appropriate, conforms to the relevant subpart of 47 CFR Part 15B. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

Equipment:	FRE-220-NEMA-T-NB1-M1-G
Model Number:	FRE-220-NEMA-T-NB1-M1-G
Unique Serial Number:	0000268951583
Applicant:	Flashnet SA Fundatura Harmanului Street No 4, Brasov Romania 500240
Full measurement results are detailed in Report Number:	03-14953-5-25 Issue 02
Test Standards:	47 CFR Part 15B Class B Digital Device Effective Date October 2024 ↪ ANSI C63.4:2014

DEVIATIONS: No deviations have been applied.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Date of Test: 21st March 2025

Test Engineer: Graham Blake
Graham Blake
Digitally signed by: Graham Blake
DN: CN = Graham Blake email = graham.blake@kiwa.com C = GB OU = Kiwa Electrical Compliance
Date: 2025.06.10 13:14:45 Z

Approved By: Quality Lead
Clint Hilling
Digitally signed by: Clint Hilling
DN: CN = Clint Hilling email = clint.hilling@kiwa.com C = GB OU = Kiwa Electrical Compliance
Date: 2025.06.10 12:21:57 Z

Authorised Representative:

ilac-MRA UKAS TESTING 2360

1 Contents

2 Equipment under test (EUT)

2.1 Equipment specification

Applicant	Flashnet SA Fundatura Harmanului Street, No 4 Brasov Romania 500240	
Manufacturer of EUT	Flashnet SA	
Full Name of EUT	FRE-220-NEMA-T-NB1-M1-G	
Model Number of EUT	FRE-220-NEMA-T-NB1-M1-G	
Serial Number of EUT	0000268951583	
Hardware Version	NEMA_ME310G1-W1_v2	
Firmware Version	(Microcontroller) FW version 4713 (Radio module) FW version 37.00.116-P0C.110000	
Date Received	24th February 2025	
Date of Test:	21st March 2025	
Purpose of Test	To demonstrate design compliance to relevant rules of Title 47 of the Code of Federal Regulations.	
Date Report Issued	10th June 2025	
Main Function	The product is a street light management and control device that can remotely turn on/off and dim a luminaire, while measuring a wide range of electrical parameters and capable of sending alarms in case of fault detection.	
Information Specification	Height	70 mm
	Width	80 mm
	Depth	80 mm
	Weight	0.115 kg
	Voltage	230 V AC 50 / 60 Hz
	Current	0.02 Amp
	Highest Signal	2480 MHz (integrated ESP32 module)

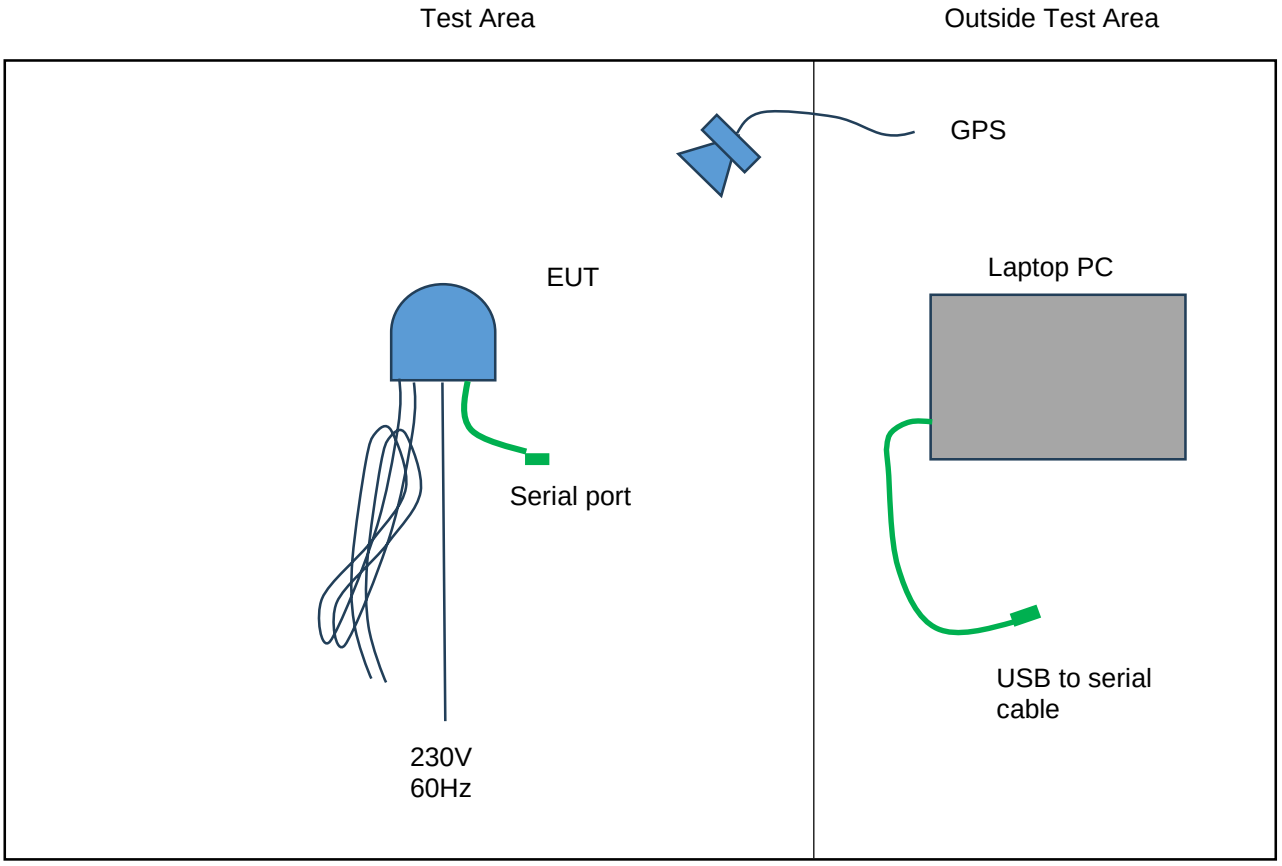
2.2 Functional description

The product is connected to the public mains supply via an ANSI C136.41 compliant socket and its outputs are connected directly to the driver of the luminaire. It communicates wirelessly with the central management software, using an embedded LTE CatM1 and NB2 modem. The purpose of the controller is to turn the luminaire ON/OFF, as well as dim it to a preferred light level, either by direct commands from the user, by using the pre-loaded modifiable scheduler, or as a result of the integrated light sensor. Besides controlling the luminaire, the product measures a wide range of electrical parameters [ex. voltage, current, energies] and transmits them to the central management software and additionally is capable of sending alarms in case of various faults detected [ex. overcurrent, overvoltage, device fault].

2.3 Modes of operation

Mode Reference	Description	Used for testing
IDLE	The EUT is powered and configured into an idle state.	Yes

2.4 Emissions configuration



The unit was powered from a 230V 60Hz AC mains supply. The voltage used for test was declared by the applicant as that used by the device in operation. A GPS signal was reradiated inside the chamber using a horn antenna. Prior to test the unit was configured using a laptop PC running QCOM terminal software. To configure the EUT into the relevant test mode “AT” commands were sent to the EUT using a USB to serial cable. The unit was configured to “Idle mode” in accordance with the applicants’ instructions.

Following the manufactures instructions the following commands were set:

AT#TESTMODE=”TM”	(Sets the EUT into TEST MODE)
AT#TESTMODE=”INIT4G”	(Initialises 4G cellular radio)
AT+CFUN=0	(Sets idle mode)

2.4.1 Signal leads

Port Name	Cable Type	Connected
Mains	2-core	Yes

3 Summary of test results

The FRE-220-NEMA-T-NB1-M1-G, FRE-220-NEMA-T-NB1-M1-G was tested for compliance to the following standard(s):

47 CFR Part 15B Class B Digital Device
Effective Date October 2024

Any compliance statements are made reliant on the modes of operation and the failure criteria as instructed to us by the applicant based on their specific knowledge of the application and functionality of the equipment tested. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the relevant rules, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty.

Title	References	Results
1. AC powerline conducted emission	ANSI C63.4 Class - B	PASSED
2. Antenna power conducted emission	ANSI C63.4	NOT APPLICABLE[1]
3. Radiated emissions 30 MHz - 1 GHz	ANSI C63.4 Class - B	PASSED
4. Radiated Emissions above 1 GHz	ANSI C63.4 Class - B	PASSED[2]

[1] The EUT does not have an Antenna Port.
[2] Tested up to 12.4 GHz based on a highest EUT frequency of 2480 MHz

3.1 Electromagnetic Environment

Emissions categories as described in 47 CFR Part 15B

Class A digital device.

A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Class B digital device.

A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

NOTE: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

The FRE-220-NEMA-T-NB1-M1-G was deemed by Flashnet SA to be tested as Class B Digital Device.

4 Specifications

The tests were performed and operated in accordance with Kiwa Electrical Compliance procedures and the relevant standards listed below.

4.1 Relevant standards

Ref.	Standard Number	Version	Description
4.1.1	47 CFR Part 15B	2024	Part 15: Radio frequency devices. Sub part B: Unintentional Radiators.
4.1.2	ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

4.2 Deviations

No deviations were applied.

5 Tests, methods and results

5.1 AC powerline conducted emission

5.1.1 Test methods

Test Requirements: 47 CFR Part 15B [Reference 4.1.1 of this report]
Test Method: ANSI C63.4 [Reference 4.1.2 of this report]

5.1.2 Configuration of EUT

The EUT was placed on a wooden table 0.8m above the ground plane and connected to a LISN via a 1 metre mains cable. The LISN was powered using a 230 VAC 60 Hz mains source.

Refer to section 8 for a photograph and diagram of this test set-up.

Details of the peripheral and ancillary equipment connected for this test is listed in section 10.

IDLE mode (refer to section 2.3) was used for this test.

5.1.3 Test procedure

Measurements were made via a LISN on the live and neutral conductors using both average and quasi-peak detectors.

At least 6 signals within 20dB and/or all signals within 10dB of the limit were investigated.

Tests were performed in Test Site F.

5.1.4 Test equipment

E035, E150, E411, E624, ZSW1

See Section 9 for more details

5.1.5 Test results

Temperature of test environment 15°C
Humidity of test environment 50%

Cond 1 AC

Plot References
Peak emissions 150 kHz - 30 MHz on the live terminal against the average limit line.
Peak emissions 150 kHz - 30 MHz on the live terminal against the quasi-peak limit line.
Peak emissions 150 kHz - 30 MHz on the neutral terminal against the average limit line.
Peak emissions 150 kHz - 30 MHz on the neutral terminal against the quasi-peak limit line.

These results show that the EUT has PASSED this test.

Receiver plots showing peak values can be found in Section 6 of this report along with tables of peak / quasi-peak and peak / average values.

The uncertainty gives a 95% confidence interval in which the emissions from the EUT fall. Expanded uncertainty (K=2) is as follows, which is within the CISPR uncertainty budget:

(CISPR): 150kHz to 30MHz ±3.40dB (UE71)

5.2 Antenna power conducted emission

NOT APPLICABLE: The EUT does not have an Antenna Port.

