

EMC TEST REPORT

No. 2024167STO-112

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment: Connected Cellular Blinds with Zigbee radio
Type/Model: E2102
Additional type/model: E2103
Manufacturer: IKEA of Sweden AB
Tested by request of: IKEA of Sweden AB

*See opinions and interpretations clause 2.5

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 equipment.

For details, see clause 2 – 4.

Date of issue: September 22, 2021

Tested by:


Jan Adolfsson

Approved by:


Love Eriksson

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Revision History

Test report no.	Release no.	Date of issue	Description
2024167STO-101	1	April 9, 2021	
2024167STO-103	2	May 10, 2021	Type/model updated. The name "PRAKTLYSING" and "TREDANSEN" excluded. Marking sign updated regarding text. "7.2V 1xbattery type" changed to "7.2V 1xCBL7.2-18-USB-A1"
2024167STO-112	3	September 22, 2021	Photos of EUT and test setup have been transferred to Test report no. 2024167STO-112 Annex 1.

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	Jeton Sali

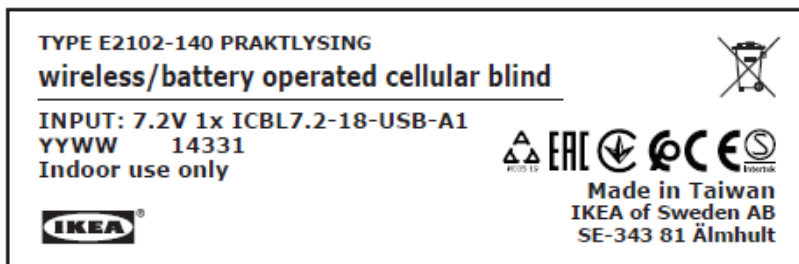
2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Connected Cellular Blinds with Zigbee radio module														
Type/Model:	E2102														
Brand name:	IKEA														
S/N:	No visible serial number														
Manufacturer:	IKEA of Sweden AB														
Installation class:	☐ I ☒ II ☐ III ☐ N/A														
Highest clock frequency, F_X:	2402 – 2480 MHz														
Software version:	--														
Hardware version:	P1.2														
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	0.2	7	<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	5.0	--	1.0	5	<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											
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☒ Battery	7.2	--	2.6		<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:	5.0	--	1.0	5	Micro USB										

Rating plate

E2102-140-EU



2.2 Test set up and EUT photos

Test set up and EUT photos are enclosed in Test report no. 2024167STO-112 Annex 1.

2.3 Additional information about the EUT

The blind is intended to be mounted on walls above windows and operated by a remote control or manually by the buttons on the blind. The battery has to be removed from the blind during charging.

For commercial use the blind is powered by an internal battery.

For demo use the blind is powered by an external power supply.

The EUT consists of the following units:

Commercial use

Unit	S/N	Description
Blind	--	Cellular Blinds with Zigbee radio module
Internal battery	--	7.2 V battery BeiHai Innotech Technology Co., Ltd

Demo use

Unit	S/N	Description
Blind	--	Cellular Blinds with Zigbee radio module
Dummy battery	--	Dummy battery connector with 3m. cable
Power supply PS	--	S018BAV0750200

2.4 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
Remote	IKEA	E1766 Trådfri	--
Repeater	IKEA	E1746	-
Power supply repeater	SAFETY Mark		

2.5 Modifications made to improve EMC-characteristics

No modification was required to obtain the results presented in this report.

2.6 Opinions and interpretations

The EUT was powered by the external power supply listed in section 2.2 second table during the tests. The battery powered blind is assumed to have less emitted disturbances.

The types listed below have mutual, identical, electronic circuits and ratings. The electrical motor and the circuit are separate units, connected with a bus cable. The length of bus cable is dependent of the width of the blind. The widest blind, E2102-140, has been tested.

Additional types included in this test report, see table below:

PRAKTLYSING	Difference as compared to the tested type Sheer light transmission
E2102-58	Blind area 58 x 195 cm.
E2102-68	Blind area 68 x 195 cm.
E2102-76	Blind area 76 x 195 cm.
E2102-81	Blind area 81 x 195 cm.
E2102-86	Blind area 86 x 195 cm.
E2102-91	Blind area 91 x 195 cm.
E2102-96	Blind area 96 x 195 cm.
E2102-122	Blind area 122 x 195 cm.

Additional types:

TREDANSEN	Difference as compared to the tested type Block out light transmission
E2103-58	Blind area 58 x 195 cm.
E2103-68	Blind area 68 x 195 cm.
E2103-76	Blind area 76 x 195 cm.
E2103-81	Blind area 81 x 195 cm.
E2103-86	Blind area 86 x 195 cm.
E2103-91	Blind area 91 x 195 cm.
E2103-96	Blind area 96 x 195 cm.
E2103-122	Blind area 122 x 195 cm.

