EMC TEST REPORT

No. 2024497STO-104

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Decoration lamp with LED
Type/Model:	J2020 Stråla
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-005 Issue 5: Lighting Equipment, Class B.

For details, see clause 2 – 4.

Date of issue: December 22, 2020

Tested by: Ann-Christine Norrström

Approved by: Per Granberg

Revision History

Test report no.	Release no.	Date of issue	Description
2024497STO-104	1	December 22, 2020	

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

CONTENTS

1. CLIENT INFORMATION

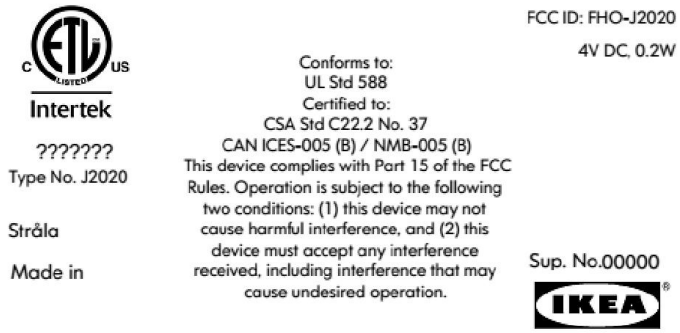
The EUT has been tested by request of

Company	IKEA of Sweden AB
Name of contact	Jianqiu Chen
Client observer	-

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Decoration lamp with LED								
Type/Model:	J2020 Stråla								
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:								
Input ratings	**Voltage [V]**	**Freq. [Hz]**	**Current [A]**	**Power [W]**	**Coupling**				
☒ AC*	100-120	50/60	0.09		**L1** ☒	**L2** ☐	**L3** ☐	**N** ☒	**PE** ☐
☒ DC	4			0,2	**V+** ☒	**V-** ☒			**PE** ☐
☐ Battery					**V+** ☐	**V-** ☐			**PE** ☐
☐ Other:									
Supplementary information:	* Auxiliary LED-driver								



Photo/copy of marking/rating plate(s)

2.2 Additional information about the EUT

The EUT consists of the following units:

Unit	Type	Description
Decoration lamp with LED	J2020 Stråla	-
LED driver	KMV-040-030-NA-3	Auxiliary equipment, needed for correct operation, but not EUT.

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		☐
☐ 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
AC	Plug-in	LED driver
DC	Two-core	Lamp

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 V AC/4 V DC	Light on
2	120 V AC/4 V DC	Stand by

Test	Mode of operation
Conducted continuous emission	1,2
Radiated emission of EM fields	1,2

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	-	P
5	ICES-005	Conducted continuous emission	AC input	-	P
6	FCC Part 15 subpart B	Radiated emission of EM fields	Enclosure	-	P
6	ICES-005	Radiated emission of EM fields	Enclosure	-	P
Supplementary information:					

