

EMC TEST REPORT

No. 2102344STO-102

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment: Electronic control gear for LED / Power Supply
Type/Model: ICPSW24-7-3
Manufacturer: IKEA of Sweden AB
Tested by request of: IKEA of Sweden AB

SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

FCC 47 CFR Part 15: Radio frequency devices, Subpart B: Unintentional radiators. Class B equipment.

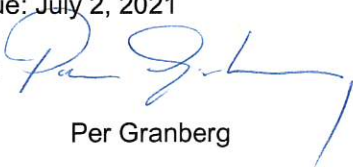
ICES-001 Issue 5: Industrial, Scientific and Medical (ISM) Radio Frequency Generators with emission limits for class B Group 1 equipment

ICES-005 Issue 5: Lighting Equipment, Class B. (2018)

For details, see clause 2 – 4.

Date of issue: July 2, 2021

Tested by:


Per Granberg

Approved by:


Matti Virkki

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Revision History

Test report no.	Release no.	Date of issue	Description
2102344STO-102	1	July 2, 2021	

Terms, definition and abbreviations

The following terms, definitions and abbreviations may be used throughout the report.

Term/definition/abbreviation	Meaning
AAN	Asymmetrical Artificial Network
AC	Alternating Current
AE	Associated Equipment
AMN	Artificial Mains Network
AV	Average
BW	Bandwidth
CAV	CISPR Average
CM	Common Mode
CMAD	Common Mode Absorption Device
DC	Direct Current
DM	Differential Mode
EM	Electromagnetic
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
F	Fail
FAR	Fully Anechoic Room
F_x	Highest fundamental frequency generated or used within the EUT, or highest frequency at which it operates
H	Horizontal
ISN	Impedance Stabilizing Network
MU	Measurement Uncertainty
N/A	Not Applicable
P	Pass
PE	Protective Earth
PK	Peak
Pol.	Polarisation
QP / QPK	Quasi-Peak
RBW	Resolution Bandwidth
RF	Radio Frequency
RGP	Reference Ground Plane
RH	Relative Humidity
RMS	Root Mean Square
Rx	Receiver / Receiving
SAC	Semi-Anechoic Chamber
Tx	Transmitter / Transmitting
V	Vertical
VBW	Video Bandwidth

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1. CLIENT INFORMATION

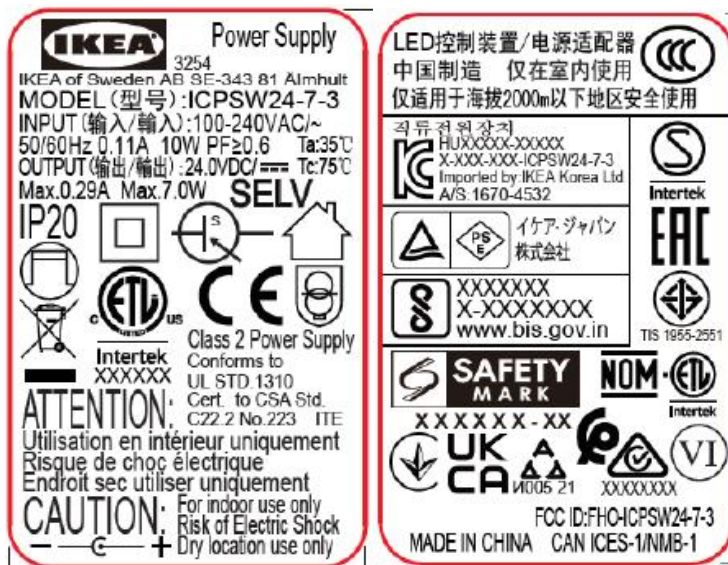
The EUT has been tested by request of

Company	IKEA of Sweden AB Box 702 SE-343 81 Älmhult Sweden
Name of contact	Christian Truedsson
Client observer	-