The difference is considered not to affect EMC-characteristics when compared to the tested type. Therefore, the additional types are also covered by the tests performed in this test report.

2.7 Decision rule

The statements of conformity are reported as:

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

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

3. TEST SPECIFICATIONS

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

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 V 60Hz	Active, manually operated by the remote control

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	Conducted continuous emission	AC input	-	P
5	CISPR 32	Conducted continuous emission	AC input	-	P
6	ANSI C63.4	Radiated emission of EM fields	Enclosure	-	P
6	CISPR 32	Radiated emission of EM fields	Enclosure	-	P
Supplementary information:					

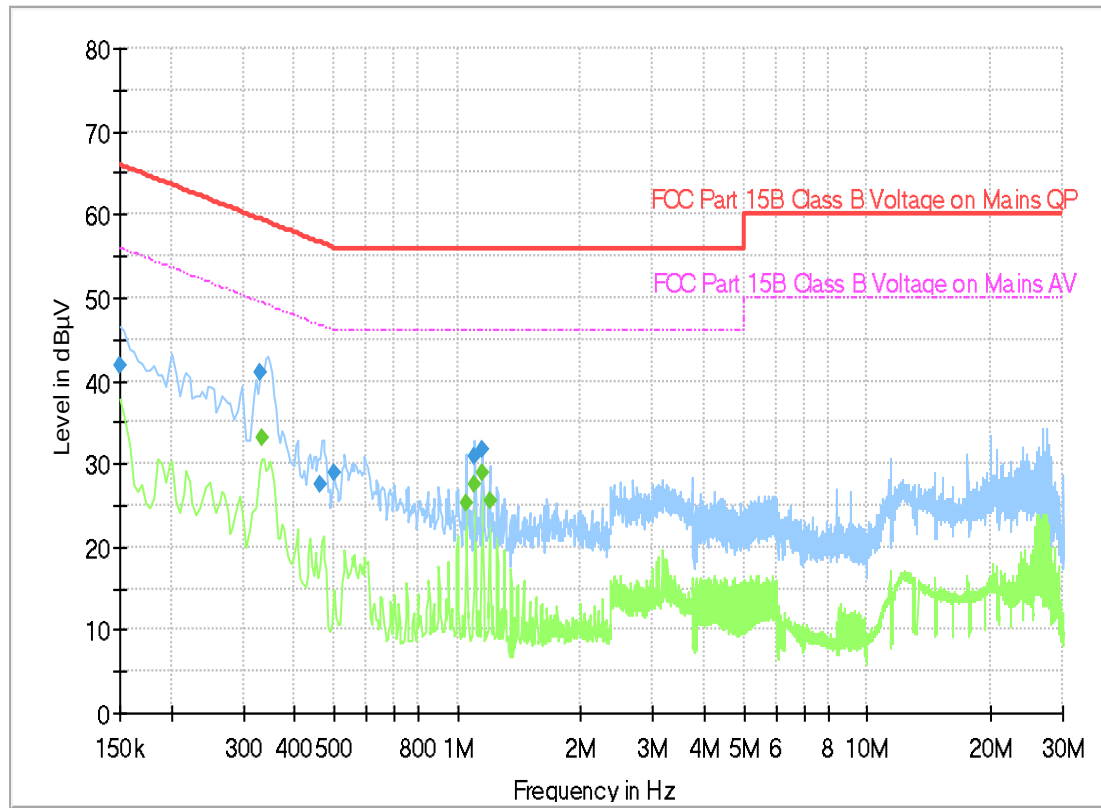
5. CONDUCTED CONTINUOUS DISTURBANCES

Date of test	Temp. [°C]	Humidity [%RH]	Tested by
February 5, 2021	22	10	Jan Adolfsson

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 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.			

5.1 Test results, AC Power input port, Class B



Diagram, Peak and AV overview sweep

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.329000	41.02	---	59.48	18.46	N
0.333000	---	33.07	49.38	16.31	N
1.050000	---	25.37	46.00	20.63	N
1.100000	---	27.47	46.00	18.53	N
1.150000	---	28.98	46.00	17.02	N

Measurement results, Quasi-peak and Average

All other measured disturbances have a margin of more than 20 dB to the limits.