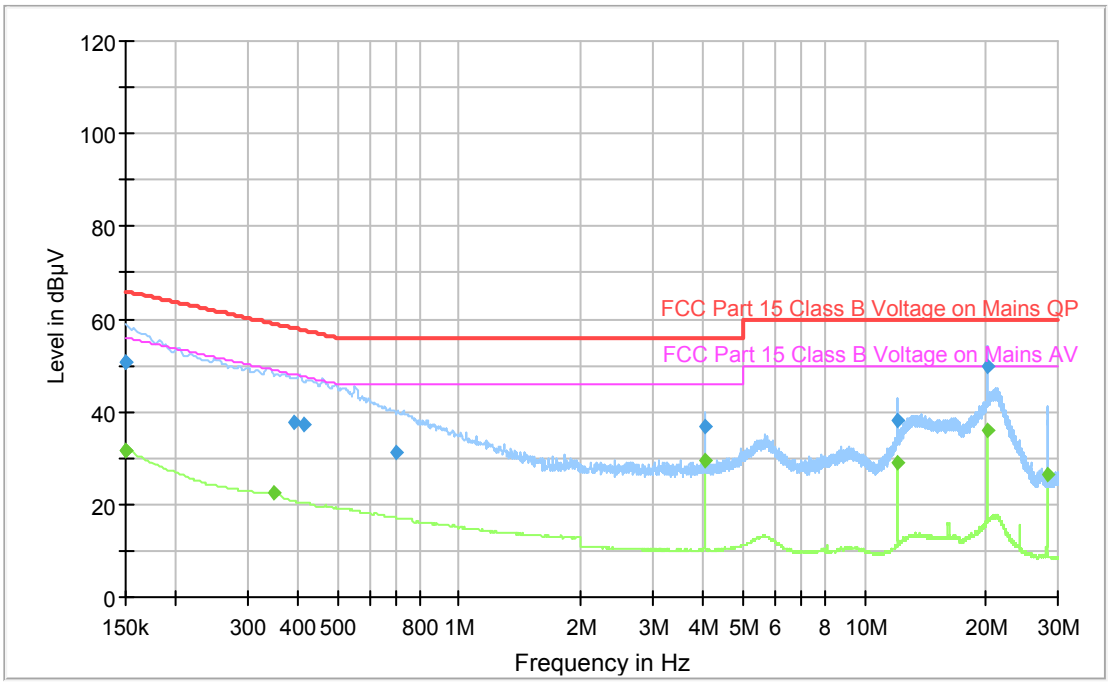
5. CONDUCTED CONTINUOUS DISTURBANCES

Date of test	Temp. [°C]	Humidity [%RH]	Tested by
December 23, 2020	22	29	Ann-Christine Norrström

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.			

5.1 Test results, AC Power input port, Class B, Mode1



Diagram, Peak and AV overview sweep

Measurement results, Quasi-peak, Mode 1

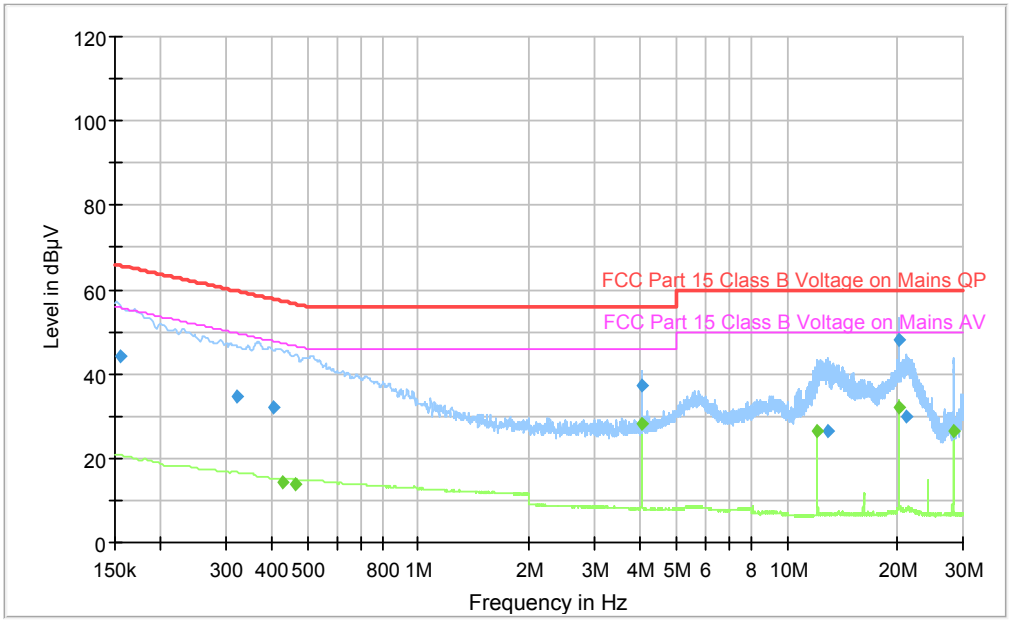
Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Line	Margin (dB)
4.0312	37.0	56.0	N	19.0
20.146	49.8	60.0	N	10.2