5.3 Radiated emissions 30 MHz - 1 GHz

5.3.1 Test methods

Test Requirements: 47 CFR Part 15B [Reference 4.1.1 of this report]
Test Method: ANSI C63.4 [Reference 4.1.2 of this report]

5.3.2 Configuration of EUT

The EUT was placed on a turntable, 0.8m above the ground plane and was connected to 230 VAC 60 Hz mains supply via the mains lead. The front edge of the EUT was initially positioned facing the antenna. The horizontal projection onto the ground plane of the front edge of the EUT and the measuring point of the antenna were 3m apart.

Refer to section 8 for a photograph and diagram of this test set-up.

Details of the peripheral and ancillary equipment connected for this test is listed in section 10.

IDLE mode (refer to section 2.3) was used for this test.

5.3.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. Measurements were made on a site listed with the FCC. The equipment was rotated 360 degrees and the antenna scanned 1 – 4 metres in both horizontal and vertical polarisations to record the worst case emissions. The EUT was rotated in all three orthogonal planes.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using Test Site M

5.3.4 Test equipment

CB02, E411, E443, E624, E743, LPE364, NSA-M, ZSW1

See Section 9 for more details

5.3.5 Test results

Temperature of test environment 20°C
Humidity of test environment 50%

Rad 1

Plot References
Peak Horizontal emissions 30 MHz - 300 MHz against the quasi-peak limit line.
Peak Vertical emissions 30 MHz - 300 MHz against the quasi-peak limit line.
Peak Horizontal emissions 300 MHz - 1 GHz against the quasi-peak limit line.
Peak Vertical emissions 300 MHz - 1 GHz against the quasi-peak limit line.

These results show that the EUT has PASSED this test.

Receiver plots showing peak values can be found in Section 6 of this report along with tables of peak / quasi-peak values.

The uncertainty gives a 95% confidence interval in which the emissions from the EUT fall. Expanded uncertainty (K=2) is as follows, which is within the CISPR uncertainty budget:

30MHz - 40MHz ±10.67dB (UE82)
40MHz - 50MHz ±6.11dB (UE83)
50MHz - 1GHz ±6.48dB (UE84)

5.4 Radiated Emissions above 1 GHz

5.4.1 Test methods

Test Requirements: 47 CFR Part 15B [Reference 4.1.1 of this report]

Test Method: ANSI C63.4 [Reference 4.1.2 of this report]

5.4.2 Configuration of EUT

The EUT was placed on a 0.8 metre high turntable. The front edge of the EUT was initially positioned facing the antenna.

Refer to section 8 for a photograph and diagram of this test set-up.

Details of the peripheral and ancillary equipment connected for this test is listed in section 10.

IDLE mode (refer to section 2.3) was used for this test.

5.4.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below.

The frequency range of the test was chosen as per Section 15.33 of FCC Part 15. This was limited to 12.4 GHz based on the supplier declared highest internal source frequency of 2480 MHz.

Measurements were made in a semi-anechoic chamber with appropriate absorbing material for use in this range. Horn antennas were used at heights where the whole of the EUT was contained within the main beam in both horizontal and vertical polarisations. Emissions pre-scans were performed, including Antenna height scanning (1-4 metres) to determine any worst-case maximised emissions for final test. Final tests were performed with the antenna in worst case position. The EUT was rotated through 360 degrees to record the worst-case emissions. The EUT was rotated in all three orthogonal planes.

A measurement distance of 3m was used for the test range 1 - 6GHz, 1.2m was used for the test range 6 – 12.4GHz.

Where measurement distances other than 3 metres are specified, the appropriate correction factor has been determined and applied in the measurement software, corrected for a 3 metre measurement distance.

At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using test Site M.

5.4.4 Test equipment

E136, E411, E624, E651, E902, F362, TMS82, VSWR-M, ZSW1

See Section 9 for more details

5.4.5 Test results

Temperature of test environment	15°C
Humidity of test environment	50%

Rad 1

Plot References
Peak Horizontal emissions 1 - 2 GHz against the average limit line
Peak Vertical emissions 1 - 2 GHz against the average limit line
Peak Horizontal emissions 2 - 5 GHz against the average limit line
Peak Vertical emissions 2 - 5 GHz against the average limit line
Peak Horizontal emissions 5 - 6 GHz against the average limit line
Peak Vertical emissions 5 - 6 GHz against the average limit line
Peak Horizontal emissions 6 - 10 GHz against the average limit line
Peak Vertical emissions 6 - 10 GHz against the average limit line
Peak Horizontal emissions 10 – 12.4 GHz against the average limit line
Peak Vertical emissions 10 – 12.4 GHz against the average limit line

These results show that the EUT has PASSED this test.

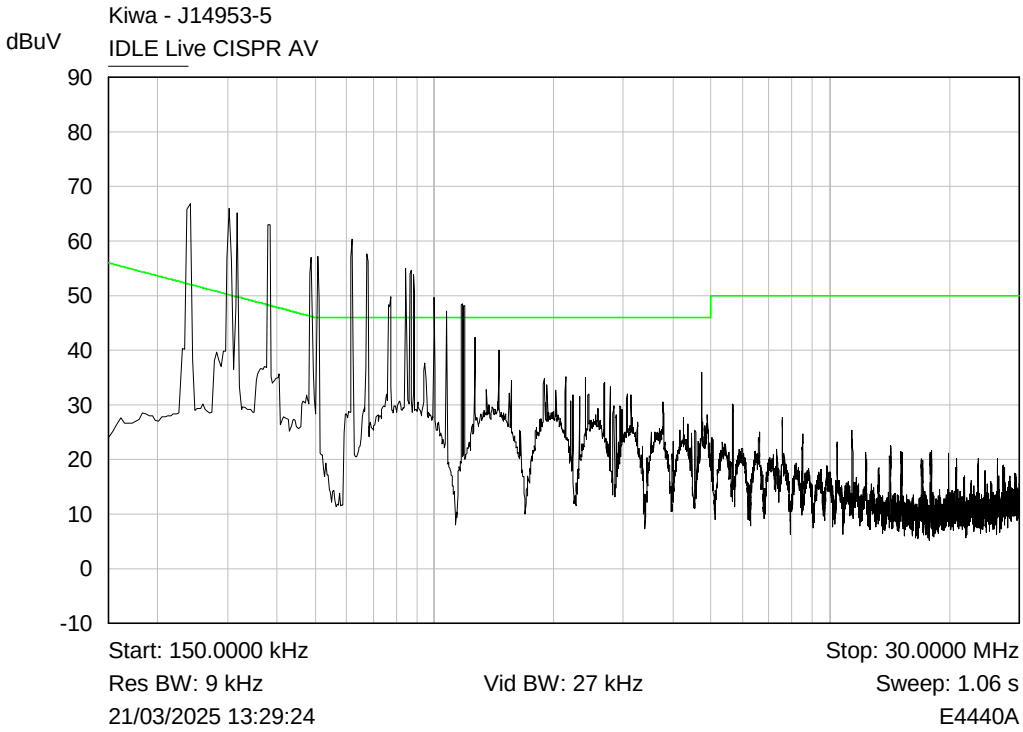
Receiver plots showing peak values can be found in Section 6 of this report along with tables of peak & average values.

The uncertainty gives a 95% confidence interval in which the emissions from the EUT fall. Expanded uncertainty (K=2) is as follows, which is within the CISPR uncertainty budget:

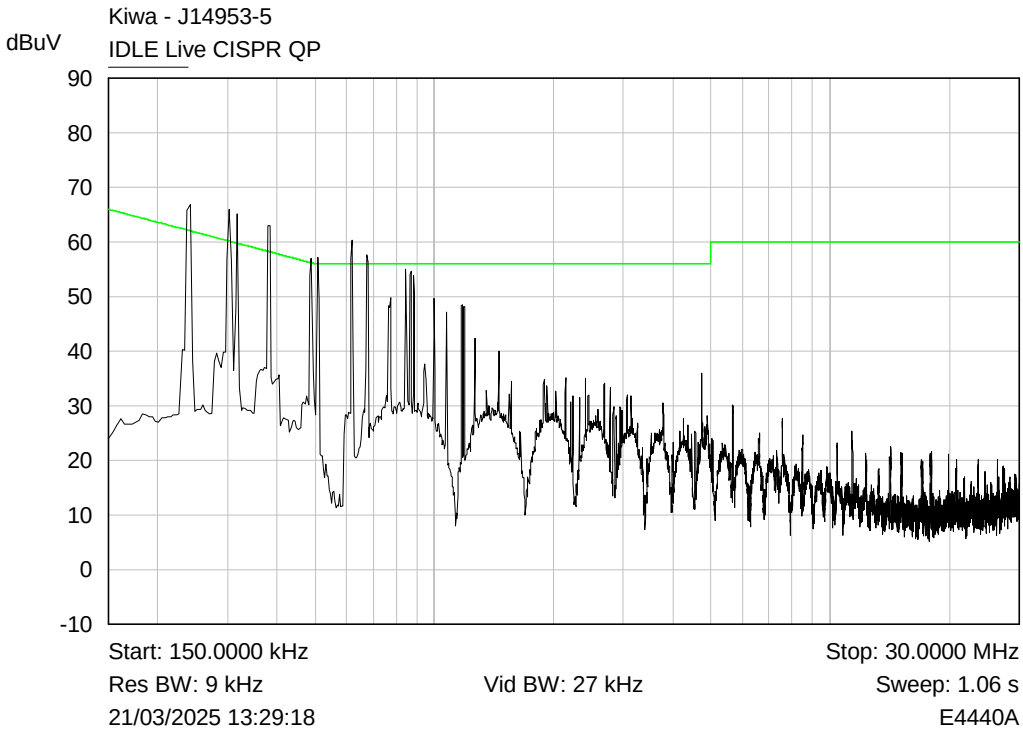
1GHz to 3GHz ±4.81dB (UE77)
3GHz to 6GHz ±4.81dB (UE78)
6GHz to 12.5GHz ±5.39dB (UE79)