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 - 10.50.40	--	--	--
Receiver	Rohde & Schwarz	ESCI	12741	08-2020	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	8768	06-2020	1 year
Limiter	Rohde & Schwarz	ESH3-Z2	32798	06-2020	1 year
Cable	Suhner	RG223/U	9786	01-2021	1 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHz – 13 GHz

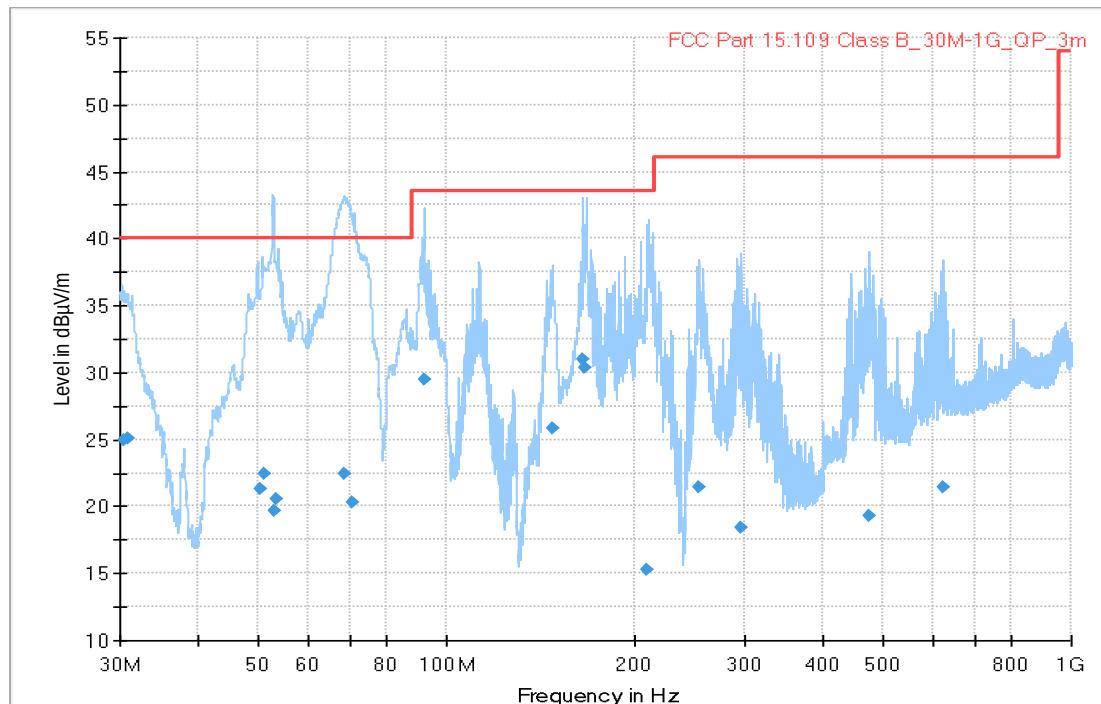
Date of test	Temp. [°C]	Humidity [%RH]	Tested by
February 15, 2021 February 16, 2021	22	14	Jan Adolfsson

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 ☐ $108 \text{ MHz} < F_X \leq 500 \text{ MHz}$: 2 GHz ☐ $500 \text{ MHz} < F_X \leq 1 \text{ GHz}$: 5 GHz ☒ $F_X > 1 \text{ GHz}$: $5 \times F_X$ 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	$\pm 5.1 \text{ dB}$	
☒ 1.0 to 13 GHz	3 m	$\pm 4.5 \text{ dB}$	
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 / ICES-003, Class B				
☒ 3 / ☐ 10	30 – 88	40.0 / 40.0	-	-
	88 – 216	43.5 / 43.5	-	-
	216 – 230	46.0 / 46.0	-	-
	230 - 960	46.0 / 47.0		
	960 – 1000	54.0 / 54.0	-	-
☐ 3 / ☐ 10	Above 1000	-	74.0 / 74.0	54.0 / 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 – 13000	0 – 359	Horn	1 – 4 m		-	1000	-	3000
Final						-	1000	1000	-