Measurement results, Average, Mode 1

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Line	Margin (dB)
4.029000	29.71	46.0	N	16.29
20.139000	35.55	50.0	L1	14.45

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

5.2 Test results, AC Power input port, Class B, Mode 2



Diagram, Peak and AV overview sweep

Measurement results, Quasi-peak, Mode 2

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Line	Margin (dB)
4.034	37.2	56.0	L1	18.8
20.173	48.3	60.0	L1	11.7

Measurement results, Average, Mode 2

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Line	Margin (dB)
4.034	28.0	46.0	N	18.0
20.166	32.2	50.0	L1	17.8

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]

5.3 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - V.10.50.40	--	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	07-2020	1 year
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2728	07-2020	1 year
Pulse Limiter	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
November 10, 2020	21	33	Ann-Christine Norrström

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	

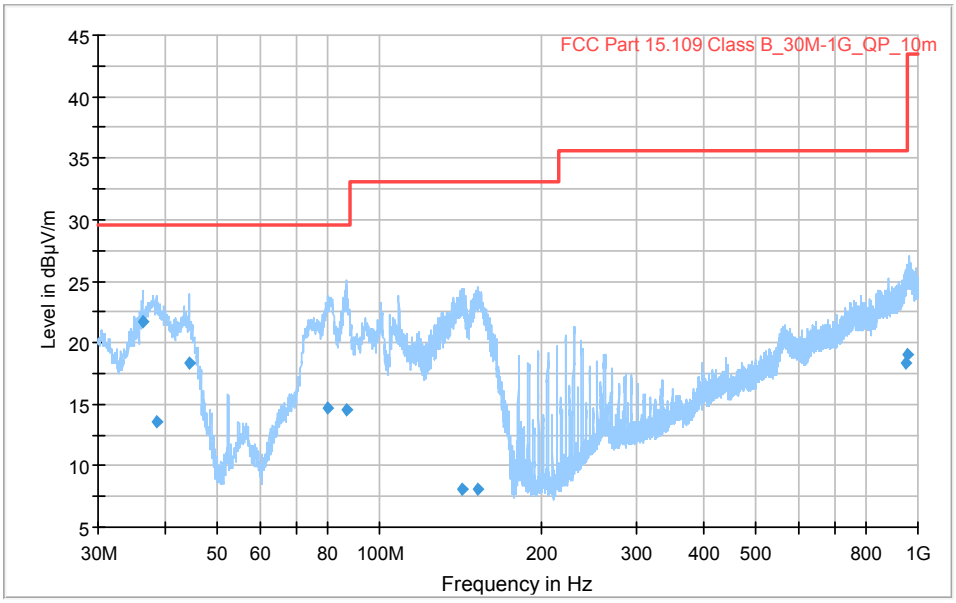
Frequency range:	**Measuring distance**	**Measurement uncertainty**
☒ 30 to 1000 MHz	3 m	± 5.1 dB
☐ 30 to 1000 MHz	10 m	± 5.0 dB
☐ 1.0 to 18 GHz	3 m	± 4.5 dB
☐ 18 to 26 GHz	3 m	± 4.8 dB
☐ 26 to 40 GHz	3 m	± 5.7 dB

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, 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
ICES-005, Class A				
☐ 3 / ☐ 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	-	-
☐ 3 / ☐ 10	Above 1000	-	80.0 /… 69.5	60.0 / 49.5
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 / ☐ 10	Above 1000	-	74.0 / 63.5	54.0 / 43.5
Limits, ICES-005, Class B				
☐ 3 / ☒ 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	-	-
☐ 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	-

