

EMC TEST REPORT

No. 2105402STO-107

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment: Water Leakage Sensor
Type/Model: E2202
Manufacturer: IKEA of Sweden AB
Tested by request of: IKEA of Sweden AB
FCC ID: FHO-E2202

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-003 Issue 7: Information Technology Equipment (Including Digital Apparatus) Class B.

For details, see clause 2 – 4.

Date of issue: November 19, 2023

Report update
prepared by:


Jens Gardström
Test Engineer

Approved by:


Anna Näslund

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Revision History

Test report no.	Release no.	Date of issue	Description
2105402STO-005	1	June 14, 2023	
2105402STO-107	2	November 16, 2023	FCC ID no. is added on page 5

Terms, definitions 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
ANSI	American National Standards Institute
AV	Average
BW	Bandwidth
CAV	CISPR Average
CFR	Code of Federal Regulations
CISPR	Comité international spécial des perbutions radioélectriques
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
FCC	Federal Communications Commission
F_x	Highest fundamental frequency generated or used within the EUT, or highest frequency at which it operates
ICES	Interference-Causing Equipment Standard
H	Horizontal
I_{ref}	Reference Current
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 702 343 81 Älmhult Sweden
Name of contact	Carl Isholt
Client observer	-

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Water Leakage Sensor				
Type/Model:	E2202				
Brand name:	IKEA				
S/N:	N/A				
Manufacturer:	IKEA of Sweden				
Highest clock frequency, F_x:	38.4MHZ				
Transmitting Frequency	2400~2483.5MHz				
Software version:	V2.4.1				
Hardware version:	P1.1				
FCC ID:	FHO-E2202				
Mounting position: (during normal use)	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor-standing <input type="checkbox"/> Wall/ceiling <input type="checkbox"/> Hand-held <input type="checkbox"/> Other:				
Supplementary information:					
Input ratings	Voltage [V]	Freq. [Hz]	Current [A]	Power [W]	Coupling
<input type="checkbox"/> AC					L1 L2 L3 N PE <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> DC					V+ V- PE <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> Battery	1.2V-1.5V	-	-	-	V+ V- PE <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
<input type="checkbox"/> Other:					



Photo(s) of EUT



Photo/copy of marking/rating plate(s)

2.2 Additional information about the EUT

The EUT has sensors that can detect water leakage. When the sensors are triggered the EUT will sound an alarm and transmit data about detected water leakage via Zigbee to other equipment.

2.3 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-003:

Referenced	Applied
ANSI C63.4-2014	ANSI C63.4-2014
CAN/CSA-CISPR 32:17	CISPR 32:2015 + A1

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 #
<input checked="" type="checkbox"/> STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2
<input type="checkbox"/> BJÖRKHALLEN	Semi-anechoic 3 m	2042G-1
<input type="checkbox"/> 5 m CHAMBER	Semi-anechoic 5 m	2042G-3

3.3 Mode of operation during the test

Mode no.	Supply	Description
1	1.2V-1.5V	The EUT is powered by a battery. The sensors of the EUT are not triggered, and no alarm is active. The EUT is not connected to any AE and its Zigbee communication is in idle mode, not transmitting or receiving any data.

Test	Mode of operation
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
-	ANSI C63.4	Conducted continuous emission	AC input	-	N/A
-	CISPR 32	Conducted continuous emission	AC input	-	N/A
5	ANSI C63.4	Radiated emission of EM fields	Enclosure	-	P
6	CISPR 32	Radiated emission of EM fields	Enclosure	-	P
Supplementary information:					

5. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 1000 GHZ

Date of test	Temp. [°C]	Humidity [%RH]	Tested by
May 30, 2023	22	27	Shaikh Zaher Jens Gardström
June 1, 2023	22	25	Shaikh Zaher Jens Gardström

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:	<input checked="" type="checkbox"/> Table-top (EUT 0.8 m from the RGP) <input type="checkbox"/> Floor-standing (EUT 12 mm from the RGP) <input type="checkbox"/> Other:	
Highest measured frequency:	<input type="checkbox"/> $F_x \leq 108$ MHz: 1 GHz <input type="checkbox"/> 108 MHz $< F_x \leq 500$ MHz: 2 GHz <input type="checkbox"/> 500 MHz $< F_x \leq 1$ GHz: 5 GHz <input checked="" type="checkbox"/> $F_x > 1$ GHz: 5 x F_x up to a max. of 40 GHz <input type="checkbox"/> F_x is unknown: 40 GHz	
Frequency range:	Measuring distance	Measurement uncertainty
<input type="checkbox"/> 30 to 1000 MHz	3 m	± 5.1 dB
<input checked="" type="checkbox"/> 30 to 1000 MHz	10 m	± 5.0 dB
<input checked="" type="checkbox"/> 1.0 to 18 GHz	3 m	± 4.5 dB
<input type="checkbox"/> 18 to 26 GHz	3 m	± 4.8 dB
<input type="checkbox"/> 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 %.		