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Electronic control gear for LED / Power Supply														
Type/Model:	ICPSW24-7-3														
Brand name:	IKEA														
S/N:	-														
Manufacturer:	IKEA of Sweden AB Box 702 SE-343 81 Älmhult Sweden														
Installation class:	☐ I ☒ II ☐ III ☐ N/A														
Highest clock frequency, F_X:	< 108 MHz														
Transmitting freq.:	-														
Software version:	-														
Hardware version:	-														
Mounting position: (during normal use)	☐ Table-top ☐ Floor-standing ☐ Wall/ceiling ☐ Hand-held ☒ Other:														
Supplementary information:	-														
Input ratings	Voltage [V]	Freq. [Hz]	Current [A]	Power [W]	Coupling										
☒ AC	100 – 240	50/60	0.11	10	<table> <tr> <td>L1</td><td>L2</td><td>L3</td><td>N</td><td>PE</td></tr> <tr> <td>☒</td><td>☐</td><td>☐</td><td>☒</td><td>☐</td></tr> </table>	L1	L2	L3	N	PE	☒	☐	☐	☒	☐
L1	L2	L3	N	PE											
☒	☐	☐	☒	☐											
☐ DC					<table> <tr> <td>V+</td><td>V-</td><td></td><td></td><td>PE</td></tr> <tr> <td>☐</td><td>☐</td><td></td><td></td><td>☐</td></tr> </table>	V+	V-			PE	☐	☐			☐
V+	V-			PE											
☐	☐			☐											
☐ Battery					<table> <tr> <td>V+</td><td>V-</td><td></td><td></td><td></td></tr> <tr> <td>☐</td><td>☐</td><td></td><td></td><td></td></tr> </table>	V+	V-				☐	☐			
V+	V-														
☐	☐														
☐ Other:															
Output ratings	Voltage [V]	Freq. [Hz]	Current [A]	Power [W]	Coupling										
☒ DC	24	-	0.29	7	<table> <tr> <td>V+</td><td>V-</td><td></td><td></td><td>PE</td></tr> <tr> <td>☒</td><td>☒</td><td></td><td></td><td>☐</td></tr> </table>	V+	V-			PE	☒	☒			☐
V+	V-			PE											
☒	☒			☐											
☐ Other:															



Photo/copy of marking/rating plate(s)

2.2 Test set up and EUT photos

Test set up and EUT photos are enclosed in Annex 1 to this test report.

2.3 Additional information about the EUT

The ICPSW24-7-3 is a plug in LED-driver for use with LED luminaires, ICPSW24-7-3 can also be used as a power supply for other type of apparatus.

The EUT has the following ports:

Port type	Port name	Length [m]	Shielded
AC I/O			
☒ AC power input	Supply plug	-	☐
☐ AC power output			☐
DC I/O			
☐ DC power input			☐
☒ DC power output	DC load, 2-core cable	3*	☐
Signal/control I/O			
☐ Signal/control			☐
☐ Telecom/network			☐
Supplementary information:			
*According to the manufacturer: the maximum length of the DC-output cable is 3 m when used as a power supply, however as LED-driver in luminaire systems the cable may be longer.			

2.4 Associated equipment

Associated equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

Equipment	Manufacturer	Type/Model	S/N
LED-load: 7 W	IKEA	L1908 Mittled L1909 Mittled	-

2.5 Decision rule

The statements of conformity are reported as:

Passed – When the measured values are within the specified limits.

Failed – When one or more measures values are outside the specified limits.

3. TEST SPECIFICATIONS

3.1 Additions, deviations and exclusions from standards and accreditation

The following editions of basic standards were applied instead of the standards referenced in FCC 47 CFR Part 15 and ICES-005:

Referenced	Applied
ANSI C63.4-2014	ANSI C63.4-2014

The following editions of basic standards were applied instead of the standards referenced in ICES-001:

Referenced	Applied
CSA CISPR 11:19	CISPR 11:2015 + A1:2016

3.2 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is an FCC listed test site with site registration number 90913
Intertek Semko AB is an FCC accredited conformity assessment body with designation number SE0002
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
☒ STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2
☐ BJÖRKHALLEN	Semi-anechoic 3 m	2042G-1
☐ 5 m CHAMBER	Semi-anechoic 5 m	2042G-3

3.3 Mode of operation during the test

Mode no.	Supply	Description
1	120 V, 60 Hz	Max output load condition, LED-load of 7 W

Test	Mode of operation
Conducted continuous emission	1
Radiated emission of EM fields	1

4. TEST SUMMARY

The test has been carried out at the Intertek Semko AB premises in Kista, Sweden.
The results in this report apply only to sample tested.