6 Plots/Graphical results

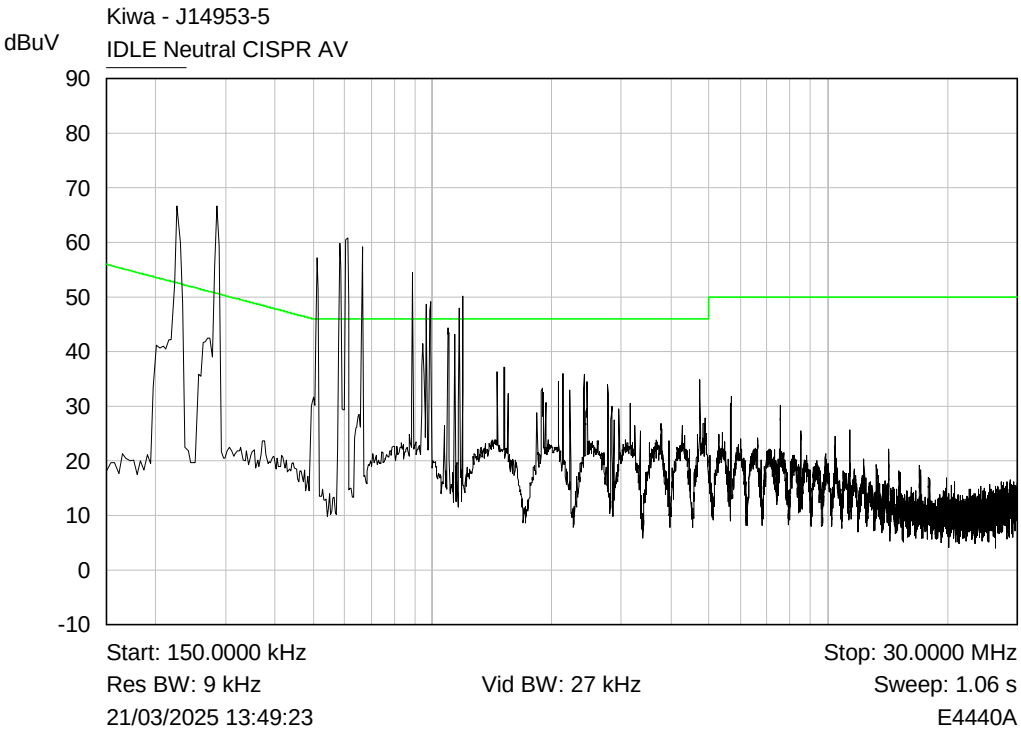
6.1 AC powerline conducted emission



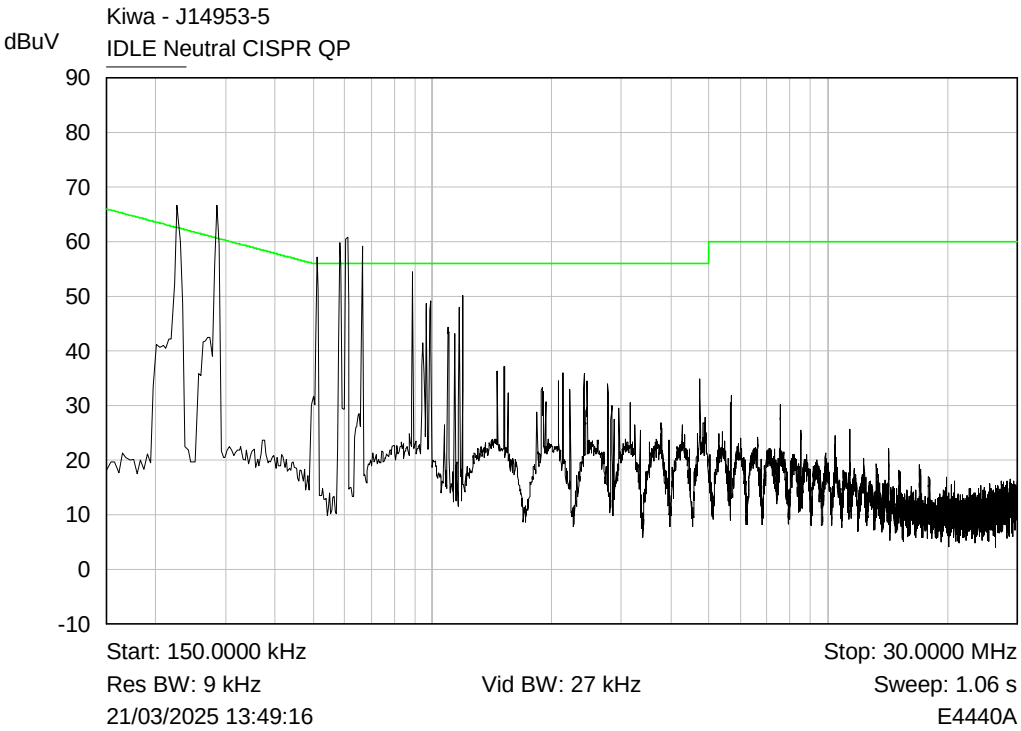
Peak emissions 150 kHz - 30 MHz on the live terminal against the average limit line.



Peak emissions 150 kHz - 30 MHz on the live terminal against the quasi-peak limit line.



Peak emissions 150 kHz - 30 MHz on the neutral terminal against the average limit line.



Peak emissions 150 kHz - 30 MHz on the neutral terminal against the quasi-peak limit line.

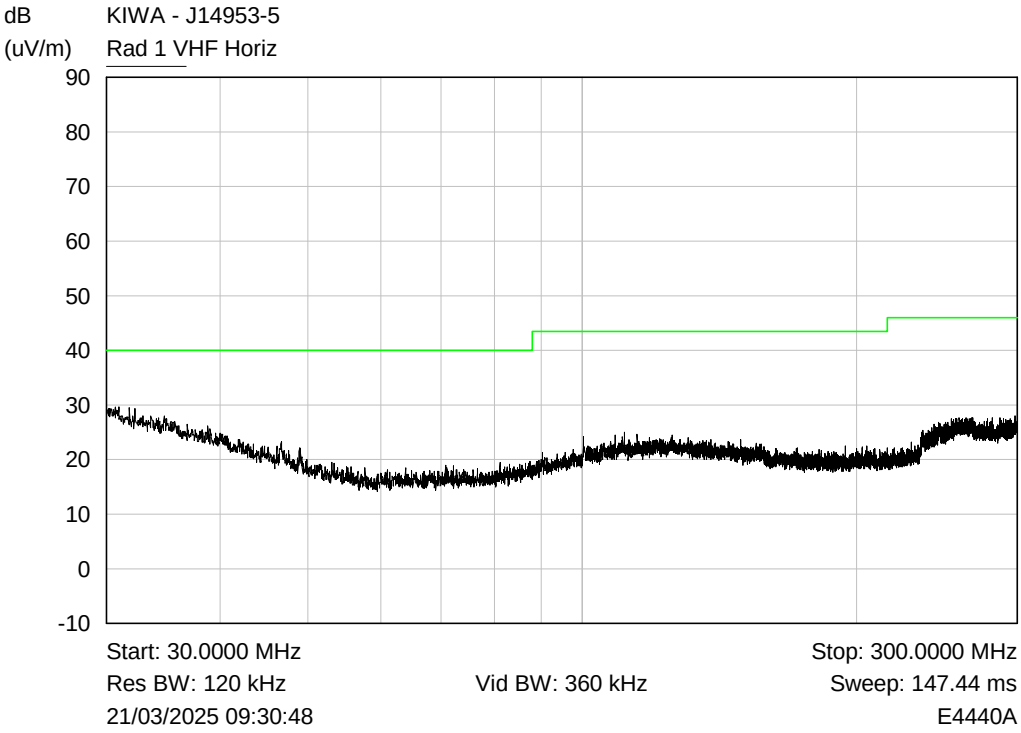
Table of signals measured for Live 150k-30M

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP -Lim (dB)	AV Amp (dBuV)	AV -Lim (dB)
1	0.166	66.4	59.3	-5.9	30.1	-25.1
2	0.195	67.1	59.2	-4.6	30.5	-23.3
3	0.212	66.9	59.4	-3.7	30.8	-22.3
4	0.272	66.3	59.3	-1.8	31.1	-20.0
5	0.283	66.3	59.2	-1.5	31.3	-19.4
6	0.290	66.1	59.0	-1.5	30.7	-19.8
7	0.300	65.9	58.7	-1.5	30.6	-19.6
8	0.300	65.9	58.8	-1.4	30.6	-19.6
9	0.317	65.7	58.4	-1.4	30.4	-19.4
10	0.340	64.8	57.6	-1.6	29.9	-19.3
11	0.369	63.5	56.4	-2.1	29.3	-19.2
12	0.374	63.3	56.2	-2.2	29.8	-18.6
13	0.399	62.0	54.8	-3.1	28.9	-19.0
14	0.532	58.7	51.6	-4.4	21.1	-24.9
15	0.577	60.8	53.1	-2.9	19.8	-26.2
16	0.600	60.5	53.3	-2.7	21.4	-24.6
17	0.617	60.5	53.2	-2.8	22.6	-23.4
18	0.850	55.0	47.8	-8.2	27.4	-18.6
19	0.899	53.6	46.6	-9.4	27.2	-18.8
20	1.120	39.4	33.8	-22.2	10.5	-35.5

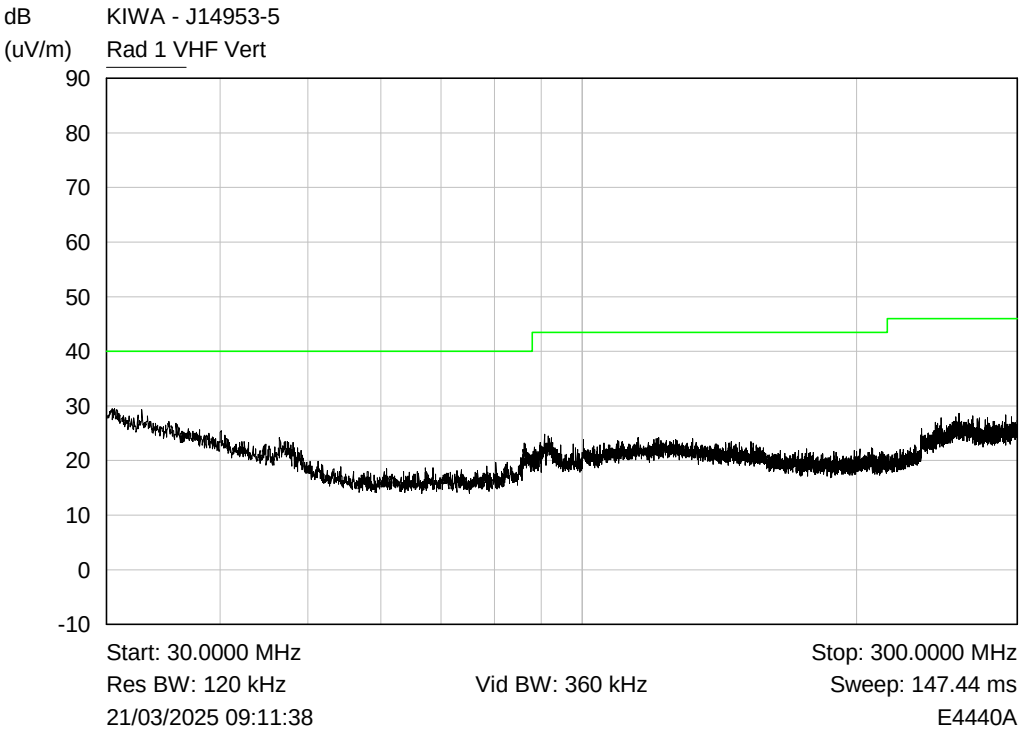
Table of signals measured for Neutral 150k-30M

