EMC TEST REPORT

No. 2024569STO-107

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Air Sensor
Type/Model:	E2014 Vindriktning
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-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and Methods of Measurement, Class B.

For details, see clause 2 – 4.

Date of issue: November 18, 2020

Tested by: Madeleine Bengtsar
Madeleine Bengtsar
Anna Näslund

Approved by: Matti Virkki
Matti Virkki

Revision History

Test report no.	Release no.	Date of issue	Description
2024569STO-102	1	October 29, 2020	
2024569STO-107	2	November 18, 2020	Updated rating plate

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
AM	Amplitude Modulation
AMN	Artificial Mains Network
AV	Average
BW	Bandwidth
CAV	CISPR Average
CDN	Coupling/Decoupling Network
CM	Common Mode
CMAD	Common Mode Absorption Device
DC	Direct Current
DM	Differential Mode
EM	Electromagnetic
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
EUT	Equipment Under Test
F	Fail
FM	Frequency Modulation
FAR	Fully Anechoic Room
F_X	Highest fundamental frequency generated or used within the EUT, or highest frequency at which it operates
H	Horizontal
HCP	Horizontal Coupling Plane
I_{ref}	Reference Current
ISN	Impedance Stabilizing Network
MU	Measurement Uncertainty
N/A	Not Applicable
P	Pass
PE	Protective Earth
PK	Peak
Pol.	Polarisation
PWHC	Partial Weighted Harmonic Current
QP / QPK	Quasi-Peak
RF	Radio Frequency
RGP	Reference Ground Plane
RH	Relative Humidity
RMS	Root Mean Square
Rx	Receiver / Receiving
SAC	Semi-Anechoic Chamber
THC	Total Harmonic Current
Tx	Transmitter / Transmitting
V	Vertical
VCP	Vertical Coupling Plane

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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 Zhang/Lingfeng Zhang
Client observer	-

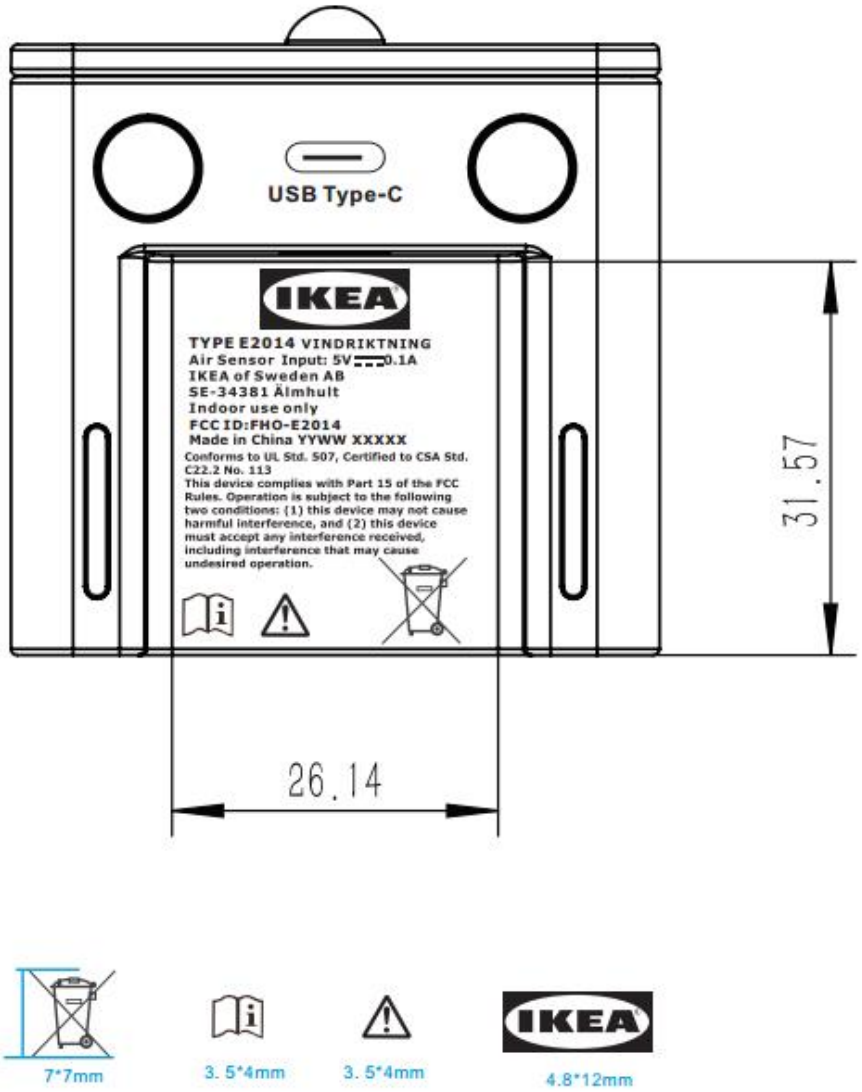
2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Air sensor								
Type/Model:	E2014 Vindriktning								
Brand name:	IKEA								
S/N:	-								
Manufacturer:	IKEA of Sweden AB								
Installation class:	☐ I ☒ II ☐ III ☐ N/A								
Highest clock frequency, F_X:	16 MHz								
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					**L1** ☐	**L2** ☐	**L3** ☐	**N** ☐	**PE** ☐
☒ DC	5	-	0.1	-	**V+** ☒	**V-** ☒			**PE** ☐
☐ Battery					**V+** ☐	**V-** ☐			**PE** ☐
☐ Other:									