6.1 Test results, 30 – 1000 MHz, Class B



Diagram, Peak overview sweep

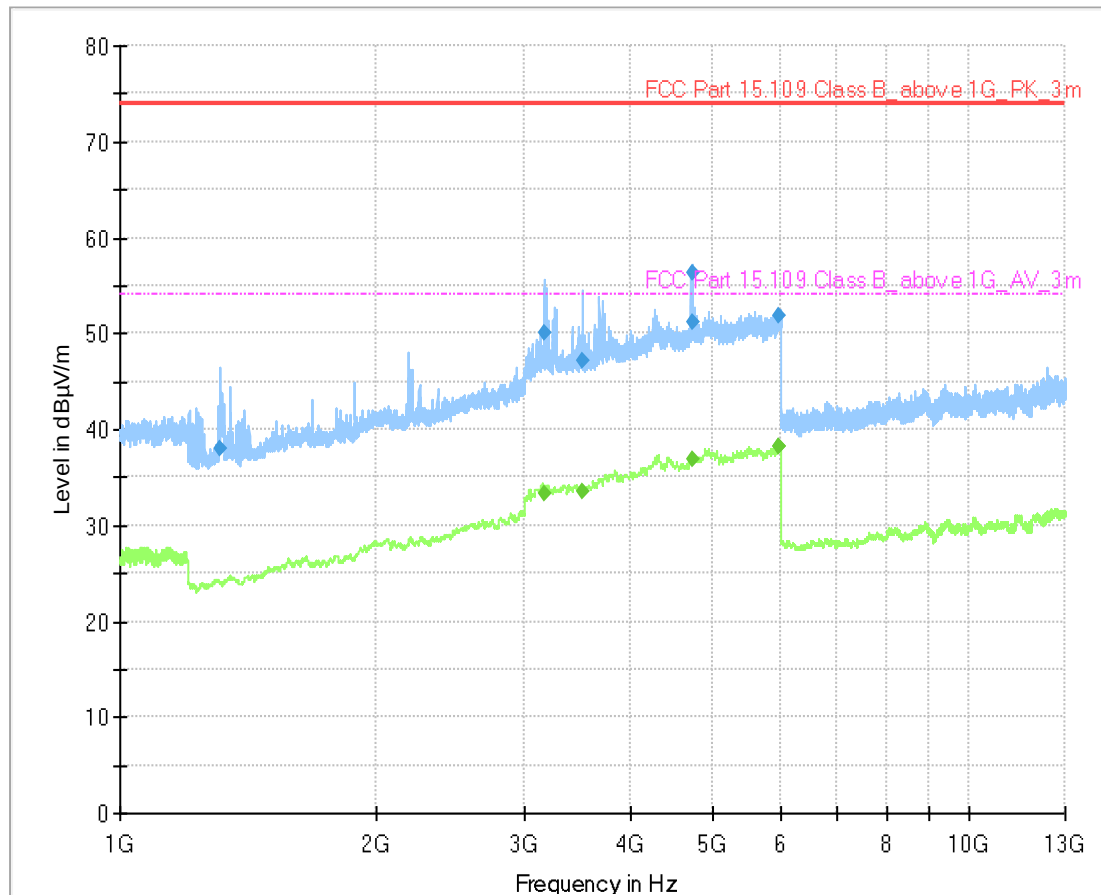
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.510	24.93	40.0	15.1	159.0	V	97.0
30.810	25.03	40.0	15.0	100.0	V	78.0
50.370	21.27	40.0	18.7	100.0	V	52.0
51.090	22.41	40.0	17.6	100.0	V	73.0
53.280	20.62	40.0	19.4	100.0	V	82.0
68.610	22.39	40.0	17.6	100.0	V	315.0
70.710	20.25	40.0	19.8	100.0	V	63.0
92.460	29.53	43.5	14.0	100.0	H	28.0
147.600	25.85	43.5	17.7	100.0	V	244.0
164.970	30.98	43.5	12.5	100.0	V	252.0
166.890	30.33	43.5	13.2	100.0	V	241.0

Measurement results, Quasi-peak

All other measured disturbances have a margin of more than 20 dB to the limits.

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

6.2 Test results, 1 – 13 GHz, Class B



Diagram, Peak and Average overview sweep

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol
4728.250	56.32	---	74.0	17.7	100.0	V
4728.500	---	36.78	54.0	17.2	100.0	V
5980.250	---	38.27	54.0	15.7	100.0	V
5980.500	---	38.27	54.0	15.7	240.0	V

Measurement results, Peak and Average

All other measured disturbances have a margin of more than 20 dB to the limits.

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

6.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde&Schwarz	EMC32 - 10.60.20	--	--	--
Measurement Receiver	Rohde&Schwarz	ESW	34030	07-2020	1 year
Antenna	Chase	CBL6111	8578	11-2019	3 year
Preamp.	Rohde&Schwarz	TS-PRE1	32306	09-2020	1 year
Antenna	Rohde&Schwarz	HF 907	32307	08-2018	3 year
Measurement cable	Rosenberger	LU7-S083	39184	08-2020	1 year
Measurement cable	Rosenberger	UFB311A	39055	05-2020	1 year
Measurement cable	Rosenberger	UFB311A	39057	05-2020	1 year
Measurement cable	Huber+Suhner	Sucoflex 104	39049	09-2020	1 year