

Prüfbericht-Nr.: <i>Test Report No.:</i>	CN2222JV 001	Auftrags-Nr.: <i>Order No.:</i>	244461991	Seite 1 von 17 <i>Page 1 of 17</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	1288983	Auftragsdatum: <i>Order date.:</i>	2022-11-14	
Auftraggeber: <i>Client:</i>	IKEA of Sweden AB Box 702, SE-343 81, Älmhult Sweden			
Prüfgegenstand: <i>Test item:</i>	VALLHORN Motion Sensor			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	E2134 FCC ID: FHO-E2134			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland EMC service			
Prüfgrundlage: <i>Test specification:</i>	FCC 47 CFR Part 15, Subpart B:2021 Class B ICES-003:2020, ICES-005:2018			
Wareneingangsdatum: <i>Date of receipt:</i>	2022-11-27			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003383387-001			
Prüfzeitraum: <i>Testing period:</i>	Refer to test report			
Ort der Prüfung: <i>Place of testing:</i>	Refer to clause 1.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: / tested by: Xuelan Zhang		genehmigt von: / authorized by: Jiayi Zhou		
Datum: / Date: 2023-02-13 <i>Xuelan Zhang</i>		Datum: / Date: 2023-02-13 <i>Jiayi Zhou</i>		
Stellung: / Position: Senior project manager		Stellung: / Position: Senior manager		
Sonstiges / <i>Other:</i>				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
<small>* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested</small>				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

TEST SUMMARY

5.1.1 RADIATED EMISSION (30 MHz - 1 GHz)

Result:

Passed

5.1.2 RADIATED EMISSION (ABOVE 1 GHz)

Result:

Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.

Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 6 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a VALLHORN motion sensor. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input : 2xAAA
Protection class : III

2.3 Independent Operation Modess

The basic operation modes are the below,

1. Light mode, on with dimming
2. Light mode, standby
3. Dark mode, on with dimming
4. Dark mode, standby

2.4 Description of interconnecting cables

None.

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is 2.4 GHz.

2.7 Submitted Documents

Circuit diagram, user's manual and rating label.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

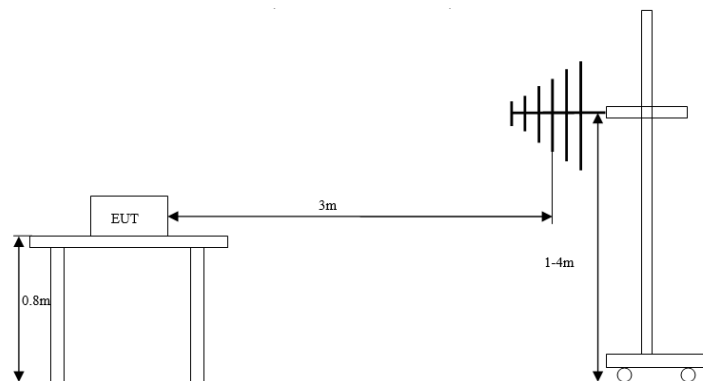
Refer to the related paragraph of this report.

The sequence of testing:

1. Radiated emission tests were performed on 2022-12-12.

3.2 Equipment and cable arrangement

Block diagram for radiated emission tests is as follows:



(Radiated emission)

Also refer to photographs on attachment 1 for test setups for radiated emission test.

3.3 Test Software

No special test software was used during the tests.

3.4 Special Accessories and Auxiliary Equipment

During the tests, the below equipment were used.

No.	Equipment	Model	Manufacturer
1	Cell phone	STF-AL10	Huawei
2	DIRIGERA hub	E2003	IKEA
3	Power supply	ICPSW5-10EU-I	IKEA
4	Bulb	A806	-

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Conformity Decision Rule

For all EMI tests included in this report, as measurement uncertainties are less than the values U_{CISPR} given in CISPR 16-4-2, compliance with the limits is determined by comparing measurement results directly with corresponding limits without taking into consideration of measurement uncertainties.