Result: P – F – N/A

EMISSION TESTS					
Chapter	Standard(s)	Description	Port type(s)	Note(s)	Verdict
5	ANSI C63.4 CISPR 11	Conducted continuous emission	AC input	-	P
6	ANSI C63.4 CISPR 11	Radiated emission of EM fields	Enclosure	-	P
Supplementary information:					

5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0.15 – 30 MHz

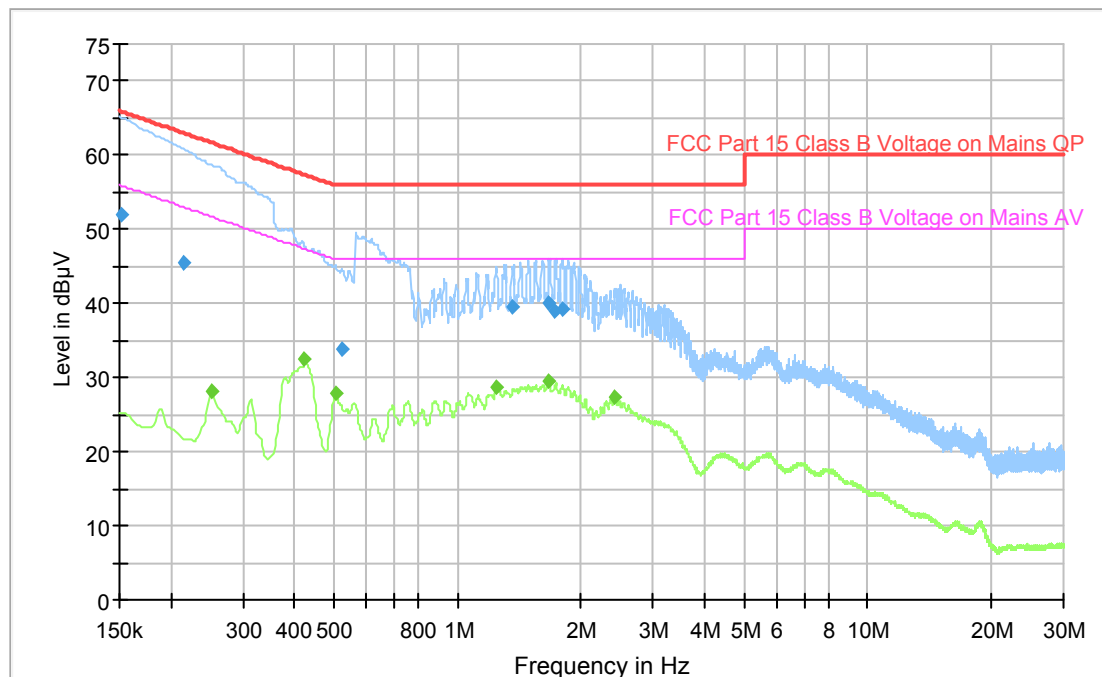
Date of test	Temp. [°C]	Humidity [%RH]	Tested by
May 31, 2021	22	30	PEG

Test setup and procedure:	EUT was placed 0.8 m from the AMN /ISN. Overview sweeps were performed for each lead of the cable(s). AE requiring mains power to operate was/were connected to AMN /ISN terminated with 50 Ω , when applicable.		
EUT position:	☒ Table-top (EUT 0.4 m from the RGP) ☐ Floor-standing (EUT 12 mm from the RGP) ☐ Other:		
Tested port type(s):	Coupling device	Measurement uncertainty	
		Frequency range	Value
☒ AC power	☒ AMN	0.15 – 30 MHz	± 3.3 dB
Supplementary information: Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011. The measurement uncertainty is given with a confidence of 95 %.			

Port	Frequency [MHz]	Voltage limits [dBμV] (2)	
		QP	AV
Limits FCC Part 15 subpart B			
□ AC power input Class A	0.15 – 0.50	79	66
	0.50 – 30.0	73	60
☒ AC power input Class B	0.15 – 0.50	66 – 56 (1)	56 – 46 (1)
	0.50 – 5.00	56	46
	5.00 – 30.0	60	50
Supplementary information: (1) The limits decrease linearly with the logarithm of the frequency. (2) At transitional frequencies the lower limit applies.			