Measurement distance [m]	Frequency [MHz]	Limits [dBµV/m]		
		QP	PK	AV
Limits, FCC, Class A				
<input type="checkbox"/> 3 / <input type="checkbox"/> 10	30 – 88	49.6 / 39.1	-	-
	88 – 216	54.0 / 43.5	-	-
	216 – 960	56.9 / 46.4	-	-
	960 – 1000	60.0 / 49.5	-	-
<input type="checkbox"/> 3	Above 1000	-	80.0	60.0
ICES-003, Class A				
<input type="checkbox"/> 3 / <input type="checkbox"/> 10	30 – 88	50.0 / 40.0	-	-
	88 – 216	54.0 / 43.5	-	-
	216 – 230	56.9 / 46.4	-	-
	230 - 960	57.0 / 47.0	-	-
	960 – 1000	60.0 / 49.5	-	-
<input type="checkbox"/> 3	Above 1000	-	80.0	60.0
Limits, FCC, Class B				
<input type="checkbox"/> 3 / <input checked="" type="checkbox"/> 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	-	-
<input checked="" type="checkbox"/> 3	Above 1000	-	74.0	54.0
Limits, ICES-003, Class B				
<input type="checkbox"/> 3 / <input checked="" type="checkbox"/> 10	30 – 88	40.0 / 30.0	-	-
	88 – 216	43.5 / 33.1	-	-
	216 – 230	46.0 / 35.6	-	-
	230 - 960	47.0 / 37.0	-	-
	960 – 1000	54.0 / 43.5	-	-
<input checked="" type="checkbox"/> 3	Above 1000	-	74.0	54.0

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		-	1000	1000	3000
Final						-	1000	1000	-