See appendix 1
Photo(s) of EUT

Air sensor-NA



Photo/copy of marking/rating plate(s)

2.2 Additional information about the EUT

The product is an air sensor indicating particles in the air by activating green, yellow or red LEDs

The EUT has the following ports:

Port type	Port name	Shielded
AC I/O		
☐ AC power input		☐
☐ AC power output		☐
DC I/O		
☒ DC power input	USBC Port	☒
☐ DC power output		☐
Signal/control I/O		
☐ Telecom/network		☐
☐ Signal/control		☐
Supplementary information:		

The EUT ports were connected according to the following:

Port name	Cable type	Connected to
USB C Port	USB C	USB C adapter

2.3 Peripheral equipment

Peripheral 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
USB C adapter	Samsung	EP-TA20EBE	-

3. TEST SPECIFICATIONS

3.1 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

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 a FCC listed test site with site registration number 90913
Intertek Semko AB is a 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 VAC / 60 Hz	EUT powered, not submitted for particles and indicator LED is green

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	FCC Part 15 subpart B	Conducted continuous emission	AC input	-	Pass
5	ICES-003	Conducted continuous emission	AC input	-	Pass
6	FCC Part 15 subpart B	Radiated emission of EM fields	Enclosure	-	Pass
6	ICES-003	Radiated emission of EM fields	Enclosure	-	Pass
Supplementary information: -					

5. CONDUCTED CONTINUOUS DISTURBANCES

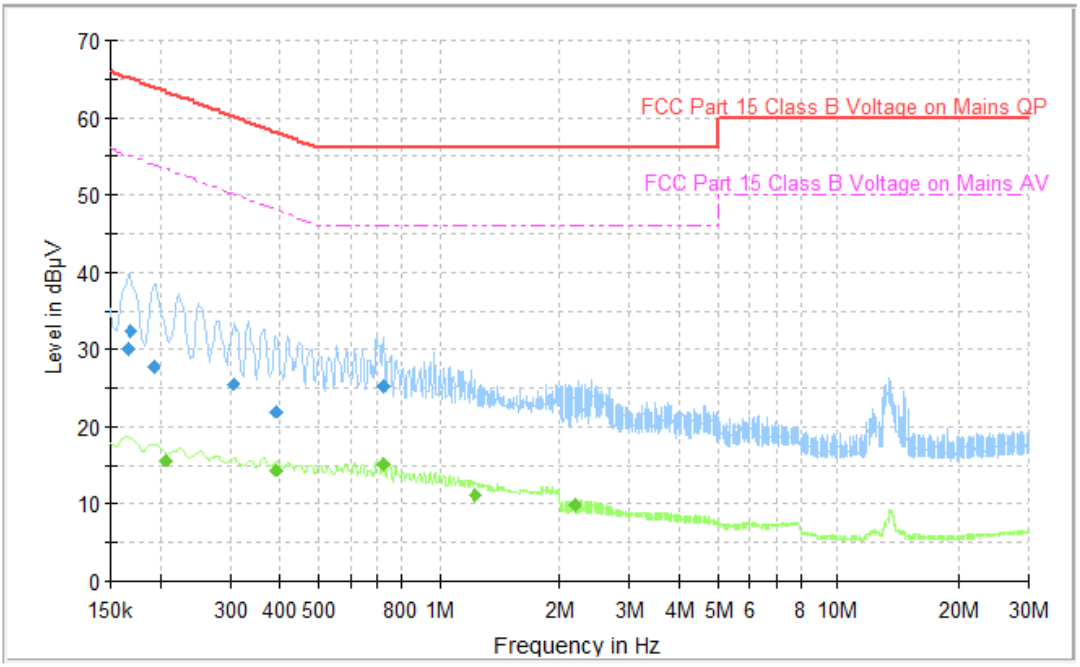
Date of test	Temp. [°C]	Humidity [%RH]	Tested by
October 21, 2020	22 [°C]	40 [%]	Madeleine Bengtsar