Port	Frequency [MHz]	Rated input power of ≤ 20 kVA (2)		Rated input power of > 20 kVA (2),(3)	
		QP dB(μV)	AV dB(μV)	QP dB(μV)	AV dB(μV)
Limits, Class A ICES-001 group 1 according to CISPR 11					
☐ AC power	0,15 – 0,50	79	66	100	90
	0,50 – 5,00	73	60	86	76
	5,00 – 30,0	73	60	90-73 (1)	80-60 (1)
Limits ICES-001, Class B group 1 according to CISPR 11					
☒ AC power	0,15 – 0,50	66-56 (1)	56-46 (1)	66-56 (1)	56-46 (1)
	0,50 – 5,00	56	46	56	46
	0,50 – 30,0	60	50	60	50
Supplementary information: (1) The limits decrease linearly with the logarithm of the frequency. (2) At transitional frequencies the lower limit applies. (3) These limits apply to equipment with a rated input power > 20 kVA and intended to be powered by a dedicated power transformer or generator, and which is not connected to Low Voltage (LV) overhead power lines. For equipment not intended to be powered by a user specific power transformer, the limits for ≤ 20 kVA apply. The manufacturer and/or supplier shall provide information on installation measures that can be used to reduce emissions from the installed equipment. In particular, it shall be indicated that this equipment is intended to be powered by a dedicated power transformer or generator and not by LV overhead power lines.					

5.1 Test results, AC Power input port, Class B



The EUT also fulfil the class B limit for ICES-001 and ICES-005, see limit table on previous page.

Diagram, Peak and AV overview sweep

Measurement results, Quasi-peak and Average

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE
0.152250	51.92	---	65.88	13.96	1000.0	9.000	N	GND
0.215250	45.47	---	63.00	17.53	1000.0	9.000	N	GND
0.251250	---	28.19	51.72	23.53	1000.0	9.000	L1	GND
0.424500	---	32.38	47.36	14.98	1000.0	9.000	L1	GND
0.503250	---	27.91	46.00	18.09	1000.0	9.000	L1	GND
0.523500	33.83	---	56.00	22.17	1000.0	9.000	N	GND
1.241250	---	28.71	46.00	17.29	1000.0	9.000	L1	GND
1.360500	39.49	---	56.00	16.51	1000.0	9.000	L1	GND
1.659750	---	29.50	46.00	16.50	1000.0	9.000	L1	GND
1.671000	40.12	---	56.00	15.88	1000.0	9.000	L1	GND
1.727250	38.99	---	56.00	17.01	1000.0	9.000	L1	GND
1.797000	39.28	---	56.00	16.72	1000.0	9.000	L1	GND
2.409000	---	27.37	46.00	18.63	1000.0	9.000	L1	GND

The EUT also fulfil the class B limit for ICES-001 and ICES-005, see limit table on previous page.

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

5.2 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - V10.50.40	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	2020-07-27	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2728	2020-07-08	1 year
Pulse limiter	Rohde & Schwarz	ESH3-Z5	4623	2020-05-13	1 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHz – 1 GHz

Date of test	Temp. [°C]	Humidity [%RH]	Tested by
May 25, 2021	21	34	PEG

Test setup and procedure:	The EUT was placed on a non-conductive support on the RGP. Overview sweeps were performed with the measurement receiver in max hold mode and the peak detector activated in the frequency range 30 – 1000 MHz. Above 1 GHz, both the peak and average detectors were activated, when applicable. During height scan above 1 GHz the EUT was kept in antennas cone of radiation.	
EUT position:	☒ Table-top (EUT 0.8 m from the RGP) ☐ Floor-standing (EUT 12 mm from the RGP) ☐ Other:	
Highest measured frequency:	☒ $F_X \leq 108$ MHz: 1 GHz ☐ $108 \text{ MHz} < F_X \leq 500$ MHz: 2 GHz ☐ $500 \text{ MHz} < F_X \leq 1$ GHz: 5 GHz ☐ $F_X > 1$ GHz: $5 \times F_X$ up to a max. of 40 GHz ☐ F_X is unknown: 40 GHz	
Frequency range:	Measuring distance	Measurement uncertainty
☒ 30 to 1000 MHz	3 m	± 5.1 dB
☐ 30 to 1000 MHz	10 m	± 5.0 dB
☐ 1.0 to 18 GHz	3 m	± 4.5 dB
☐ 18 to 26 GHz	3 m	± 4.8 dB
☐ 26 to 40 GHz	3 m	± 5.7 dB
Supplementary information: Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011. The measurement uncertainty is given with a confidence of 95 %.		