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP -Lim (dB)	AV Amp (dBuV)	AV -Lim (dB)
1	0.193	67.3	59.9	-4.0	28.2	-25.7
2	0.218	67.4	59.8	-3.1	28.3	-24.6
3	0.273	67.0	59.7	-1.3	28.2	-22.8
4	0.292	66.5	59.3	-1.2	27.6	-22.9
5	0.307	66.2	59.1	-1.0	27.4	-22.7
6	0.321	65.8	58.7	-1.0	26.8	-22.9
7	0.329	65.5	58.4	-1.1	27.1	-22.4
8	0.336	65.4	58.3	-1.0	26.6	-22.7
9	0.342	65.2	58.1	-1.1	26.3	-22.9
10	0.353	64.7	57.7	-1.2	26.6	-22.3
11	0.372	63.9	56.8	-1.7	25.7	-22.8
12	0.380	63.5	56.3	-2.0	25.4	-22.9
13	0.409	61.7	54.6	-3.1	23.7	-24.0
14	0.569	60.5	53.3	-2.7	19.7	-26.3
15	0.613	60.9	53.7	-2.3	20.6	-25.4
16	0.620	60.8	53.6	-2.4	20.8	-25.2
17	0.870	55.2	48.2	-7.8	21.5	-24.5
18	0.883	54.9	47.6	-8.4	21.4	-24.6
19	0.891	54.5	47.4	-8.6	21.2	-24.8
20	0.949	52.1	45.0	-11.0	36.3	-9.7

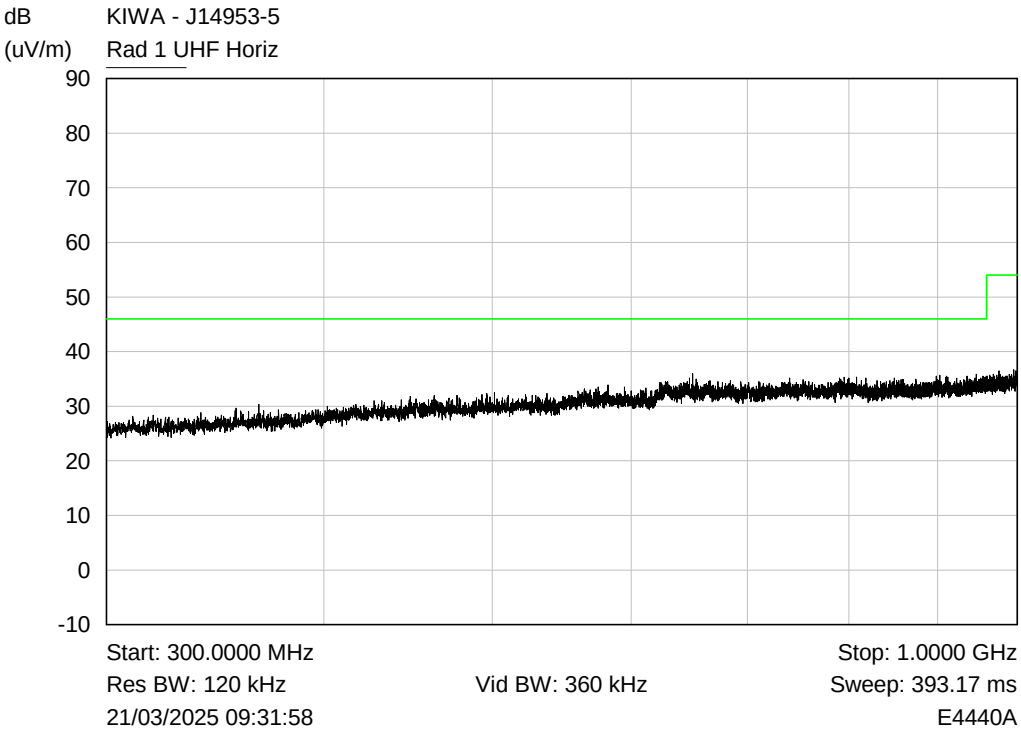
6.2 Radiated emissions 30 MHz - 1 GHz



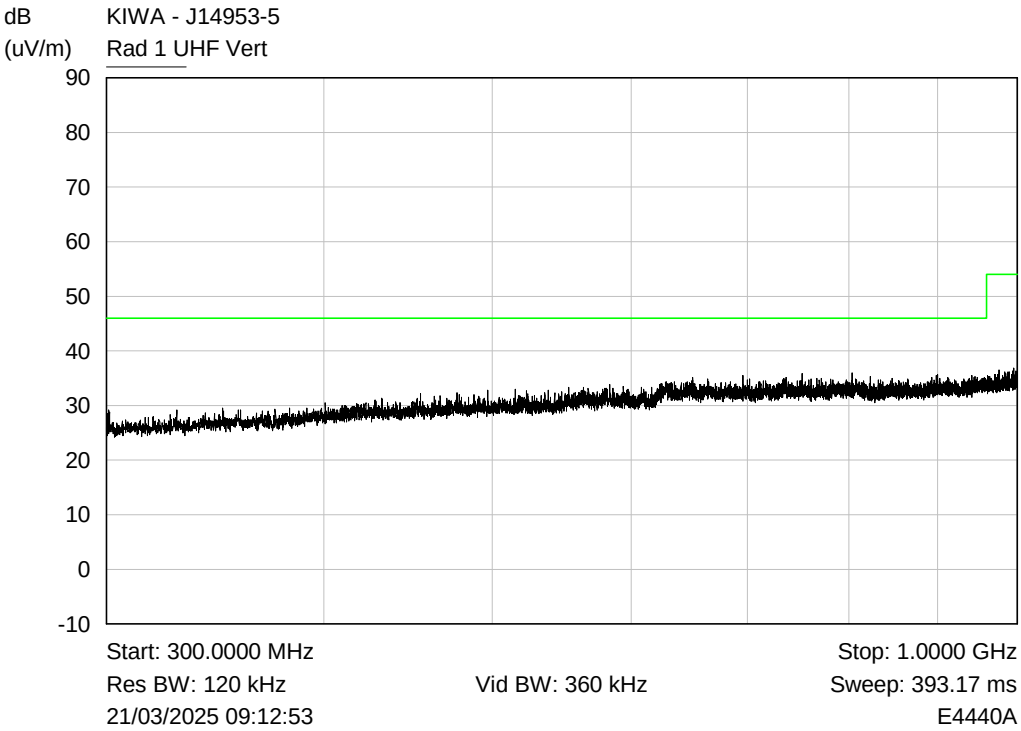
Peak Horizontal emissions 30 MHz - 300 MHz against the quasi-peak limit line.



Peak Vertical emissions 30 MHz - 300 MHz against the quasi-peak limit line.



Peak Horizontal emissions 300 MHz - 1 GHz against the quasi-peak limit line.



Peak Vertical emissions 300 MHz - 1 GHz against the quasi-peak limit line.

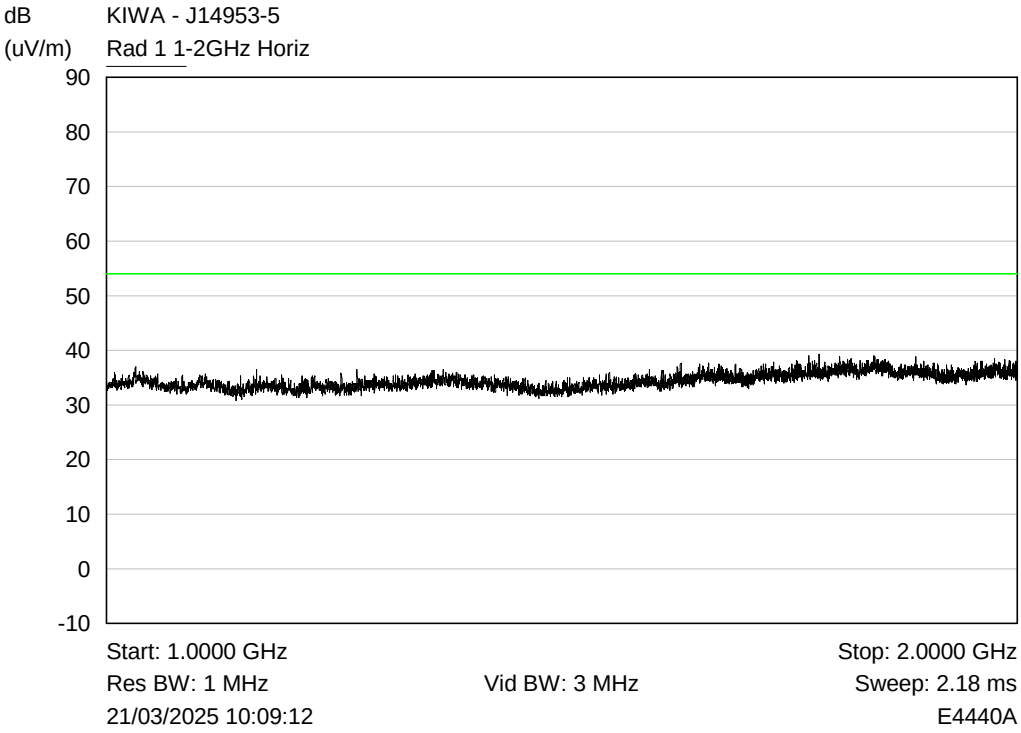
Table of signals measured for Horizontal Signal List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	QP Amp (dBuV/m)	QP -Lim (dB)
1	32.131	29.7	23.2	-16.8
2	41.972	24.5	18.0	-22.0
3	48.892	22.4	16.9	-23.1
4	100.322	23.6	17.6	-25.9
5	110.135	23.8	17.9	-25.6
6	651.522	36.6	31.0	-15.0

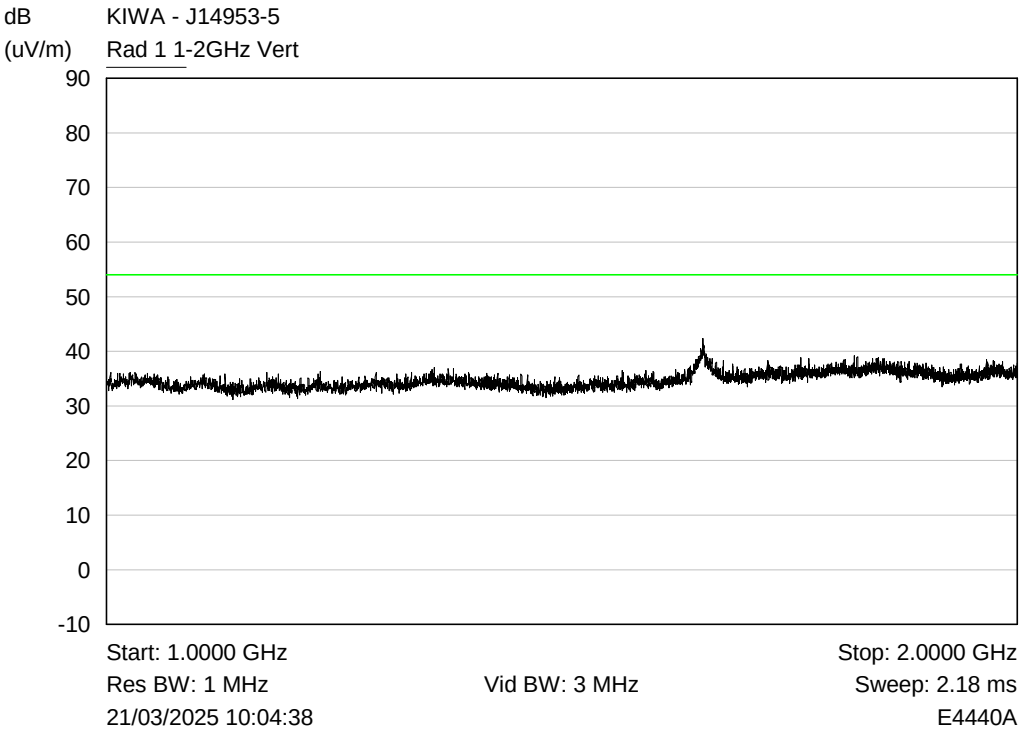
Table of signals measured for Vertical Signal List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	QP Amp (dBuV/m)	QP -Lim (dB)
1	32.359	31.2	22.9	-17.1
2	47.630	27.0	21.2	-18.8
3	86.454	25.2	18.6	-21.4
4	91.877	26.7	19.8	-23.7
5	100.579	23.6	17.3	-26.2
6	259.588	27.8	21.8	-24.2