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 and ICES-003			
☐ AC power input Class A	0.15 – 0.50	79	66
	050 – 30.00	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.			

Photo(s) of test setup(s) for conducted continuous disturbances, see appendix 1

5.1 Test results, AC Power input port, Class B



Diagram, Peak and AV overview sweep

Measurement results, Quasi-peak

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE
0.165750	29.96	65.17	35.21	1000.0	9.000	N	GN
0.168000	32.47	65.06	32.59	1000.0	9.000	N	GN
0.192750	27.84	63.92	36.07	1000.0	9.000	N	GN
0.303000	25.49	60.16	34.67	1000.0	9.000	L1	GN
0.388500	22.09	58.10	36.00	1000.0	9.000	N	GN
0.721500	25.37	56.00	30.63	1000.0	9.000	L1	GN

Measurement results, Average

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE
0.206250	15.55	53.36	37.80	1000.0	9.000	L1	GN
0.388500	14.38	48.10	33.72	1000.0	9.000	L1	GN
0.723750	15.23	46.00	30.77	1000.0	9.000	L1	GN
1.227750	11.11	46.00	34.89	1000.0	9.000	L1	GN
2.170500	9.92	46.00	36.08	1000.0	9.000	L1	GN

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 - Version	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	07-2020	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2728	07-2020	1 year
Transient protection	Rohde & Schwarz	ESH3-Z2	4623	05-2020	1 year
Cable	Suhner	G03232 D-01	9701	06-2020	1 year
Cable	Huber + Suhner	RG 223/U	9815	06-2020	1 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 1 GHZ

Date of test	Temp. [°C]	Humidity [%RH]	Tested by
October 20, 2020	20 [°C]	43 [%]	Madeleine Bengtsar