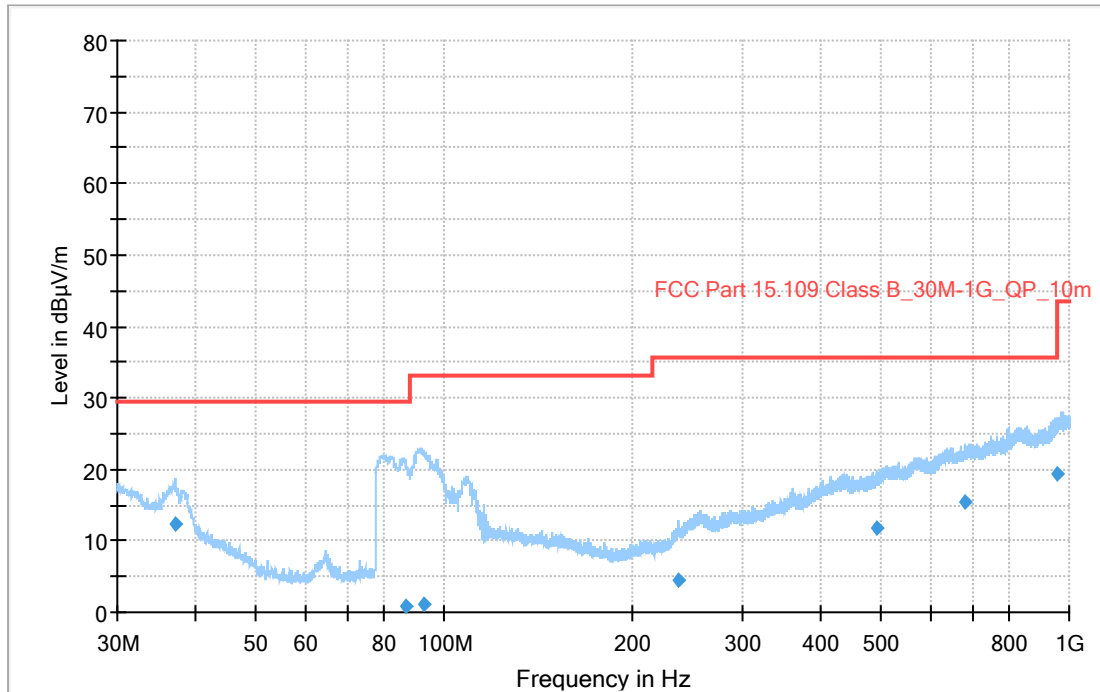


Photo(s) of test setup(s) for radiated disturbances 30 – 1000 MHz



Photo(s) of test setup(s) for radiated disturbances 1 – 13 GHz

5.1 Test results, 30 – 1000 MHz, Class B



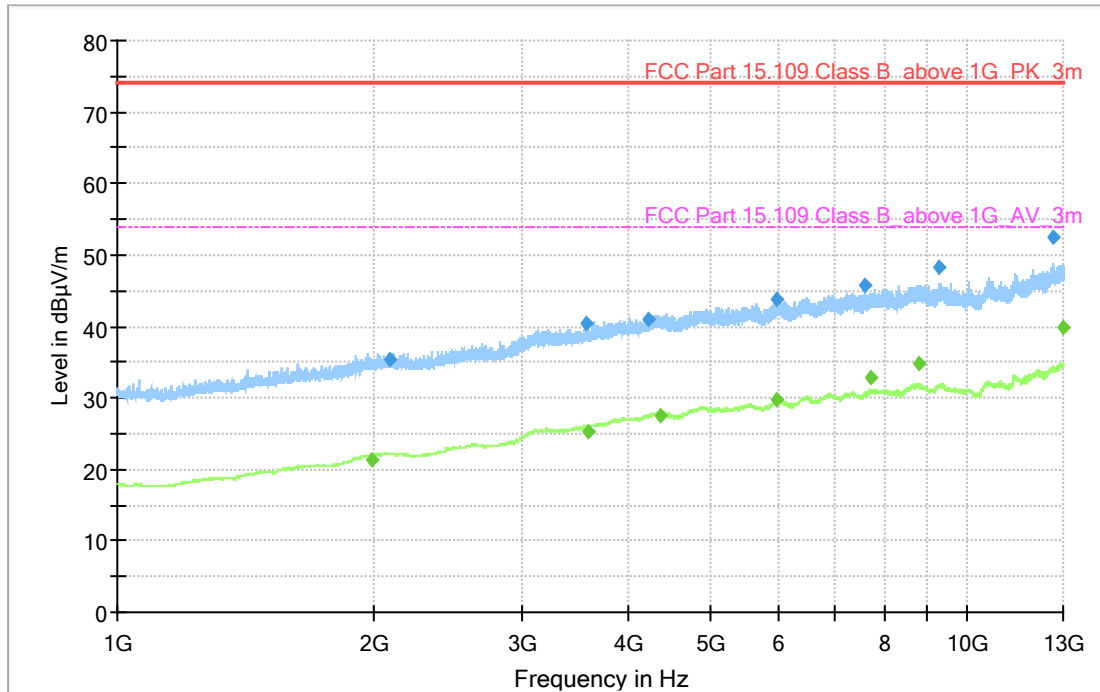
Diagram, Peak overview sweep

Measurement results, Quasi-peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
37.050	12.36	29.54	17.18	1000.0	120.0	177.0	V	170.0
79.470	-0.29	29.54	29.83	1000.0	120.0	109.0	H	251.0
86.760	0.75	29.54	28.79	1000.0	120.0	259.0	H	214.0
92.490	1.02	33.06	32.04	1000.0	120.0	258.0	H	266.0
236.940	4.51	35.56	31.05	1000.0	120.0	266.0	V	335.0
492.540	11.91	35.56	23.65	1000.0	120.0	231.0	V	105.0
678.810	15.52	35.56	20.04	1000.0	120.0	269.0	H	-25.0
953.760	19.36	35.56	16.20	1000.0	120.0	279.0	H	18.0

Since the EUT fulfils the requirements for FCC class B, it is deemed to pass for ICES-003 limits as well because of the stricter limits of the FCC standard.

5.2 Test results, 1 – 13 GHz, Class B



Diagram, Peak and Average overview sweep

Measurement results, Peak

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
2098.500	35.33	74.00	38.67	1000.0	1000.0	188.0	H
3567.000	40.29	74.00	33.71	1000.0	1000.0	249.0	H
4212.250	41.00	74.00	33.00	1000.0	1000.0	322.0	V
5978.500	43.82	74.00	30.18	1000.0	1000.0	103.0	V
7600.750	45.79	74.00	28.21	1000.0	1000.0	193.0	H
9274.750	48.17	74.00	25.83	1000.0	1000.0	218.0	V
12632.000	52.48	74.00	21.52	1000.0	1000.0	121.0	H

Measurement results, Average

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
1997.500	21.37	54.00	32.63	1000.0	1000.0	285.0	H
3587.000	25.36	54.00	28.64	1000.0	1000.0	325.0	H
4355.750	27.48	54.00	26.52	1000.0	1000.0	323.0	H
5975.750	29.79	54.00	24.21	1000.0	1000.0	113.0	V
7696.250	32.85	54.00	21.15	1000.0	1000.0	100.0	V
8803.250	34.73	54.00	19.27	1000.0	1000.0	305.0	V
12966.500	39.97	54.00	14.03	1000.0	1000.0	325.0	H

5.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde&Schwarz	ESC 32	-	-	-
Measurement software	Rohde&Schwarz	ESW44	33890	2022-07	1 year
Antenna-Bilog 30-1000-MHz	Chase	CBL 6111	8578	2022-12	3 years
Horn-Antenna 1-6 GHz	Rohde&Schwarz	HF907	31245	2022-01	3 years
Preamplifier	SEMKO	AM1331	S7992	2022-10	1 year
Measurement cable	Huber+Suhner	SUCOFLEX 106	39122	2023-06	1 year
Measurement cable	Rosenberger	LA5-S003-10000 (UFB293C)	39163	2023-06	1 year
Temperature and humidity meter	Vasiala	HMI41	31215	2022-07	1 year