Test	Freq. [MHz]	Meas. angle [°]	Antenna			RBW [kHz]			VBW [kHz]
			Type	Height	Pol.	QP	PK	AV	PK
Preview	30 – 1000	0 – 359	Bilog	1 – 4 m	V and H	-	120	-	1000
Final						120	-	-	-
Preview	1000 – 40000	0 – 359	Horn	1 – 4 m	V and H	-	1000	1000	3000
Final						-	1000	1000	-

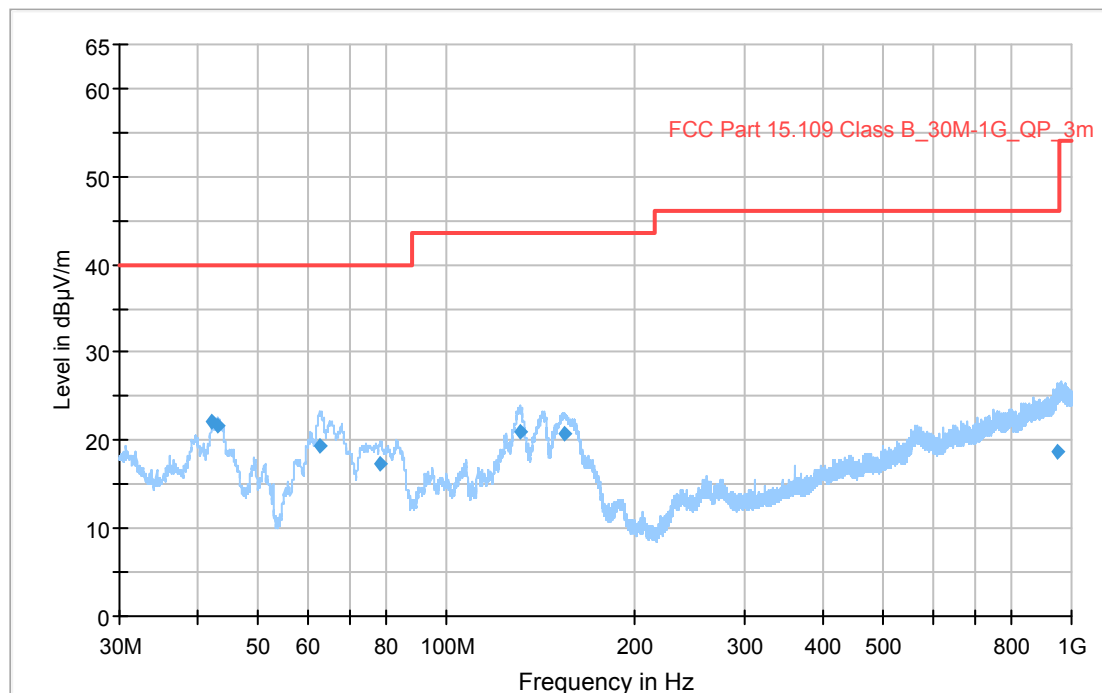
Measurement distance [m]	Frequency [MHz]	Limits [dBµV/m]		
		QP	PK	AV
Limits, FCC, Class A				
☐ 3 / ☐ 10	30 – 88	49.5 / 39.1	-	-
	88 – 216	54.0 / 43.5	-	-
	216 – 960	56.9 / 46.4	-	-
	960 – 1000	60.0 / 49.5	-	-
☐ 3	Above 1000	-	80.0	60.0
Limits, FCC, Class B				
☒ 3 / ☐ 10	30 – 88	40.0 / 29.5	-	-
	88 – 216	43.5 / 33.1	-	-
	216 – 960	46.0 / 35.6	-	-
	960 – 1000	54.0 / 43.5	-	-
☐ 3	Above 1000	-	74.0	54.0
Limits, ICES-005 Class A				
☐ 3 / ☐ 10	30 – 88	49.5 / 39.1	-	-
	88 – 216	54.0 / 43.5	-	-
	216 – 1000	56.9 / 46.4	-	-
Limits, ICES-005, Class B				
☒ 3 / ☐ 10	30 – 88	40.0 / 29.5	-	-
	88 – 216	43.5 / 33.1	-	-
	216 – 1000	46.0 / 35.6	-	-