6.3 Radiated Emissions above 1 GHz

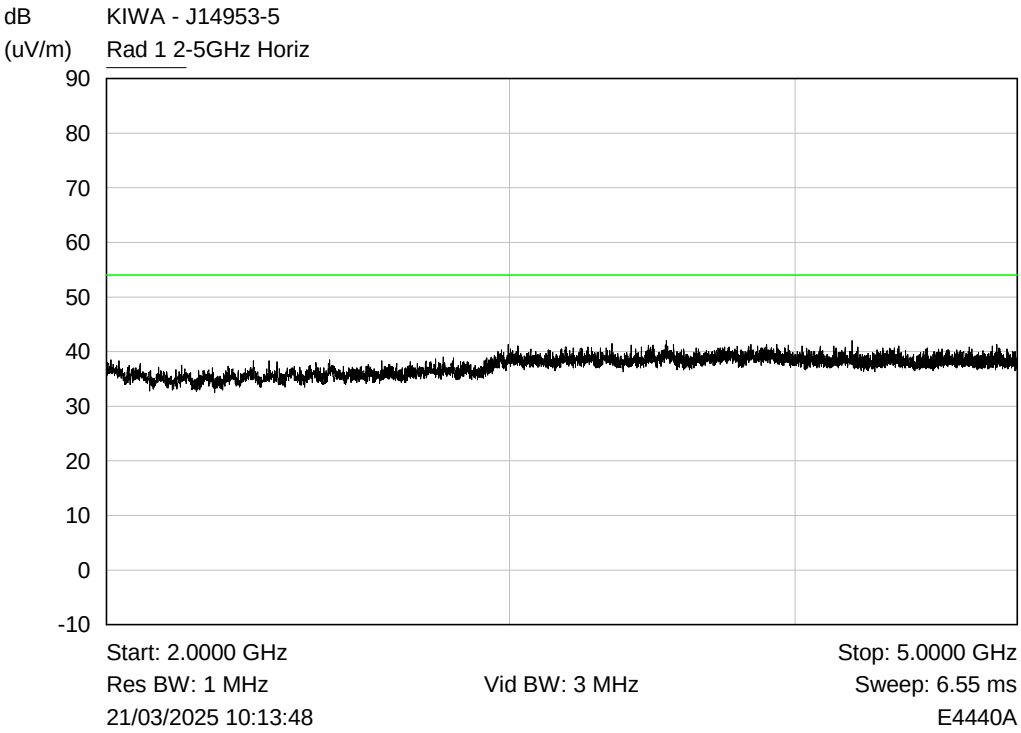


Peak Horizontal emissions 1 - 2 GHz against the average limit line

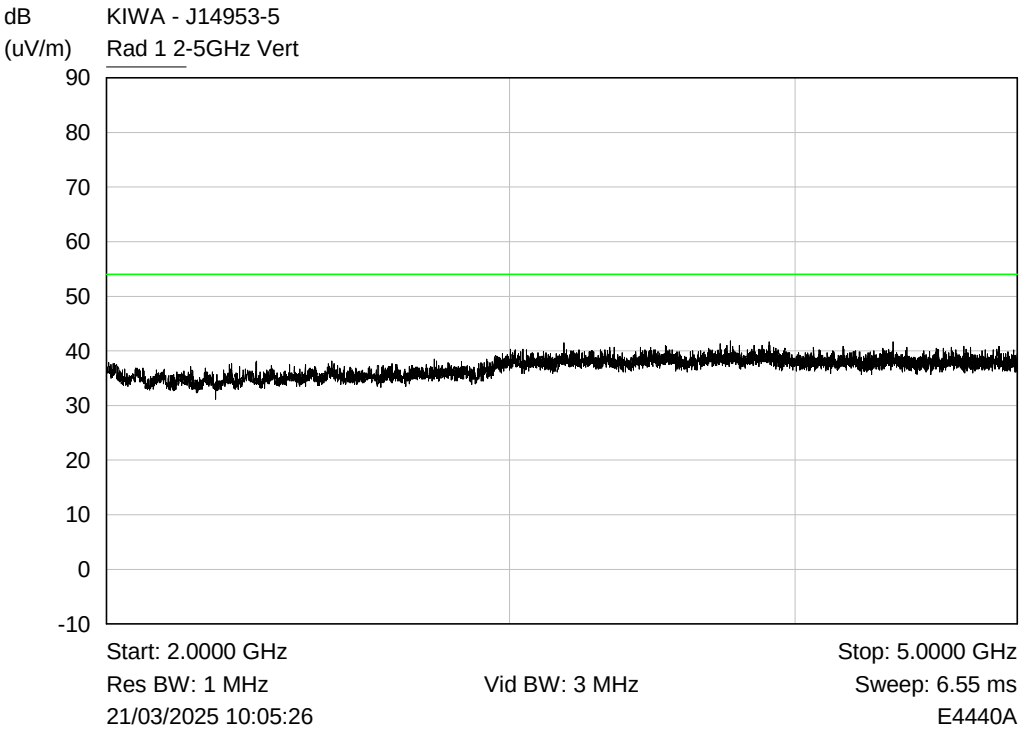


Peak Vertical emissions 1 - 2 GHz against the average limit line

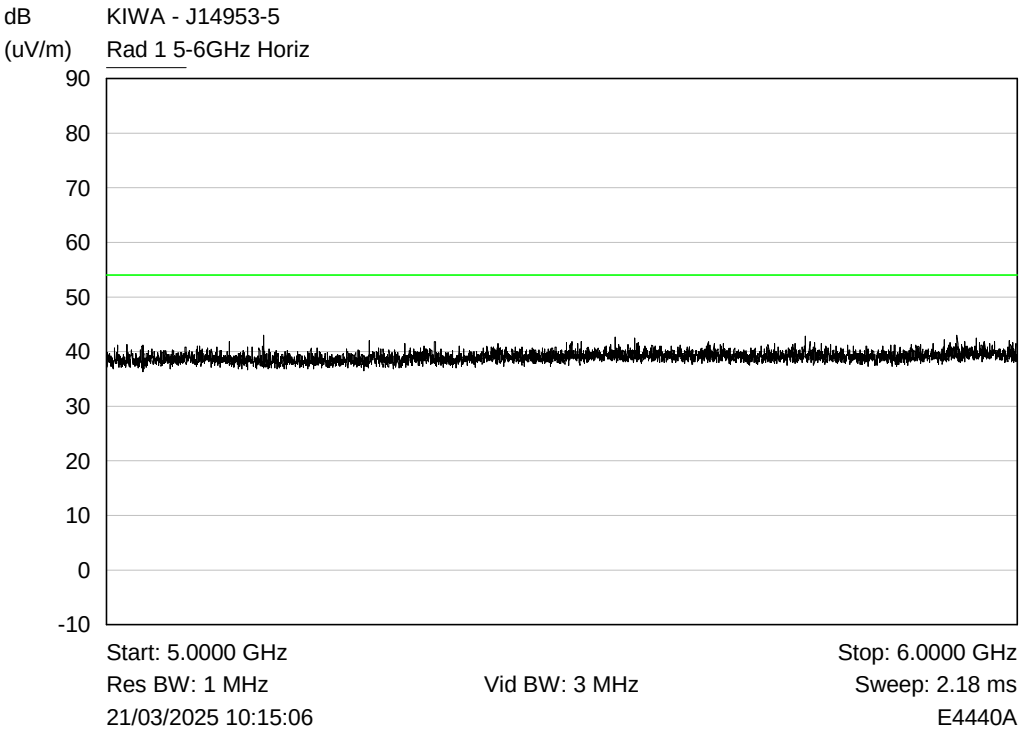
Note: Plot shows the re-radiated GPS signal.



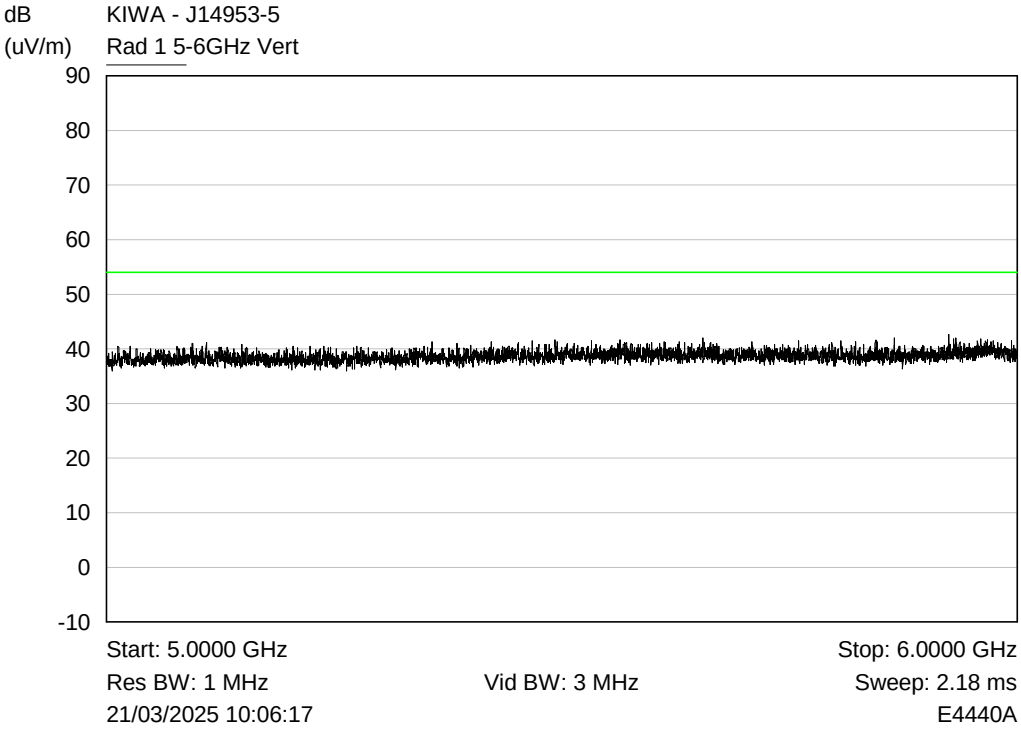
Peak Horizontal emissions 2 - 5 GHz against the average limit line