6.1 Test results, 30 – 1000 MHz, Class B, Mode 1



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Mode 1

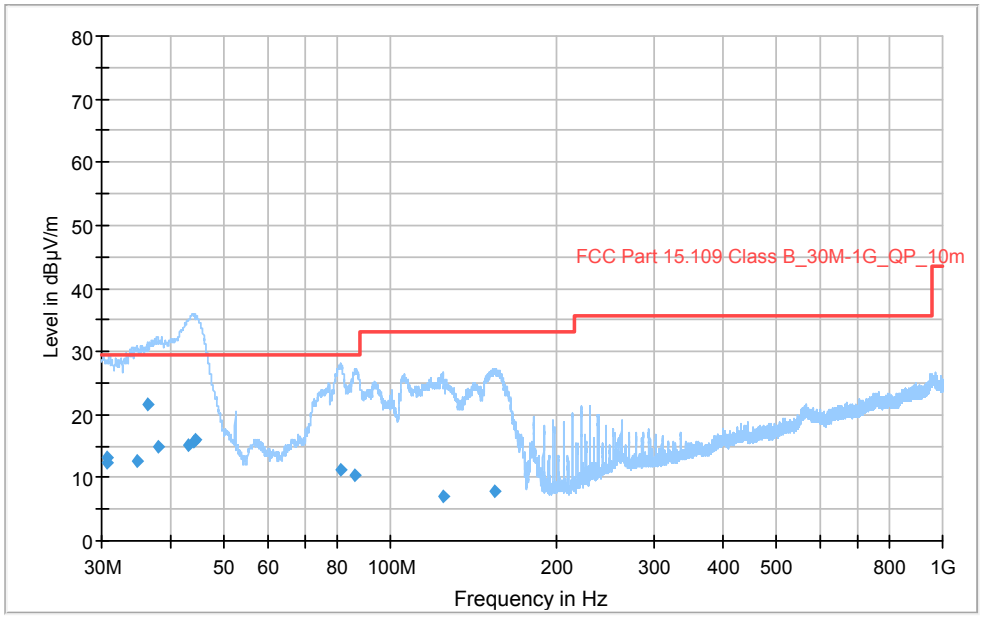
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Pol	Margin* (dB)
36.300	21.6	29.5	V	7.9
38.460	13.6	29.5	V	15.9
44.340	18.4	29.5	V	11.1
80.250	14.7	29.5	V	14.8
86.790	14.5	29.5	V	15.0
946.200	18.3	35.6	V	17.3
958.110	19.0	35.6	H	16.6

*The EUT also fulfil the limit for ICES-005, see limit in table page 16.

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, 30 – 1000 MHz, Class B, Mode 2



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Mode 2

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Pol	Margin* (dB)
30.750	13.2	29.5	V	16.3
30.780	12.3	29.5	V	17.2
34.710	12.7	29.5	V	16.8
36.300	21.7	29.5	V	7.8
37.920	14.9	29.5	V	14.6
43.050	15.1	29.5	V	14.4
43.980	15.6	29.5	V	13.9
44.520	16.0	29.5	V	13.5
81.360	11.2	29.5	V	18.3
86.400	10.5	29.5	V	19.0
86.400	10.5	29.5	V	19.0

*The EUT also fulfil the limit for ICES-005, see limit in table page 16.

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
Antenna bilog	TESEQ	CBL 6111D	34200	03-2020	3 Years
Preamplifier	SEMKO	AM1331	7992	06-2020	1 Year
Coaxial cable	ROSENBERGER	LA5-S003-10000 (UFB293C)	39163	06-2020	1 Year
Coaxial cable	ROSENBERGER	LA5-S003-8500	39148	04-2020	1 Year
Coaxial cable	Huber+Suhner	SUCOFLEX 106	39122	04-2020	1 Year
Measurement receiver	Rohde & Schwarz	ESW 44	33890	07-2020	1 Year
Temp and moisture	Vaisala	HMI 41	31215	06-2020	1 Year