5 Test Results EMISSION

5.1 Emission in the Frequency Range above 30 MHz

5.1.1 Radiated emission (30 MHz - 1 GHz)

Result:	Passed
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Date of testing	: 2022-12-12
Test procedure	: FCC 47 CFR Part 15, Subpart B:2021, ICES-003:2020, ICES-005:2018, ANSI C63.4-2014 and CISPR 16-2-3
Frequency range	: 30 – 1000 MHz
Limits	: Quasi-peak limits (3 m distance): 30 – 88 MHz, 40 dB μ V/m; 88 – 216 MHz, 43.5 dB μ V/m; 216 – 1000 MHz, 46 dB μ V/m (see Note 1)
Bandwidth of EMI receiver for final measurement	: 120 kHz
Measurement time for final measurement	: 1 s
Kind of test site	: Semi-anechoic chamber
Operational mode	: Modes 1 as defined in clause 2.3
Input voltage	: 2xAAA battery
Ambient condition	: Temperature: 21.7 °C; Relative humidity: 48.2 %
Expanded measurement uncertainty ($k=2$)	: 5.49 dB

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 0.8 m high wooden table above the reference ground plane. The wooden table was rotated 360° around and the height of the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, “×” means quasi-peak test results.

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Note 1: The Class B limits in ICES-005:2018 Table 4 are more stringent than those in FCC Part 15 subpart B §15.109 (a) and Class B limits in ICES-003:2020 Table 2. Therefore, the former are used in following figures and tables.

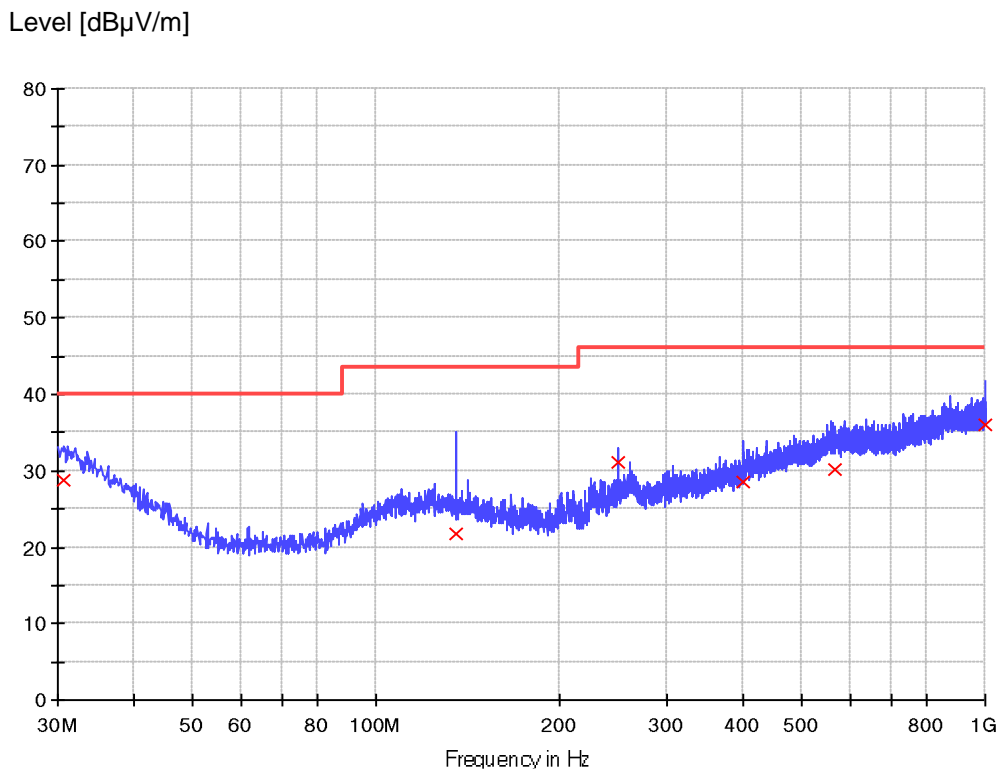
Notes on following tables of radiated emission results and conversions:

QuasiPeak (dB μ V/m): final measurement results by using quasi-peak detector

Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)

Margin: Limit (dB μ V/m) - QuasiPeak (dB μ V/m)