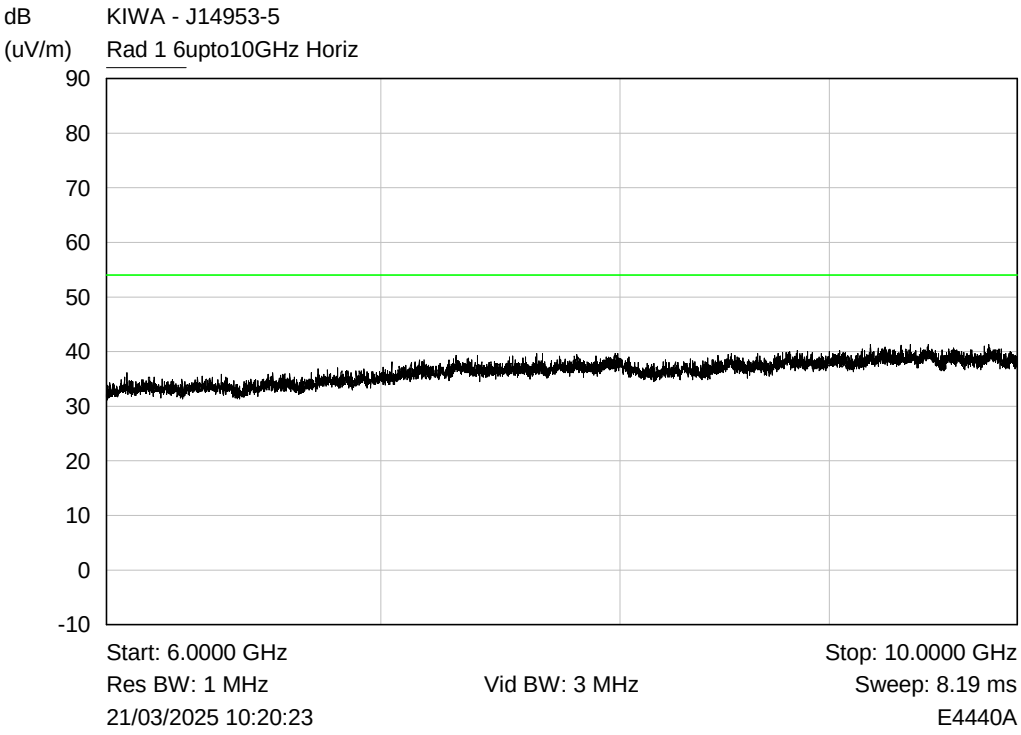
Peak Vertical emissions 2 - 5 GHz against the average limit line



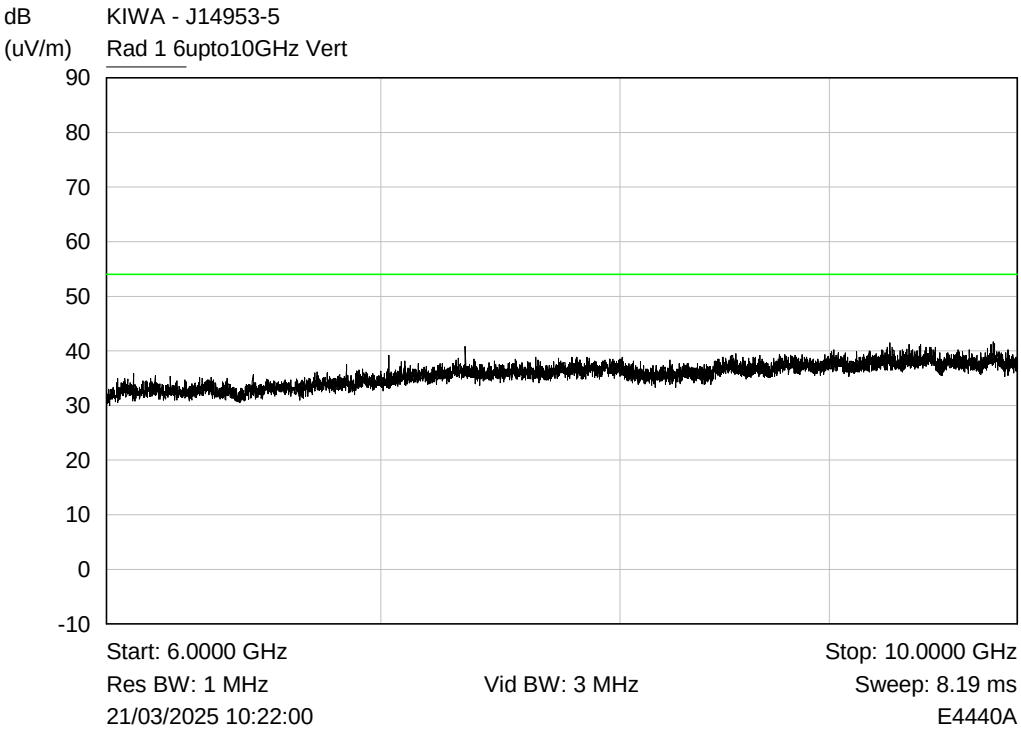
Peak Horizontal emissions 5 - 6 GHz against the average limit line



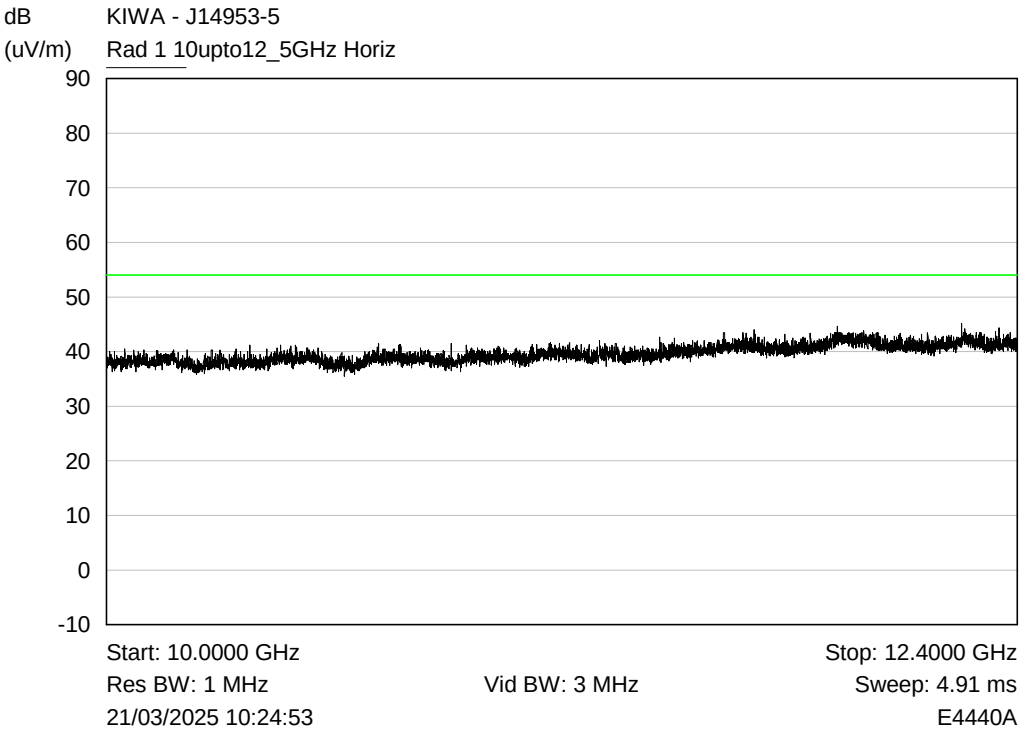
Peak Vertical emissions 5 - 6 GHz against the average limit line



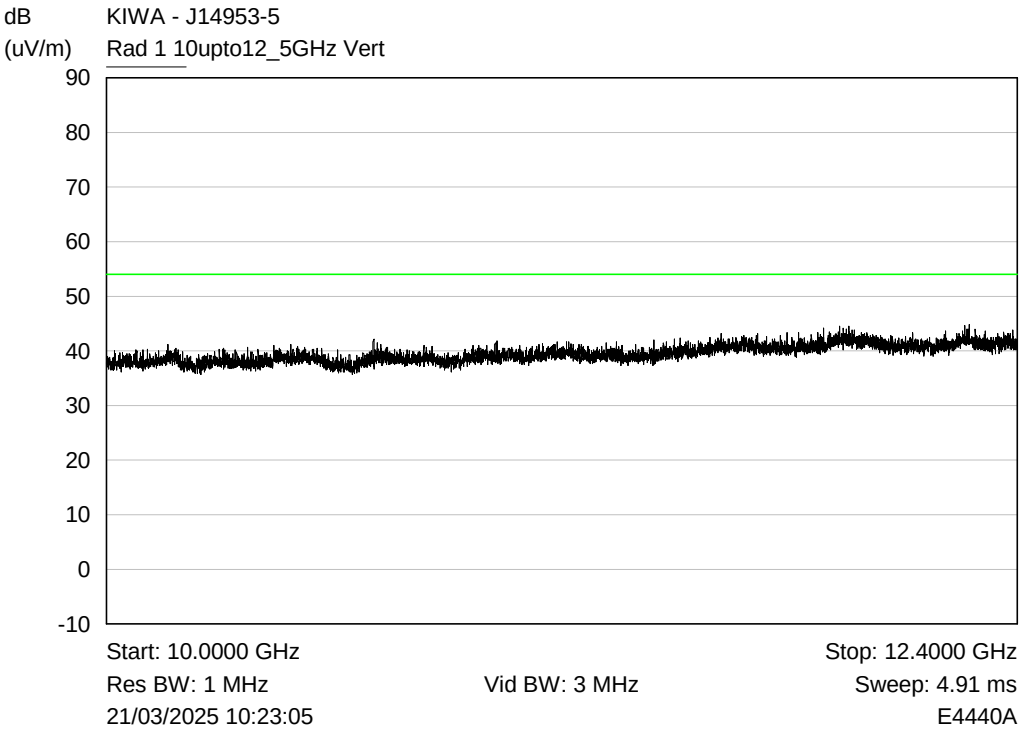
Peak Horizontal emissions 6 - 10 GHz against the average limit line



Peak Vertical emissions 6 - 10 GHz against the average limit line



Peak Horizontal emissions 10 – 12.4 GHz against the average limit line



Peak Vertical emissions 10 – 12.4 GHz against the average limit line

Table of signals measured for Horizontal signal list above 1GHz

The plots show that no signals were required to be measured.

Table of signals measured for Vertical signal list above 1GHz

The plots show that no signals were required to be measured.

7 Explanatory Notes

7.1 Explanation of Table of Signals Measured

Measurements are made as required by the standard. These measurements are made and recorded using detectors, either peak, quasi peak or average dependant on the test. A table of results has been given following the relevant plots. This table looks similar to the one illustrated below dependant on the measurements required by the test: -

Signal No.	Freq (MHz)	Peak Amp (dBuV)	Pk – Lim 1 (dB)	QP Amp (dBuV)	QP - Lim1 (dB)	Av Amp (dBuV)	Av - Lim1 (dB)
1	12345	54.9	-10.5	48	-12.6	37.6	-14.4

Column One - Labelled Signal No. is an incremental number that the receiver has given to each signal that has been measured.

Column Two - Labelled Freq (MHz) is the approximate frequency of the signal received.

Column Three - Labelled Peak Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the peak detector.

Column Four - Labelled Pk - Lim1 (dB) is the difference in level from the peak signal given to the active limit line. If this column appears in the table the peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Five - Labelled QP Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the quasi-peak detector.