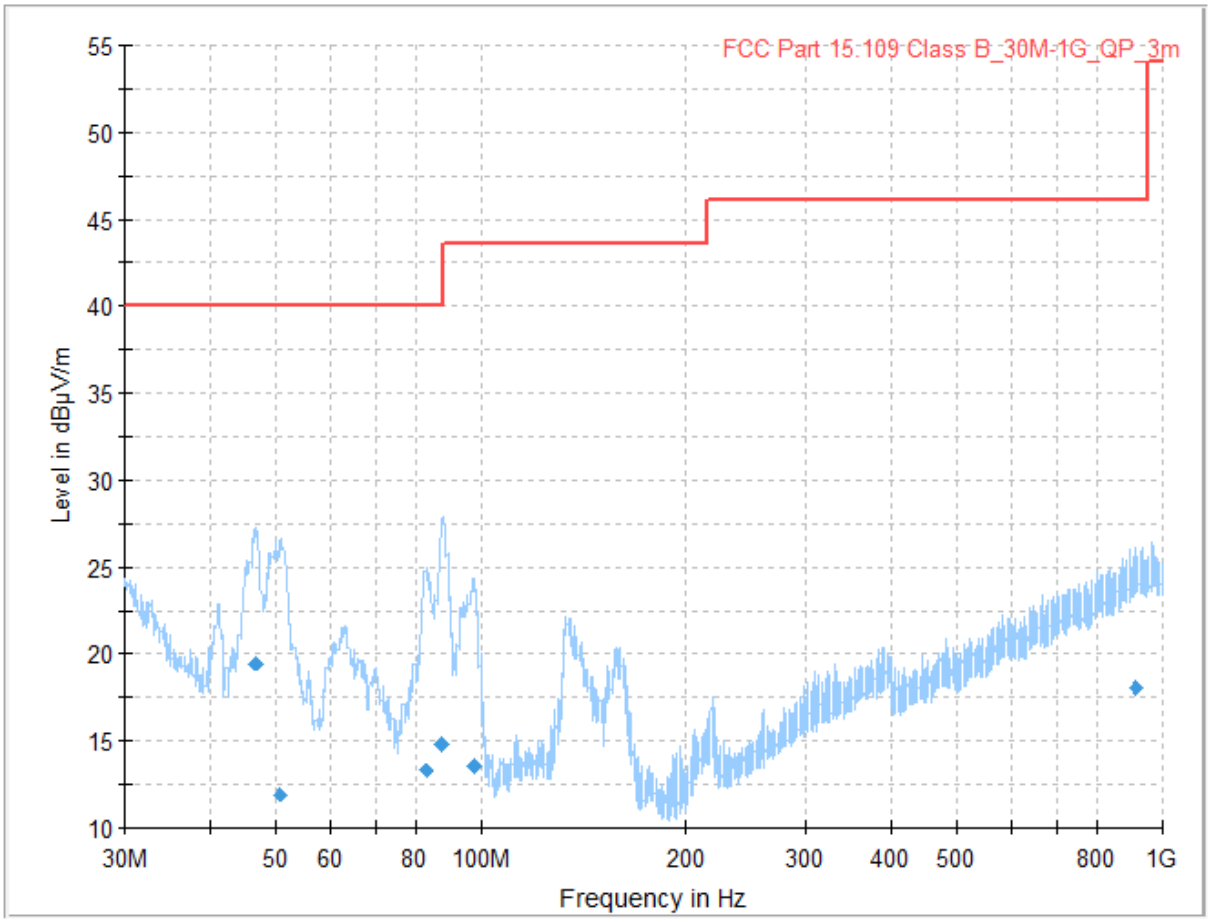
Test setup and procedure:	The EUT was placed on a non-conductive support on the RGP. Overview sweeps were performed with the measurement receiver in max hold mode and the peak detector activated in the frequency range 30 – 1000 MHz. Above 1 GHz, both the peak and average detectors were activated, when 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 ≤ 108 MHz: 1 GHz ☐ 108 MHz < F_X ≤ 500 MHz: 2 GHz ☐ 500 Mhz < F_X ≤ 1 GHz: 5 GHz ☐ F_X > 1 GHz: 5 x 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 %.		

Measurement distance [m]	Frequency [MHz]	Limits [dBµV/m]		
		QP	PK	AV
Limits, FCC and ICES-003, Class A				
☐ 3 / ☐ 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	-	-
☐ 3 / ☐ 10	Above 1000	-	80.0 / 69.5	60.0 / 49.5
Limits, FCC and ICES-003, 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 / ☐ 10	Above 1000	-	74.0 / 63.5	54.0 / 43.5

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	-	3000
Final						-	1000	1000	-

Photo(s) of test setup(s) for conducted continuous disturbances, see appendix 1

6.1 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)
46.620	19.4	40.0	20.6	1000	120.000	114.0	V	303.0
50.550	18.6*	40.0	21.4	1000	120.000	103.0	V	58.0
83.070	18.0*	40.0	22.0	1000	120.000	105.0	V	66.0
87.570	19.3*	40.0	20.7	1000	120.000	104.0	V	129.0
97.410	17.6*	43.5	25.9	1000	120.000	100.0	V	0.0
915.820	18.10	46.0	27.9	1000	120.000	296.0	H	135.0

*This peak was measured manually after the test.

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 - Version	--	--	--
Measurement Receiver	Rohde&Schwarz	ESW 44	34030	07-2020	1 year
Antenna	Rohde&Schwarz	HL562	30711	08-2018	3 year
Measurement cable	Radiall	LMR400UF	9976	07-2020	1 year
Measurement cable	Rosenberger	LU7-S083-3000	39184	08-2020	1 year
Measurement cable	Rosenberger	UFB311A	39055	05-2020	1 year
Antenna mast	Maturo GM BH	TAM 4.0-E	32376	-	-