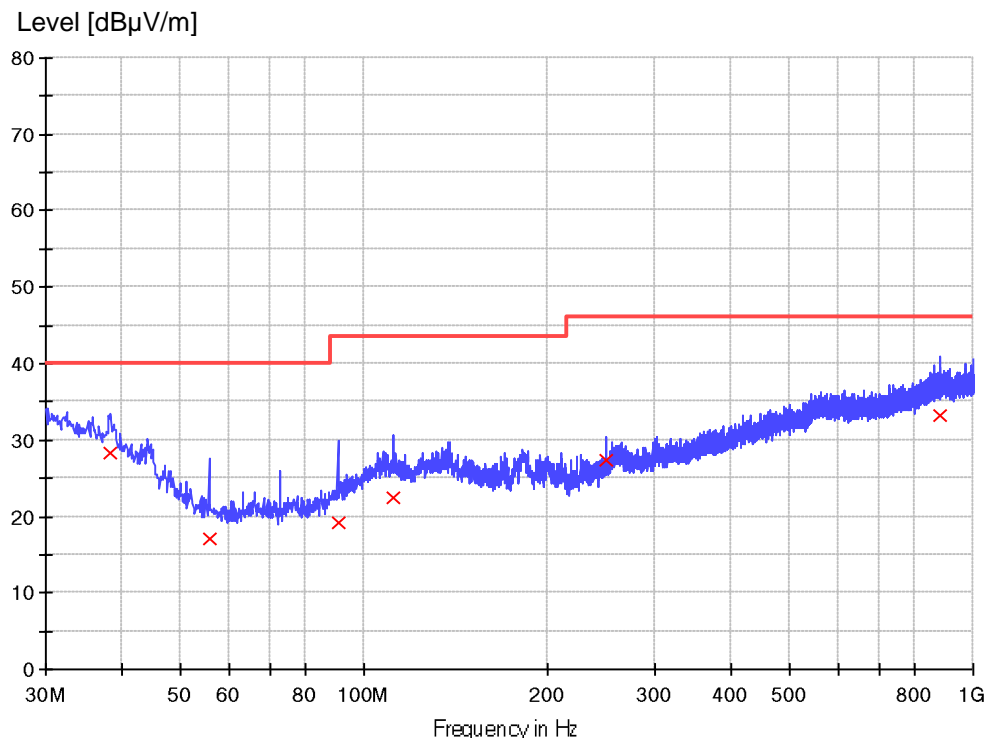
Figure 1: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz)



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.727500	28.7	120.000	150.0	H	132.0	25.0	11.3	40.0
134.881250	21.7	120.000	133.0	H	-91.0	18.4	21.8	43.5
250.068750	31.1	120.000	120.0	H	-145.0	19.3	14.9	46.0
400.055000	28.5	120.000	120.0	H	-131.0	22.6	17.5	46.0
566.652500	30.2	120.000	110.0	H	86.0	26.2	15.8	46.0
1000.000000	36.0	120.000	145.0	H	114.0	28.9	18.0	54.0

Figure 2: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz)



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
38.245000	28.3	120.000	115.0	V	-145.0	21.0	11.8	40.0
55.583750	17.0	120.000	130.0	V	61.0	13.1	23.0	40.0
90.503750	19.1	120.000	130.0	V	112.0	15.6	24.4	43.5
111.601250	22.4	120.000	152.0	V	78.0	18.5	21.1	43.5
250.068750	27.4	120.000	145.0	V	90.0	19.3	18.6	46.0
882.630000	33.2	120.000	130.0	V	-141.0	28.0	12.9	46.0

5.1.2 Radiated emission (Above 1 GHz)

Result:	Passed
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Date of testing	: 2022-12-12
Port	: Enclosure
Test procedure	: FCC 47 CFR Part 15, Subpart B:2021, ANSI C63.4-2014 and CISPR 16-2-3 ICES-003:2020
Limit	: Above 1 GHz, Peak limit: 74 dB μ V/m; Average limit: 54 dB μ V/m
Frequency range	: 1-18 GHz Note: The highest frequency in the EUT is 2.4 GHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 12 GHz. The actual test frequency is up to 18 GHz.
Bandwidth of EMI receiver for final measurement	: 1000 kHz
Measurement time for final measurement	: 1 s
Test distance	: 3 m
Kind of test site	: Semi-anechoic chamber
Operational mode	: Mode 1 as defined in clause 2.3
Input voltage	: 2xAAA battery
Earthing	: No earthing
Ambient condition	: Temperature: 21.7 °C; Relative humidity: 48.2 %

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a poly table, which is 0.8 m high. The wooden table was rotated 360° around and the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, “x(red)” means measurement results with peak detector and “+ (blue)” means measurement results with average detector.