Column Six - Labelled QP - Lim1 (dB) is the difference in level from the quasi-peak signal given to the active limit line. If this column appears in the table the quasi-peak detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Column Seven - Labelled Av Amp (dBμV) is the level of received signal that was measured in dB above 1μV using the average detector.

Column Eight - Labelled Av - Lim1 (dB) is the difference in level from the average signal given to the active limit line. If this column appears in the table the average detector measurement is required by the standard for this test. The results entered in this column indicate the signal level relative to the compliance limit required. Negative numbers indicate that the product is compliant.

Only signals highlighted in red are deemed to exceed the limit of the detector required.

7.2 Limit line calculations for radiated measurements

The limits given in the test standard are normally expressed as absolute values (e.g. in mV/m at a specified distance), whereas the measured values are expressed in dBmV referenced to the measuring instrument inputs. Kiwa Electrical Compliance calibrate the test set-up to account for any path losses, antenna gains, etc. so that the value read at the receiver relates directly to the absolute value required, except that it is expressed in dB relative to one microvolt and may need to take account of any alternative measuring distance used. Examples:

(a) Limit of 500mV/m equates to 20.log (500) = 54 dBmV/m.

(b) Limit of 300mV/m at 10m equates to 20.log (300 . 10/3) = 60 dBmV/m at 3m.

7.3 Example Calculation

The measurement receiver used for emissions testing, performs the field strength (FS) calculations automatically. The receiver combines the signal amplitude (RA), Antenna Factor (AF) and Cable Loss (CL) factors for the frequency to be measured.

Example calculation: - FS = RA + AF + CL.

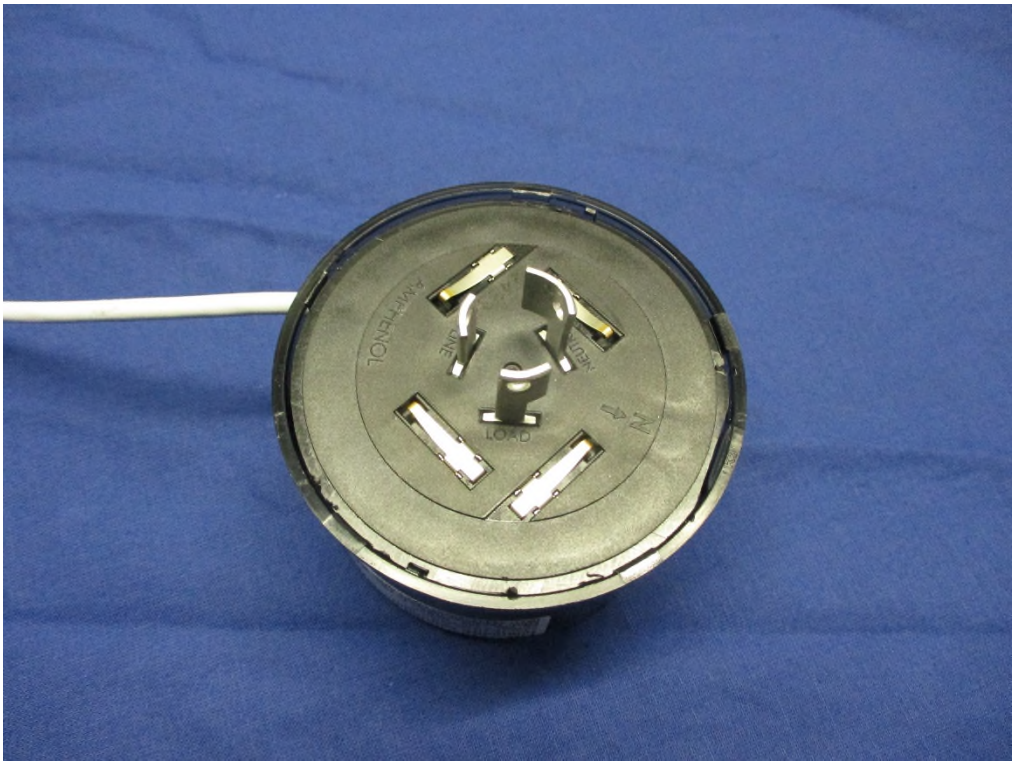
Receiver amplitude (RA)	Antenna factor (3m) (AF)	Cable loss	Field strength result (3m) (FS)
20dBuV/m	25 dB	3 dB	48dBuV/m