Test facility & measurement distance	Frequency [MHz]	Limits [dBμV/m]	
		Rated input power ≤ 20 kVA	Rated input power > 20 kVA (1)
		QP	QP
Limits ICES-001, Class A group 1 according to CISPR 11			
☐ SAC, 10 m	30 – 230	40	50
	230 – 1000	47	50
☐ SAC, 3 m	30 – 230	50	60
	230 – 1000	57	60
Limits ICES-001, Class B group 1 according to CISPR 11			
☐ SAC, 10 m	30 – 230	30	30
	230 – 1000	37	37
☒ SAC, 3 m	30 – 230	40	40
	230 – 1000	47	47

Supplementary information:

(1): These limits apply to equipment with a rated input power of > 20 kVA and intended to be used at locations where there is a distance greater than 30 m between the equipment and third party sensitive radio communications. The manufacturer shall indicate in the technical documentation that this equipment is intended to be used at locations where the separation distance to third party sensitive radio services is > 30 m. If the manufacturer does not include the particular conditions of use of the equipment in the technical documentation for the user, then the limits for equipment with a rated input power of ≤ 20 kVA shall apply

6.1 Test results, 30 – 1000 MHz, FCC, Class B, ICES-001, Group 1, Class B, ICES-005, Class B



The EUT also fulfil the class B limit for ICES-001 and ICES-005, see measurement result below.

Diagram, Peak overview sweep

Measurement results, Quasi-peak, FCC, Class B

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
42.270	22.21	40.00	17.79	1000.0	120.0	100.0	V	191.0
43.110	21.69	40.00	18.31	1000.0	120.0	100.0	V	131.0
62.940	19.28	40.00	20.72	1000.0	120.0	122.0	V	269.0
78.300	17.25	40.00	22.75	1000.0	120.0	124.0	V	118.0
131.460	21.04	43.52	22.48	1000.0	120.0	106.0	V	198.0
154.770	20.69	43.52	22.83	1000.0	120.0	105.0	V	210.0
951.390	18.74	46.02	27.28	1000.0	120.0	196.0	V	328.0

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

Measurement results, Quasi-peak, ICES-001, Group 1, Class B

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
42.270	22.21	40.00	17.79	1000.0	120.0	100.0	V	191.0
43.110	21.69	40.00	18.31	1000.0	120.0	100.0	V	131.0
62.940	19.28	40.00	20.72	1000.0	120.0	122.0	V	269.0
78.300	17.25	40.00	22.75	1000.0	120.0	124.0	V	118.0
131.460	21.04	40.00	18.96	1000.0	120.0	106.0	V	198.0
154.770	20.69	40.00	19.31	1000.0	120.0	105.0	V	210.0
951.390	18.74	47.00	28.26	1000.0	120.0	196.0	V	328.0

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

Measurement results, Quasi-peak, ICES-005, Class B

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
42.270	22.21	40.00	17.79	1000.0	120.0	100.0	V	191.0
43.110	21.69	40.00	18.31	1000.0	120.0	100.0	V	131.0
62.940	19.28	40.00	20.72	1000.0	120.0	122.0	V	269.0
78.300	17.25	40.00	22.75	1000.0	120.0	124.0	V	118.0
131.460	21.04	43.52	22.48	1000.0	120.0	106.0	V	198.0
154.770	20.69	43.52	22.83	1000.0	120.0	105.0	V	210.0
951.390	18.74	46.02	27.28	1000.0	120.0	196.0	V	328.0

Result [dBμV/m] = Analyser reading [dBμV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.2 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - V10.50.40	--	--	--
Measurement Receiver	Rohde & Schwarz	ESW44	33890	2020-07-08	1 year
Antenna	Chase	CBL 6111A	34200	2020-03-18	3 years
Pre-amplifier	SEMKO	AM1331	7992	2020-06-15	1 year