Notes on following tables of radiated emission results and conversions:

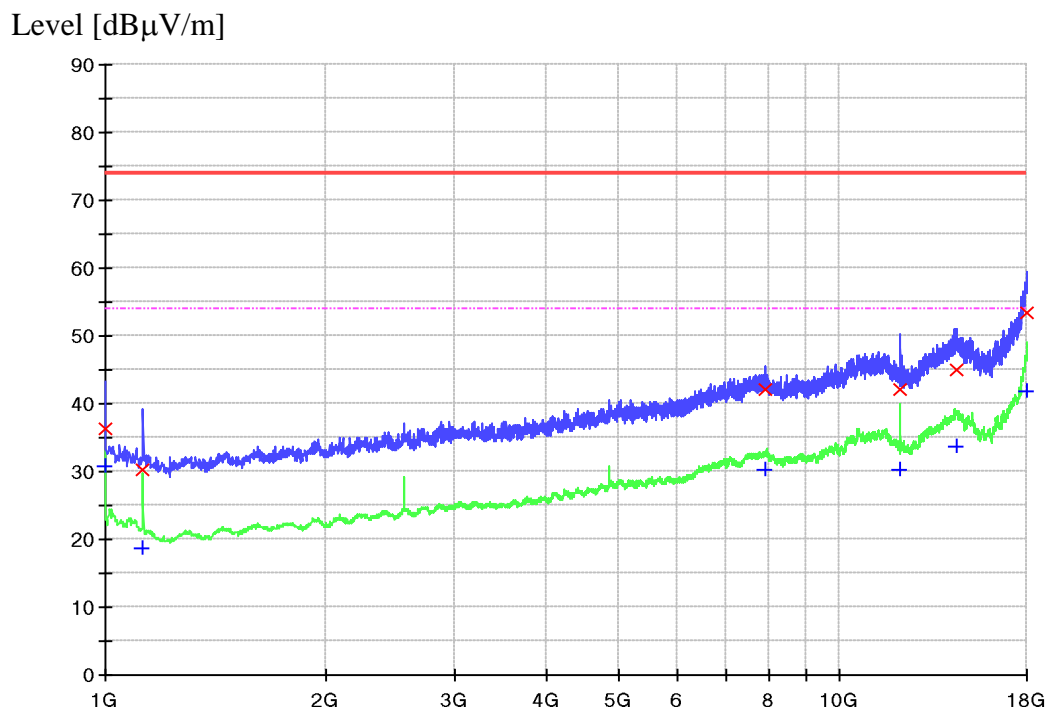
- Peak (dB μ V/m): final measurement results by using peak detector
- Average (dB μ V/m): final measurement results by using average detector
- Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)
- Margin: Limit PK (dB μ V/m) - Peak (dB μ V/m)

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Limit CAV (dB μ V/m) – Average (dB μ V/m)

Figure 3: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization



Final Peak measurement results:

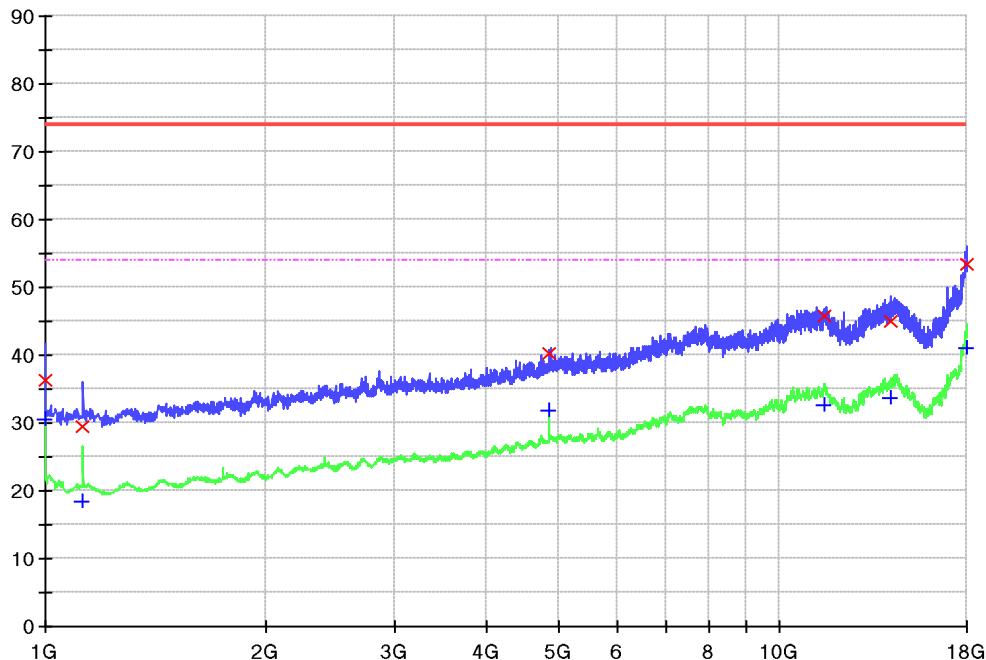
Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1000.000000	36.3	1000.000	120.0	H	118.0	-21.3	37.8	74.0
1123.250000	30.3	1000.000	150.0	H	100.0	-20.8	43.7	74.0
7923.250000	42.1	1000.000	150.0	H	-20.0	-5.0	31.9	74.0
12122.250000	42.1	1000.000	130.0	H	-46.0	-2.7	31.9	74.0
14476.750000	45.1	1000.000	120.0	H	180.0	2.6	28.9	74.0
17985.125000	53.4	1000.000	120.0	H	165.0	12.5	20.6	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1000.000000	30.7	1000.000	120.0	H	118.0	-21.3	23.3	54.0
1123.250000	18.6	1000.000	150.0	H	100.0	-20.8	35.4	54.0
7923.250000	30.3	1000.000	150.0	H	-20.0	-5.0	23.7	54.0
12122.250000	30.3	1000.000	130.0	H	-46.0	-2.7	23.7	54.0
14476.750000	33.6	1000.000	120.0	H	180.0	2.6	20.4	54.0
17985.125000	41.9	1000.000	120.0	H	165.0	12.5	12.1	54.0

Figure 4: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1000.000000	36.3	1000.000	120.0	V	165.0	-21.3	37.7	74.0
1123.250000	29.4	1000.000	135.0	V	-88.0	-20.8	44.7	74.0
4852.625000	40.2	1000.000	135.0	V	138.0	-10.6	33.8	74.0
11501.750000	45.7	1000.000	15.0	V	20.0	-0.4	28.3	74.0
14215.375000	45.1	1000.000	115.0	V	-15.0	2.1	29.0	74.0
17978.750000	53.3	1000.000	120.0	V	138.0	12.3	20.7	74.0

Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1000.000000	30.4	1000.000	120.0	V	165.0	-21.3	23.6	54.0
1123.250000	18.5	1000.000	135.0	V	-88.0	-20.8	35.5	54.0
4852.625000	31.8	1000.000	135.0	V	138.0	-10.6	22.2	54.0
11501.750000	32.6	1000.000	15.0	V	20.0	-0.4	21.4	54.0
14215.375000	33.7	1000.000	115.0	V	-15.0	2.1	20.3	54.0
17978.750000	41.0	1000.000	120.0	V	138.0	12.3	13.0	54.0

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6 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
G1811417	Log periodic antenna	HL050	Rohde&Schwarz	10.03.2020	10.03.2023
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	04.11.2021	04.11.2023
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	14.05.2021	14.05.2023
G1811416	Fully anechoic chamber	FAC3plus	Frankonia	25.07.2019	25.07.2024
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	10.06.2021	10.06.2024

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End of test report