8 Photographs

8.1 EUT Front View


FRE–220–
luminaire

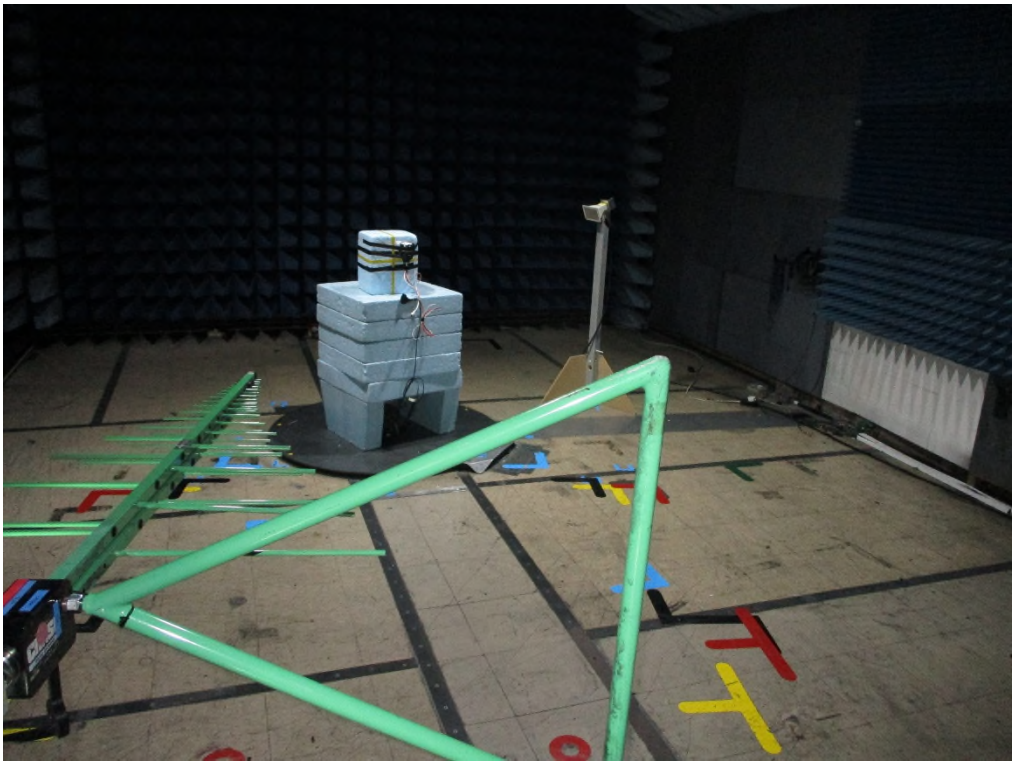
8.2 EUT Back View

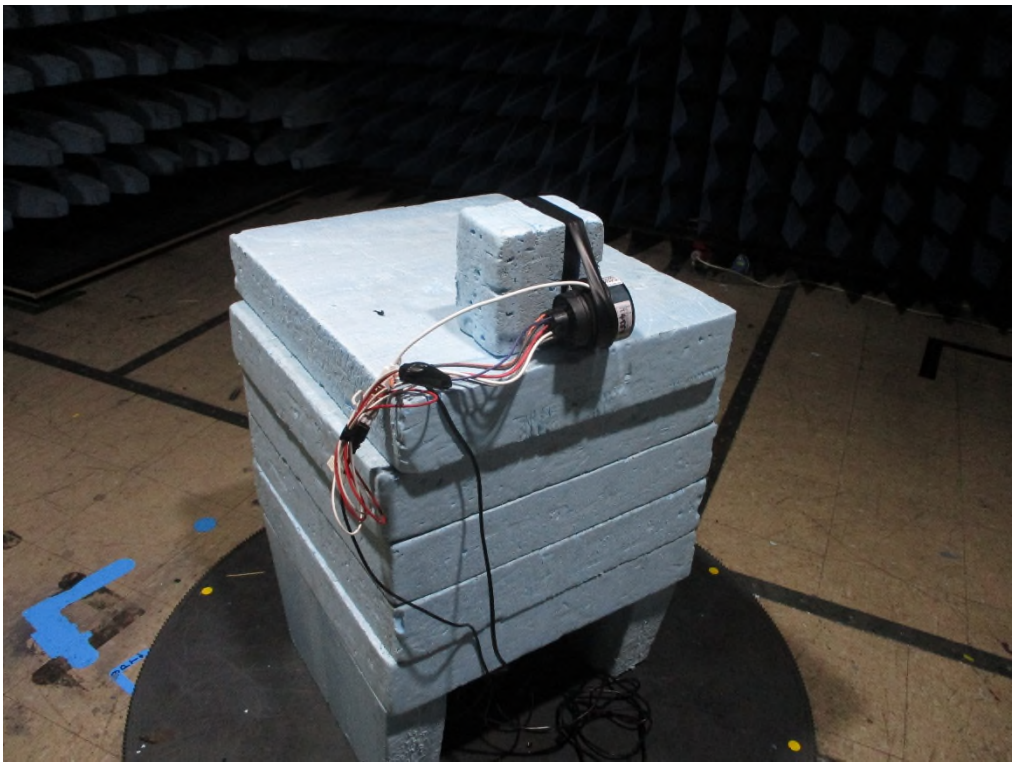


8.3 EUT Left Side Angle

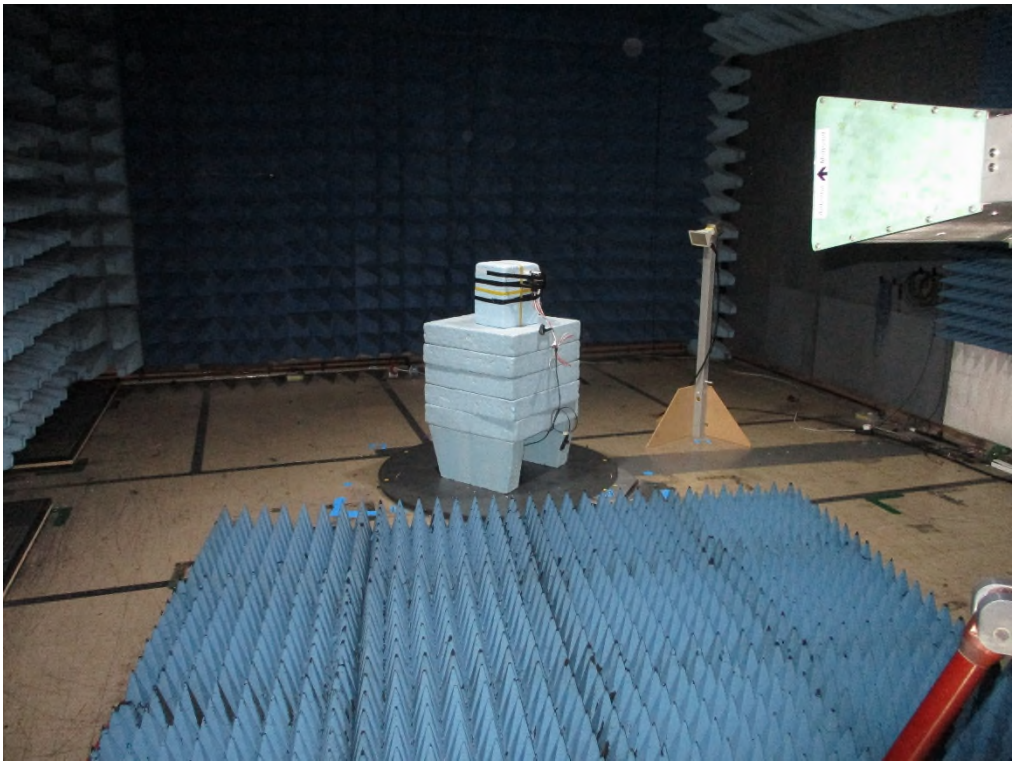
8.4 EUT Right Side Angle

8.5 Radiated emissions 30 MHz - 1 GHz



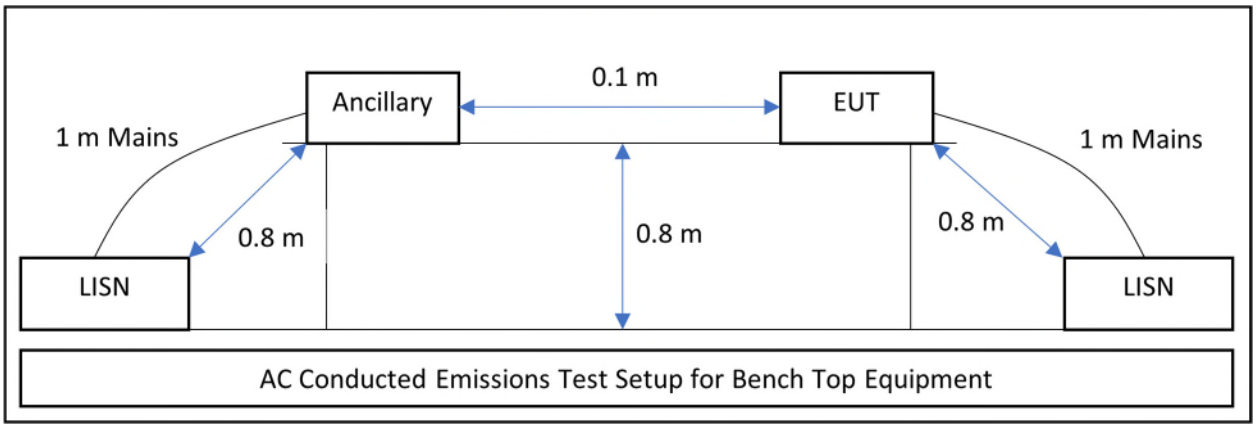


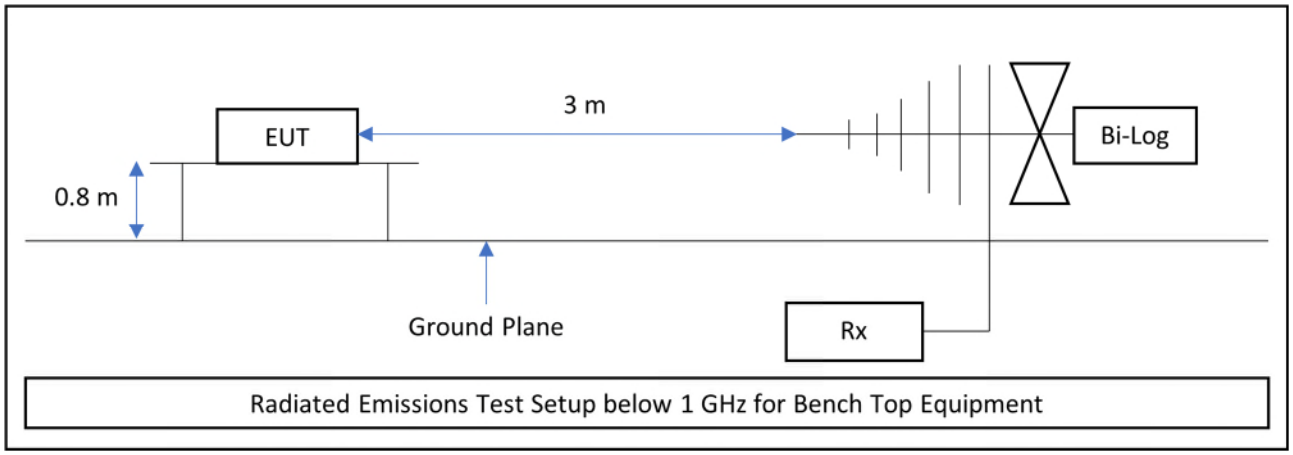
8.6 Radiated Emissions above 1 GHz

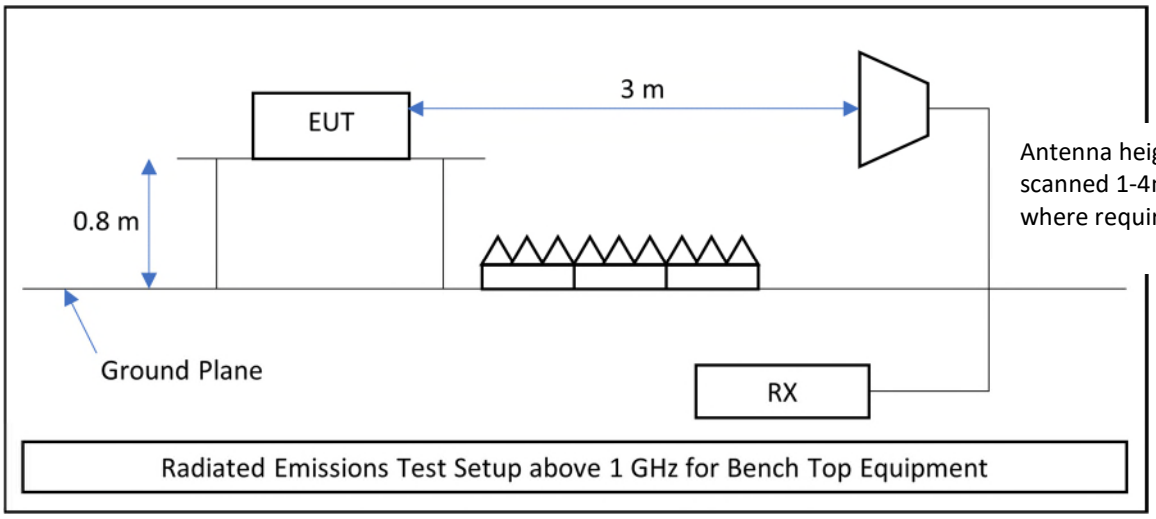


8.7 AC Conducted emissions

8.8 Set-up diagrams







9 Test equipment calibration list

The following is a list of the test equipment used by Kiwa Electrical Compliance to test the unit detailed within this report. In line with our procedures, the equipment was within calibration for the period during which testing was carried out.

KEC No	Model	Description	Manufacturer	Calibrated Date	Period
CB02	CB02	Cable RG213 N to N 9.5m Antenna (M)	RN Electronics	27/09/2024	12 months
E035	11947A	Transient Limiter 9 kHz - 200 MHz	Hewlett Packard	10/01/2025	12 months
E136	3105	Horn Antenna 1 - 12.5 GHz	EMCO	15/05/2024	12 months
E150	MN2050	LISN 13A	Chase	13/06/2024	12 months
E411	N9039A	9 kHz - 1 GHz RF Filter Section	Agilent Technologies	02/07/2024	12 months
E443	07145	Cable RG142 N-N 4m Receiver (M)	Times Fiber Communications	10/08/2024	12 months
E624	E4440A	PSA 3 Hz - 26.5 GHz	Agilent Technologies	06/07/2023	24 months
E651	MWX221	Cable N Type to SMA Blue 2m (M)	Junflon	10/08/2024	12 months
E743	2017 4/2dB	Attenuator 4/2dB 30-1000MHz	RN Electronics	17/02/2025	12 months
E902	MWX221	Cable SMA (m) to SMA (m) 2m Blue (M)	Junflon	10/08/2024	12 months
F362	ACO-055-510070-K4K4	Cable SMA to SMA 5.5m (M)	Atlantic Microwave	10/08/2024	12 months
LPE364	CBL6112A	Antenna BiLog 30MHz - 2GHz	Chase Electronics Ltd	28/03/2022	36 months
NSA-M	NSA - M	NSA - Site M	RN Electronics	10/12/2024	36 months
TMS82	8449B	Pre-Amplifier 1GHz - 26.5GHz	Agilent Technologies	14/01/2025	12 months
VSWR-M	VSWR	VSWR 1-18GHz	RN Electronics	19/11/2024	36 months
ZSW1	V2.5.7	KEC Measurement Software Suite	KEC	Not applicable	

10 Support equipment

10.1 Customer supplied equipment

Item No.	Model No.	Description	Manufacturer	Serial No.
1	Not stated	USB to serial cable	Generic	Not stated

10.2 Kiwa Electrical Compliance supplied equipment

Item No	Model	Description	Manufacturer	Serial No
E465	PCR2000LA	AC Power Source 2kVA	Kikusui	HJ000995
I323	Vostro I5 3000	Laptop Computer	Dell	Not stated

11 Condition of the equipment tested

In order for the EUT to produce the results shown within this report the following modifications, if any, were implemented.

11.1 Modifications before test

No modifications were made before test by Kiwa Electrical Compliance.

11.2 Modifications during test

No modifications were made during test by Kiwa Electrical Compliance.

12 Description of test sites

Site A Radio Laboratory and Anechoic Chamber

Site B Semi-Anechoic Chamber and Control Room
FCC Registration No. 654321, ISED Registration No. 5612A-4

Site C Transient Laboratory

Site D Screened Room (Conducted Immunity)

Site E Screened Room (Control Room for Site D)

Site F Screened Room (Conducted Emissions)

Site G Screened Room (Control Room for Site H)

Site H 3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 654321, ISED Registration No. 5612A-2, VCCI Registration No. 4065

Site J Transient Laboratory

Site K Screened Room (Control Room for Site M)

Site M 3m Semi-Anechoic Chamber (indoor OATS)
FCC Registration No. 654321, ISED Registration No. 5612A-3

Site N Radio Laboratory

Site Q Fully-Anechoic Chamber

Site OATS 3m and 10m Open Area Test Site
FCC Registration No. 654321, ISED Registration No. 5612A-1

Site R Screened Room (Conducted Immunity)

Site S Safety Laboratory

Site T Transient Laboratory

CAB identifier as issued by Innovation, Science and Economic Development Canada is UK0002
CAB identifier as issued by FCC is UK2015

13 Revision History

Issue Number	Revision History	Page Reference(s)
01	First Issue	-
02	Clarification that the voltage used for full-test was declared by the applicant and is that used by the device in service. Test procedure expanded to clarify that height scanning was performed to determine that worst-case emissions were measured during test. Incorrect photographs replaced. Photographs now show 0.8 metre turntable height used for test.	5 12 32 & 33